OKUMA

OPEN POSSIBILITIES

# MU-400V III
# MU-500V III

5-Axis Vertical Machining Centers

# MU-400VⅢ/MU-500VⅢ

## 5-Axis Vertical Machining Centers

Intelligent Technology | Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | 5-Axis Auto Tuning System | SERVONAVI

## Productivity is higher with process-intensive machining 5-Axis Vertical Machining Center achieves high accuracy and decarbonization with space-saving and a large machining area

The best match for efficient production of high value-added parts through one-chucking multi-sided machining.

This 5-axis control vertical machining center is based on our best-selling vertical machining center MB-V and is equipped with a trunnion structure rotary table.

Added to the basic performance of high speed, high precision, and high rigidity, we achieve new value creation with the new generation CNC OSP-P500 control that makes manufacturing DX a reality.


MU-400VⅢ

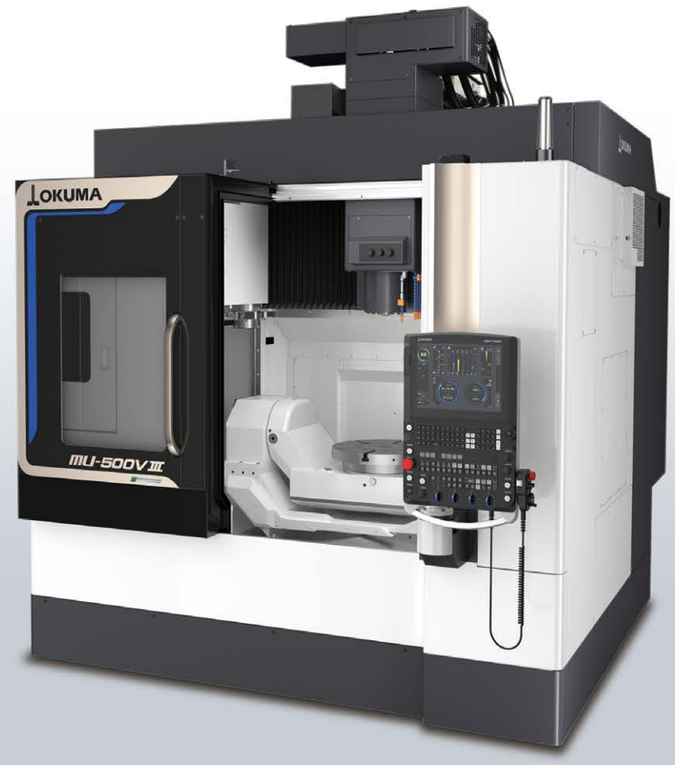
### High value-added production through process-intensive machining

- Highly efficient production with one-chucking multi-face processing
- Cutting the number of jigs reduces workload and costs
- Reduce mounting errors that accumulate each time a workpiece is attached or detached

### Hypoid gears provide fast and accurate machining with 2-axis trunnion table

| | |
|---|---|
| ● Rotation speed | C-axis: 50 $min^{-1}$ (300 deg/sec) |
| | A-axis: 40 $min^{-1}$ (240 deg/sec) |
| ● Indexing accuracy | A-, C-axis: ±4 sec* |
| ● Repeatability | A-, C-axis: ±1 sec* |
| ● Indexing angle minimum command | 0.0001° |

* The data mentioned in this brochure are “actual data” and do not represent guaranteed accuracies.



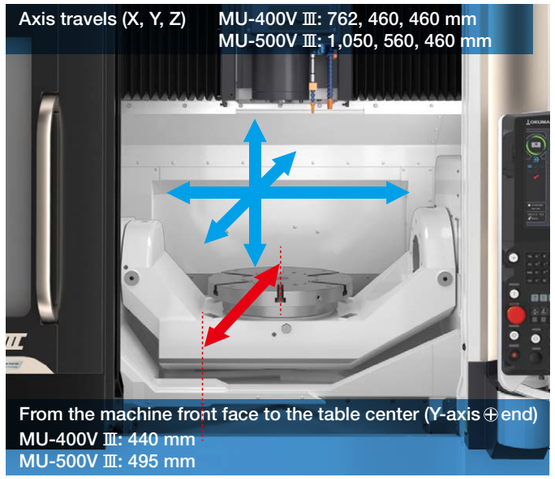

MU-500VⅢ

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

# High value-added production in a compact space

## Realizes wide processing area in a space-efficient way

Even though they are as space-saving as vertical machining centers, these models have the largest machining areas among machines in the same class. They can also handle with high efficiency the 5-axis machining of large workpieces. And they can also easily replace existing machines.



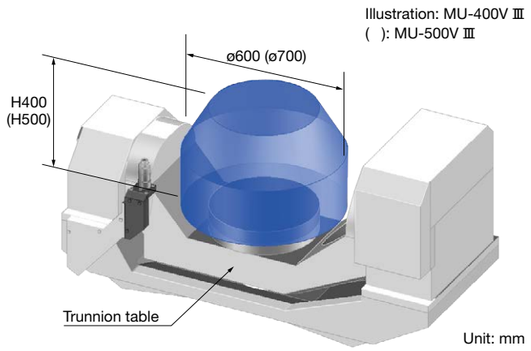

MU-500V Ⅲ is pictured.

**■ Rotation range** C-axis: 360 degrees
A-axis: +20 to -110 degrees

**■ Maximum workpiece size** MU-400V Ⅲ: ø600 × h400 mm
MU-500V Ⅲ: ø700 × h500 mm
[See details on page 13.]

**■ Maximum load** MU-400V Ⅲ: 300 kg
MU-500V Ⅲ: 400 kg

Illustration: MU-400V Ⅲ
( ): MU-500V Ⅲ




Unit: mm

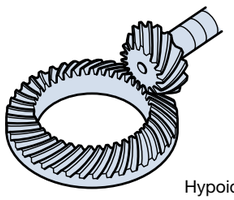
## Solid trunnion construction permits fast and accurate machining

The trunnion table is driven by a hypoid gear made of high-precision ground heat-treated steel. It has high wear resistance and can operate at high speed and high torque.

Equipped with a high-precision DD encoder as standard, it achieves high-precision positioning.

**■ High accuracies** Indexing: ±4 sec (A-, C-axis)*
Repeatability: ±1 sec (A-, C-axis)*

**■ High speeds** C-axis: 50 $min^{-1}$ (300 deg/sec)
A-axis: 40 $min^{-1}$ (240 deg/sec)



Hypoid gears

* The data mentioned in this brochure are “actual data” and do not represent guaranteed accuracies.



# A full spindle lineup to meet a wide range of needs

## Increased productivity with enhanced machining capacity

**■ Machining capacity** 504 (face milling) $cm^3/min$ / 602 (end milling) $cm^3/min$ (actual data*)

**MU-400V Ⅲ 15,000 $min^{-1}$ (No. 40) wide range spindle** (option) **actual data*** Workpiece material: S45C

| Cutting Tool | Spindle $min^{-1}$ | Cutting m/min | Feed rate mm/min | Width mm | Depth mm | Removed $cm^3/min$ |
|---|---|---|---|---|---|---|
| ø80 face mill 8 blades (cermet) | 895 | 225 | 3,000 | 56 | 3 | **504** |
| ø20 roughing end mill 7 flutes (carbide) | 4,000 | 251 | 4,300 | 7 | 20 | **602** |
| ø63 insert drill (carbide) | 606 | 120 | 91 | – | – | – |
| M30 P3.5 tap | 318 | 30 | 1,113 | – | – | – |

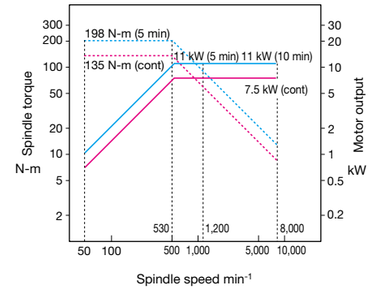
* The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting condition, and others.

## You can select the optimum spindles to match your application requirements

### ■ Standard spindle

**For general applications**

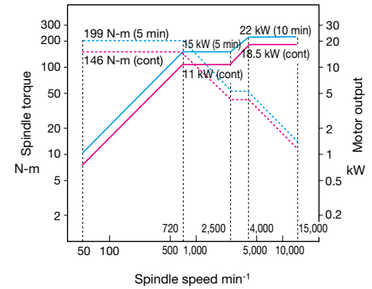
- Spindle speed 8,000 $min^{-1}$
- Max output 11/7.5 kW (10 min/cont)
- Max torque 198/135 N-m (5 min/cont)




### ■ Wide-range spindle (option)

**Highly efficient machining of light alloys such as steel and aluminum**

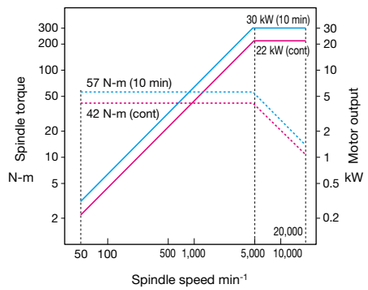
- Spindle speed 15,000 $min^{-1}$
- Max output 22/18.5 kW (10 min/cont)
- Max torque 199/146 N-m (5 min/cont)




### ■ High-speed spindle (option)

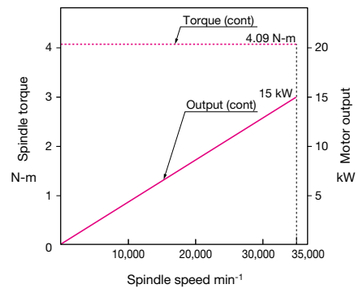
**Die/mold and aluminum applications**

- Spindle speed . . 20,000 $min^{-1}$
- Max output . . . . 30/22 kW (10 min/cont)
- Max torque . . . . 57/42 N-m (10 min/cont)




**Die/mold and small precision parts**

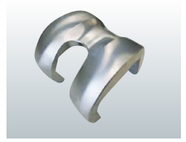
- Spindle speed . . 35,000 $min^{-1}$
- Max output . . . . 15 kW (cont)
- Max torque . . . . 4 N-m



# Highly efficient 5-axis machining of complex-shaped parts

## Highly efficient machining with 5-axis machining

Process-intensive machining through 5-axis machining saves setup time, reduces waste between processes, improves machining accuracy and also enables machining with simultaneous 5-axis control.

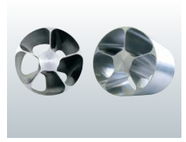

Artificial joint


Bone setting plates


Tire mold

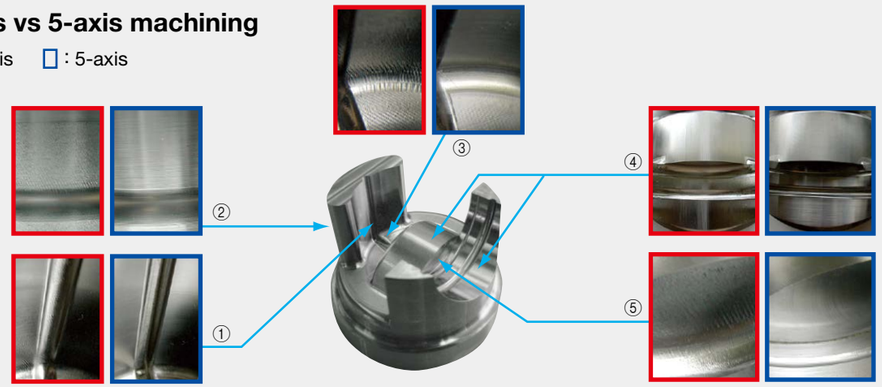

Artificial satellite part


Blisk


Rolls

### 3-axis vs 5-axis machining

□ : 3-axis □ : 5-axis




- Machine MU-400V Ⅲ 15,000 min$^{-1}$
- Workpiece Rubber mold
- Material NAK80
- Work size ø100 × 75 mm
- Data NX (Unigraphics)

| Advantages | Application Used |
|---|---|
| ① Can use smaller-dia tools (ø6 → ø3 mm) | Shorter tool lengths for tools with higher rigidity |
| ② Perpendicular wall (H45 mm) vibration eliminated | |
| ③ Corner R vibration eliminated | |
| ④ Higher quality cuts; concave bottom (convex top) | Avoid machining by the ball end milling cutting tip* |
| ⑤ Can cut pin corners | Workpiece oriented (positioned) to ideal cutting conditions |

* Cutting speed is 0

### Cutting conditions

| Area machined | Tool | Spindle speed min$^{-1}$ | Cutting speed m/min | Feed rate mm/min |
|---|---|---|---|---|
| Half cylinder | ø16 end mill | 4,000 | 215 | 400 |
| Center cylinder | ø4 ball end mill | 10,000 | 125 | 1,500 |
| All corners | ø3 ball end mill | 8,000 | 75 | 1,000 |
| Cylinder groove | ø1.5 ball end mill | 12,000 | 55 | 1,500 |



## Quick machine components reduce non-cutting times

- Rapid traverse: X, Y: 40 m/min
- Spindle accel/decel: 1.2 sec (0↔8,000 min$^{-1}$)
- ATC movement: 1.5 sec (T-T)*1, 3.4 sec (CTC min)*2

*1. MU-500V Ⅲ performance, MAS standard measurement (formerly JIS B 6013)
*2. MU-500V Ⅲ performance, ISO 10791-9 (2001) (JIS B 6336-9) measurement

### Cycle time reduction

- Operation time reduction

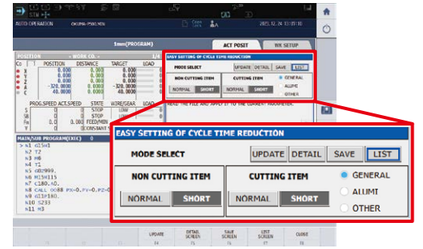
The non-cutting time is shortened by simultaneously performing multiple operations, such as spindle rotation and axis feed, and allowing the rotary axis to take the shortest path

- 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



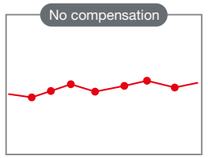
Easy parameter setting input screen

## Hyper-SurfaceⅡ (option)

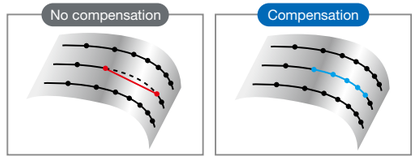
Improved die/mold surface quality with a simple operation

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 conventional Super-NURBS, the new Hyper-Surface function automatically corrects the command points output from CAM, reducing machining time while maintaining shape accuracy and achieving improved surface quality.

- Edge misalignment
- Misalignment between adjacent machining paths
- Output interval (automatic correction of roughness to suppress fluctuations in feed rate)
- Operation paths at corners (during rough/semi-finishing, machining time is shortened by optimal path compensation)
- Corners where there may be sudden acceleration/deceleration (suppressing vibration without reducing speed during finishing), etc.



Smooths minor fluctuations and variations in command points

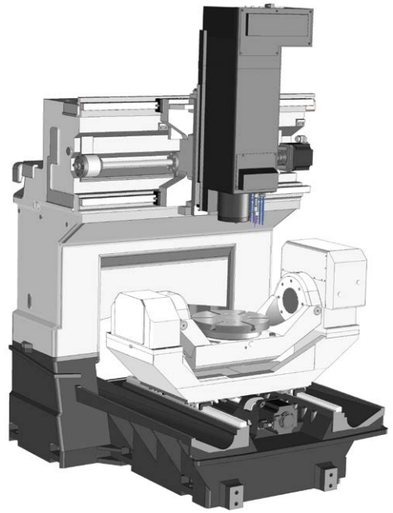


Adjust steps errors between adjacent cutter paths

Comparison of machined surface quality

# Thermally stable structure with outstanding precision

## Superior machine structure



### Thermally stable structure
- Thermally symmetric and with “box-build” structure
- Cooling unit and NC control box designed to dissipate waste heat
- Thermally balanced structure
- Structure that isolates heat from coolant and chips

### Extremely rigid machine structure
- From extended use of the advanced 3D-CAD and FEM analysis
- With ram-saddle feed

### Easy to use
- Good visibility of the machining process
- Good table access

## Thermo-Friendly Concept
The unique approach of “accepting temperature changes”

The machining accuracy of the workpiece changes significantly due to temperature change in the machine’s periphery, heat generated from the machine itself, and heat generated from machining.

This unique Thermo-Friendly Concept, which accommodates such temperature changes, achieves high accuracy in normal factory environments.

### 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**

### 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.

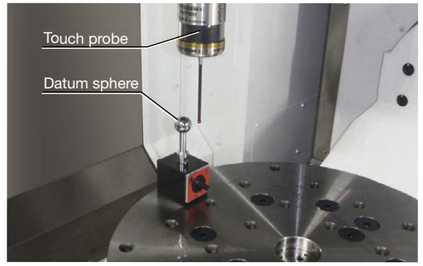
### TAS-S (Thermo Active Stabilizer—Spindle)

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.

## 5-Axis Auto Tuning SystemⅡ (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 SystemⅡ 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 addition, self-diagnosis of changes in “geometric errors” is performed, and the system indicates optimal timing for tuning. 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



# Okuma’s advanced technology enhance machine shop performance

## SERVONAVI
Optimized Servo Control

Achieves long term accuracy and surface quality

### SERVONAVI AP (Automatic Parameter setting)
Optimum settings automatically identified

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 servo parameters, including acceleration, to the optimum values. Cycle times are shortened with no changes to machining accuracy.

### SERVONAVI SF (Surface Fine-tuning)
Enables longer machine use

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.

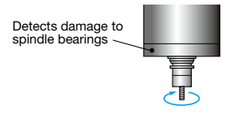
Even noise or vibration that occurs when there are large changes in the machine state can be immediately eliminated.

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

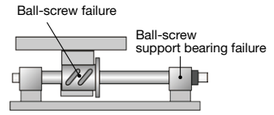
### With predictive maintenance, prevent machine stoppages just in time

Okuma’s AI-equipped control diagnoses the presence or absence of abnormalities in the machine spindle and feed axes and identifies any irregularities found. Downtime from machine stoppage is minimized, so the benefits are highly accurate, productive, and stable operations over the long term. The operators themselves can easily diagnose the machine by following simple screen guidelines on the Okuma control.

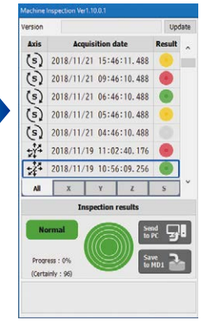
AI Spindle Diagnosis Function




AI Feed Axis Diagnosis Function




Self-diagnosis of spindle and feed axis status with AI

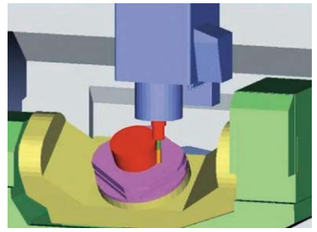



Notes:
- AI diagnostic models are already installed, and diagnoses can be performed by the machine itself. AI diagnostic models can be updated through Okuma's Connect Plan.
- Feed axis diagnosis is for linear axes.
- With AbsoScale detection specs, ball-screw wear detection is possible.

## Collision Avoidance System (option)
Collision prevention

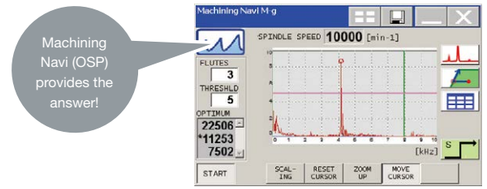
### World’s first “Collision-Free Machine”

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



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

### Search for optimum cutting conditions
- Machining Navi M-*i* changes automatically to optimum spindle speed
- Machining Navi M-*g*Ⅱ+ displays several spindle speed possibilities



# 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

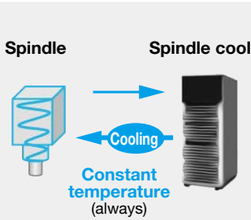
#### Reduction of power used for air conditioning

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.

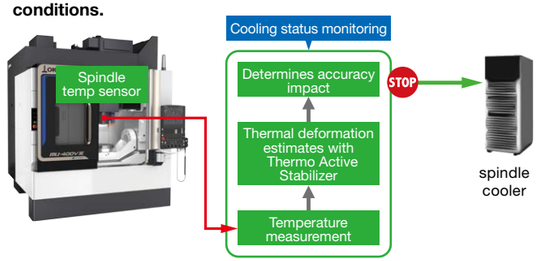
### ECO suite plus

**A system for an energy-saving society**

#### ECO Idling Stop

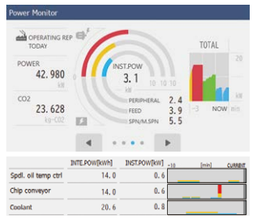
Auxiliary equipment consume a substantial portion of the power used in a factory. This function enables each of them to be turned off when not needed to reduce power consumption. In addition to when automatic operation is suspended, it is now possible to stop idling during manual operation. Power consumption 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.



### Sludgeless Tank (option)

**Reducing waste oil by suppressing coolant deterioration**

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

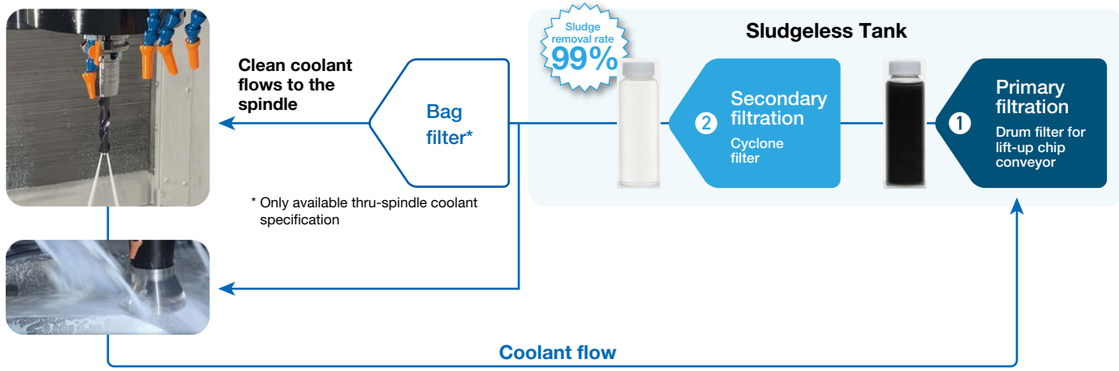
It is important to remove impurities (sludge) contained in the coolant for the stable operation of the machine, and coolant tank cleaning is indispensable. The Sludgeless Tank (option) circulates coolant at a constant speed in the tank to effectively collect sludge even during non-machining while reducing 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. Thru-spindle coolant specifications (option) collect even finer sludge with a bag filter to improve the quality of machined surfaces.

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

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

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

Note: A hinge + scraper (with drum filter) lift-up chip conveyor is necessary to select the Sludgeless Tank.




### Suction of excess coolant in spindle (option)

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

Removes residual spindle coolant dripping from the tool in 0.6 seconds (actual value using a drill tool). In-spindle coolant suction eliminates the need for an air blow to remove residual coolant, shortening tool change time. It also avoids the generation of mist due to air blowing, and prevents deterioration of the working environment. The frequency of required cleaning can also be reduced, to ease the workload on the operator.

Residual coolant suction time **0.6** sec

## Machine specifications

| | Item | Unit | MU-400V Ⅲ | MU-500V Ⅲ |
|---|---|---|---|---|
| Travel | X-axis | mm (in) | 762 (30.00) | 1,050 (41.34) |
| | Y-axis | mm (in) | 460 (18.11) | 560 (22.05) |
| | Z-axis | mm (in) | 460 (18.11) | |
| | A-axis | deg | +20 to –110 | |
| | C-axis | deg | 360 | |
| | Table surface to spindle nose | mm (in) | 100 to 560 (3.94 to 22.05) | 160 to 620 (6.30 to 24.41) |
| Table | Table size | mm (in) | ø400 (ø15.75) | ø500 (19.69) |
| | Max workpiece dimensions*1 | mm (in) | ø600 × h400 (ø23.62 x h15.75) | ø700 × h500 (ø27.56 x h19.69) |
| | Floor to table top | mm (in) | 1,050 (41.34) | 1,090 (42.91) |
| | Max load capacity | kg (lb) | 300 (660) | 400 (880) |
| Spindle | Spindle speed | $min^{-1}$ | 8,000<br>[15,000, 20,000, 35,000] | |
| | No. of spindle range | | Infinitely variable | |
| | Tapered bore | | 8,000: 7/24 taper No. 40, [BIG PLUS® (No. 40), HSK-A63]<br>[15,000: 7/24 taper No. 40, BIG PLUS® (No. 40), HSK-A63]<br>[20,000: BIG PLUS® (No. 40), HSK-A63]<br>[35,000: HSK-F63] | |
| | Bearing dia | mm (in) | ø70 [ø70, ø70, ø60] (ø2.76 [ø2.76, ø2.76, ø2.36]) | |
| Feed rate | Rapid traverse | m/min (ipm) | X, Y: 40 (1,575) Z: 32 (1,260) | |
| | Rapid traverse (A, C) | deg/min | A: 14,400 C: 18,000 | |
| | Cutting feed rate | mm/min (ipm) | X, Y, Z: 32,000 (1,260) | |
| Motor | Spindle (10 min/cont) | kW (hp) | 11/7.5 [22/18.5, 30/22, 15]<br>(15/10 [30/25, 40/30, 20]) | |
| | Feed axes | kW (hp) | X, Y, Z: 3.5 (4.7) A: 4.2 (5.6) C: 3.0 (4.0) | |
| Auto tool changer (ATC) | Tool shank | | MAS BT40 [HSK] | |
| | Pull stud | | MAS2 [–] | |
| | Tool capacity | tools | 20 [32, 48, 64, 98, 132, 166, 200, 234, 268]*2 | |
| | Max tool dia (w/ adjacent tool) | mm (in) | ø90 (ø3.54) | |
| | Max tool dia (w/o adjacent tool) | mm (in) | ø125 (ø4.92) | |
| | Max tool length | mm (in) | 240 (9.45) | 300 (11.81) |
| | Max tool mass | kg (lb) | 8 (18) | |
| | Max tool moment | N-m (ft-lbf) | 7.8 <8 kg × 100 mm> (5.7 <17.6 lb × 3.94 in>) | |
| | Tool selection | | Memory random*2 | |
| Machine size | Height | mm (in) | 2,946 (115.98) | 3,045 (119.88) |
| | Floor space W × D | mm (in) | 2,160 × 2,783 (85.04 × 109.57) | 2,515 × 3,231 (99.02 × 127.20) |
| | Mass | kg (lb) | 8,300 (18,260) | 9,600 (21,120) |
| CNC | | | OSP-P500M-H | |

*1. Some restrictions apply. See p13 for details. *2. For 64 or more, fixed addresses are selected using a matrix method. [ ] : option

## Standard specifications/accessories

| | | | |
|---|---|---|---|
| Spindle speed 50 to 8,000 $min^{-1}$ | 7/24 taper No. 40, 11/7.5 kW | Chip pan MU-400V Ⅲ | Effective capacity: 60 L |
| Rapid traverse | X, Y: 40, Z: 32 m/min | MU-500V Ⅲ | Effective capacity: 69 L |
| Spindle/Spindlehead cooling system | Oil temperature controller | ATC air blower (blast) | |
| | | Chip air blower (blast) | Nozzle type |
| Air cleaner (filter) | Including regulator | Cleaning of the Y-axis cover MU-400V Ⅲ | Telescopic cover |
| Spindle oil-air lubrication system | | MU-500V Ⅲ | Slideway cover |
| TAS-S | Thermo Active Stabilizer—Spindle | Foundation blocks (with jack bolts) | 8 pcs (with jack bolts) |
| TAS-C | Thermo Active Stabilizer—Construction | 3-lamp status indicator | Type C (LED signal tower) |
| A-, C-axis rotary table | 0.0001 deg, includes DD encoders | Work lamp | LED*3 |
| C-axis table | T-slot 18H7 6 places | Full enclosure shielding | With ceiling |
| Auto tool changer | 20-tool | Tapered bore cleaning bar | |
| ATC magazine shutter | | Hand tools | |
| Coolant supply system*1 MU-400V Ⅲ | Tank: 190 L [Effective: 100 L], pump: 250 W | Tool box | |
| MU-500V Ⅲ | Tank: 230 L [Effective: 120 L], pump: 250 W | Operation panel with color LCD | 15-inch |
| Coolant nozzle | 5 flexible nozzles | Pulse handle | |
| Chip flusher system*2 | Table L/R | | |

*1. 800 W pump required with oil-based coolant.
*2. Use an in-machine coil type chip conveyor when using an oil-based coolant.
*3. Installed on the right side for MU-400V Ⅲ, and on the right and left sides for MU-500V Ⅲ.
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

| | | | |
|---|---|---|---|
| Optional spindle speeds | | Oil mist coolant | |
| Wide-range spindle 50 to 15,000 $min^{-1}$ △ | 22/18.5 kW [10 min/cont]*3 | Mist collector | |
| High-speed spindle 50 to 20,000 $min^{-1}$ △ | 30/22 kW [10 min/cont]*4 | Semi-dry machining | |
| High-speed spindle 50 to 35,000 $min^{-1}$ △ | 15 kW [cont], HSK-F63 | Shower coolant systems | |
| Dual contact spindle*1 △ | HSK, BIG-PLUS® | Sludgeless Tank | |
| Special ATC capacities △ | 32-tool, 48-tool (chain system) | Workpiece washing gun | |
| | 64, 98, 132, 166, 200, 234, 268-tool (matrix system) | In-machine chip discharge (coil) △ | Table left/right |
| Special pull studs △ | MAS1, JIS, CAT, DIN | Off-machine chip discharge (Lift-up chip conveyor) △ | With reference to recommended chip conveyors on p. 14, right side discharge (rear discharge also possible) |
| Attachment preps | Accelerator attachment | | |
| | Anglehead attachment | Chip bucket for above △ | |
| | Oil hole supply | Dust collector | |
| AbsoScale | X-Y or X-Y-Z axes | Tool breakage detection/Auto tool length compensation | Touch sensor (Metrol) |
| Die/mold & fine-feed specs △ | Rapid traverse X, Y, Z: 20 m/min | | |
| Thru-spindle coolant*2 | Specify 1.5 MPa or 7.0 MPa | Auto zero offset/Auto gauging | Touch probe (Renishaw) |
| | 35,000 $min^{-1}$ specs for HSK-F63 only | 5-Axis Auto Tuning System Ⅱ | Gauging compensation of geometric error |
| Suction of excess coolant in spindle | | NC Gage | |
| Work lamp | LED Left side mount (MU-400V Ⅲ) | Chemical anchor specs | |
| Chip air blower (adapter) | | Hydraulic fixture preps | Hydraulic: 2 ports, air: 2 ports |

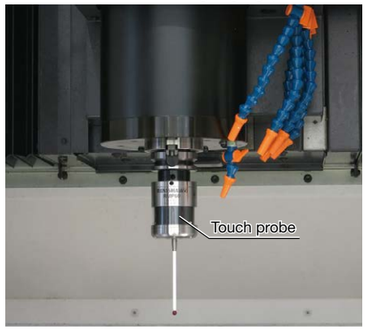
△ Corresponding standard specifications are deleted.
*1. Be sure to select this specification when BIG-PLUS® holder is used.
*2. Okuma pull studs required. (End-face grinding, O-ring, and through-hole diameter differ from those of commercial pull studs.)
*3. Spindle taper (7/24 No. 40) accepts (BT40, BIG-PLUS®, CAT40, DIN40) or HSK-A63.
*4. Spindle taper accepts BIG-PLUS® or HSK-A63.

### Major options

- Shower coolant/ Coolant nozzle

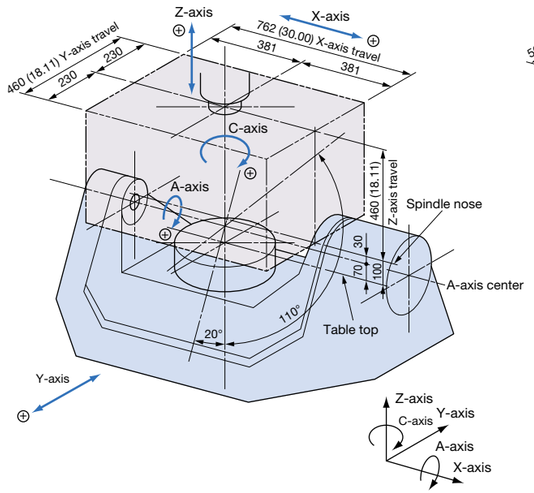
- Tool breakage detection/ Auto tool length compensation

- Auto zero offset/Auto gauging (wireless touch probe)

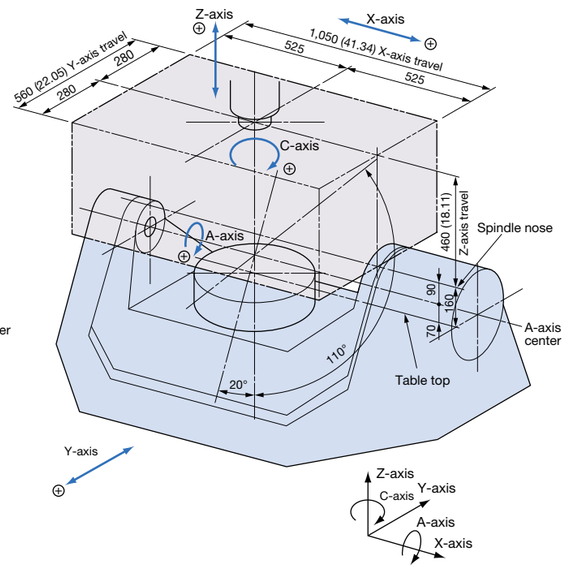



## Working range

### MU-400V Ⅲ




### MU-500V Ⅲ

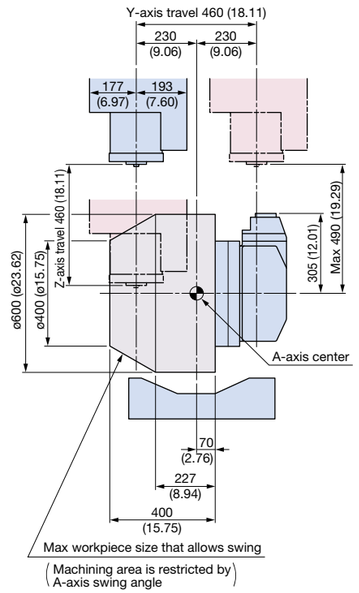



Unit: mm (in)

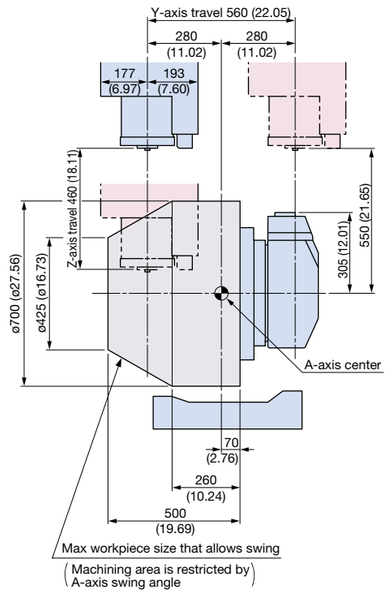
## Max workpiece dimensions

(A-axis at –90° swing)

### MU-400V Ⅲ




### MU-500V Ⅲ

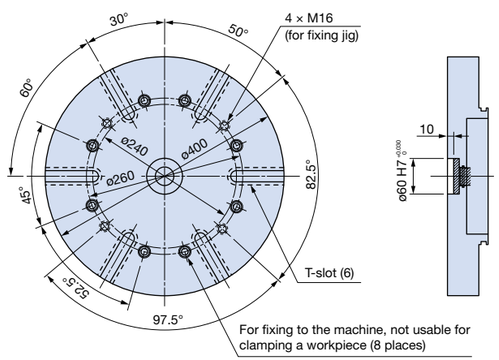


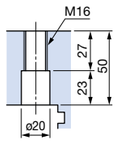

Unit: mm (in)



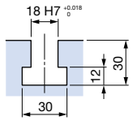
## Table dimensions

### MU-400V Ⅲ



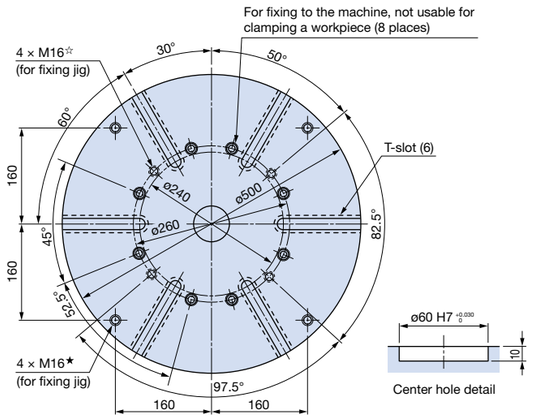



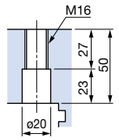

Jig fixing hole detailes (4 places)



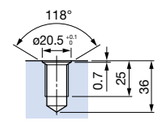

T-slot detail (6)

### MU-500V Ⅲ

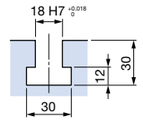



Jig fixing hole details
(4 locations marked with ☆)




Jig fixing hole details
(4 locations marked with ★)



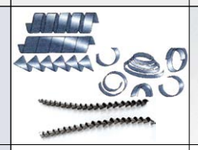

T-slot detail (6)

Unit: mm

## Recommended Chip Conveyors

(Please contact an Okuma sales representative for details.)

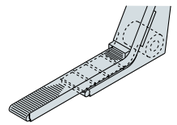
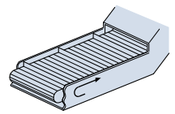
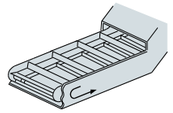
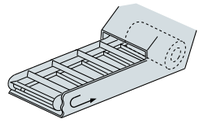
○: Recommended
△: Conditionally recommended

| Workpiece material | | Steel | Cast iron | Aluminum Non-ferrous metal | Mixed (general use) |
|---|---|---|---|---|---|
| Chip shape | |  |  |  |  |
| In-machine chip discharge | Chip flusher type (standard) | — | ○ (Wet) | ○ | — |
| | Coil type (option) | ○ | ○ (Dry/Wet) | — | ○ |
| Off-machine chip discharge (option) | Hinge + scraper with drum filter | ○ | ○ | ○ | ○ |
| | Hinge type | ○ | — | — | △ *1 |
| | Scraper type | — | ○ (Dry) | — | — |
| | Scraper type with drum filter | — | ○ (Wet) with magnet | △ *2 | — |

*1. When there are few fine chips *2. When chips are shorter than 100 mm

Note: Use of oil-based coolant may cause fires; fire prevention measures are necessary.

## Off-machine lift-up chip conveyors

| Name | Hinge + scraper with drum filter | Hinge | Scraper | Scraper with drum filter |
|---|---|---|---|---|
| Shape |  |  |  |  |

Note: Chip conveyor with drum filter when Sludgeless Tank (option) is selected.

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

# OSP-P500

## Improved productivity and stable production

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

15-inch operation panel

Faithful reproduction of machines and processing — Digital support for shop floor work

### Digital Twin (option)

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

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

### 1 Digital Twin On PC *1

#### Simulate shop machines in the office

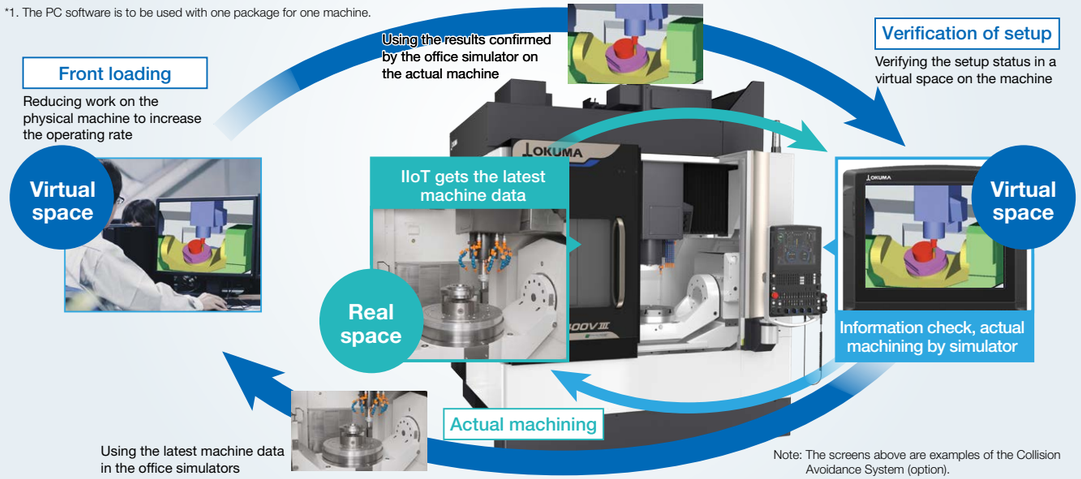
Front loading is performed with the actual status matched with the data on the office PC to further improve productivity.
Highly accurate pre-verification minimizes trial and error in first part machining, and reduces machine downtime to the minimum.

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

### 2 Digital Twin On Machine

#### Simulating the CNC of a real machine

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



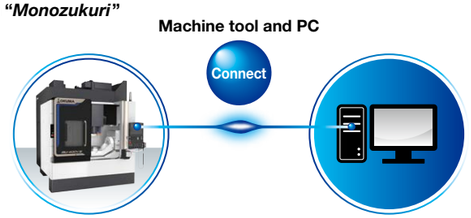

Note: The screens above are examples of the Collision Avoidance System (option).

## 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.






## OSP-P500M standard specifications

| | | |
|---|---|---|
| Basic Specs | Control | X, Y, Z, A, 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 | Override: 0 to 200% |
| | Spindle control | Direct spindle speed commands, override 30 to 300%, multi-point indexing |
| | Tool compensation | No. of registered tools: max 999 sets, tool length/radius compensation: 3 sets per tool |
| | Display | 15-inch color LCD + multi-touch panel operations |
| | Security | Operator authentication, lock screen, OSP-VPSⅡ-STD |
| Programming | Program capacity | Program storage capacity: 4 GB; operation buffer: 2 MB |
| | Program operations | Scheduled program, fixed cycle, G-/M-code macros, arithmetic, logic statements, math functions, variables, branch commands, Coordinate calculate, area machining, coordinate convert, programming help, user task, keyway cycle, fixture offset Ⅱ |
| Operations | OSP suite | “suite apps” to graphically visualize and digitize information needed on the shop floor, “suite operation” enable one-touch access to “suite apps”. |
| | Easy Operation | “Single-mode operation” to complete a series of operations. Advanced operation panel/graphics facilitate smooth machine control |
| | MacMan plus | Machining management: aggregation and display of machining records, operating records and problem information, Visualization of power consumption, file output |
| | Machine operations | Operation help, load meter, alarm help, sequence return, manual interrupt/auto return, pulse handle overlap, parameter I/O, PLC monitor, auto power shut-off |
| Communications / Networking | | USB (2 ports), Ethernet, DNC-T1, Smart I/F |
| High speed/accuracy specs | | Thermo Active Stabilizer—Spindle (TAS-S), Thermo Active Stabilizer—Construction (TAS-C), Hi-Cut Pro, pitch error compensation, Hi-G control, SERVONAVI, cycle time reduction (operation time reduction, machining time shortening, easy parameter setting) |
| Energy-saving | ECO suite plus | ECO Idling Stop, ECO Operation, oil temperature controller auto control, ECO Power Monitor |
| | Power Regeneration System | Regenerative power is used when the spindle and feed axes decelerate to reduce energy waste. |

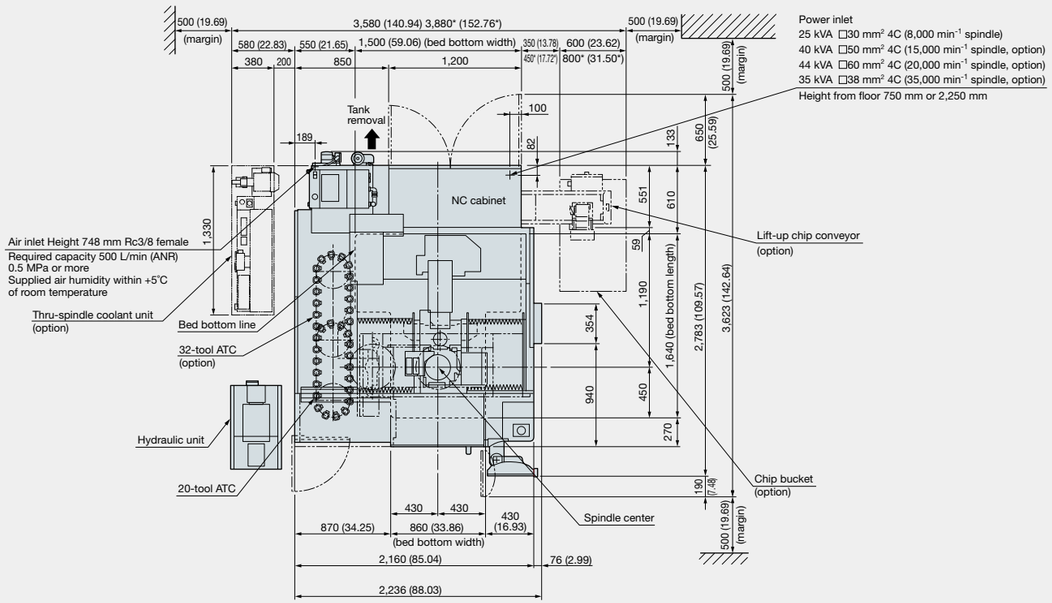
## OSP-P500M kit/optional specifications

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

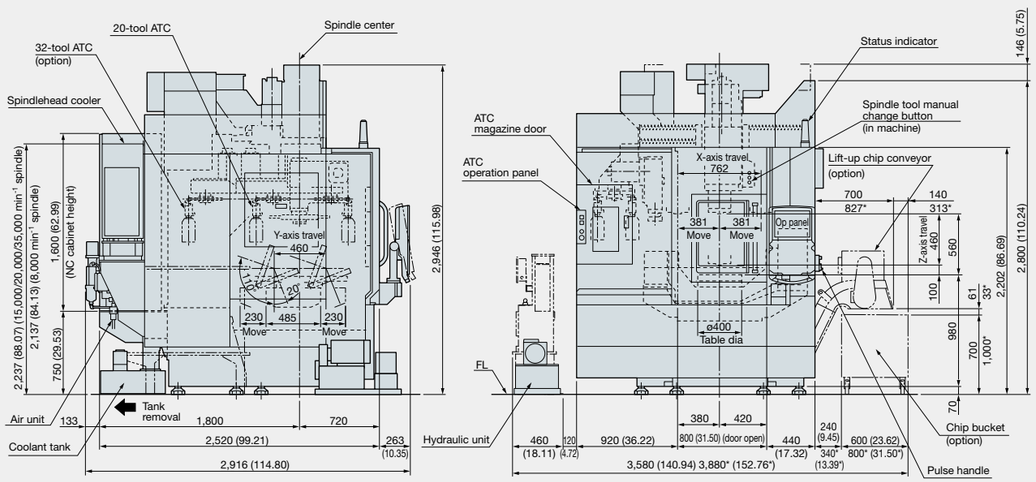
| Item | Kit Specs | NML E | NML D | AOT E | AOT D | DT E | DT D | DT AOT E | DT AOT D |
|---|---|---|---|---|---|---|---|---|---|
| **Monitoring** | | | | | | | | | |
| One-Touch Spreadsheet | | | | | | | | | |
| Collision Avoidance System | | | | | | | | | |
| Real 3-D Simulation | | | | ● | ● | ● | ● | ● | ● |
| Simple load monitor | Spindle overload monitor | ● | ● | ● | ● | ● | ● | ● | ● |
| NC operation monitor | Hour meter, workpiece counter | ● | ● | ● | ● | ● | ● | ● | ● |
| Status indicator | | | | | | | | | |
| Tool breakage no-loaddetection | | | ● | | ● | | ● | | ● |
| MOP-TOOL | Adaptive control, overload monitor | | | | | | | | |
| AI machine diagnostics * | Spindle+feed axes, or feed axes only | | | | | | | | |
| Machine Status Logger | | | | | | | | | |
| Cutting Status Monitor | | | | | | | | | |
| Machining Navi M-*i*, M-*g*Ⅱ+(cutting condition search) | | | | | | | | | |
| Feed axis retraction | | | | | | | | | |
| Tool retract cycle | | | | | | | | | |
| **Automation / unattended operation** | | | | | | | | | |
| Warm-up (calendar timer) | | | | | | | | | |
| External program | Button, rotary switch | | | | | | | | |
| | Digital switch, BCD (2-digit, 4-digit) | | | | | | | | |
| Connection with automated devices | Robot, loader I/F | | | | | | | | |
| | Stacker crane I/F | | | | | | | | |
| | FMS link I/F | | | | | | | | |
| **High-speed, high-precision** | | | | | | | | | |
| AbsoScale detection | X-Y-Z axes | | | | | | | | |
| 5-Axis Auto Tuning SystemⅡ | | | | | | | | | |
| Dynamic displacement compensation | | ● | ● | ● | ● | ● | ● | ● | ● |
| 0.1 μm control (linear axis commands) | | | | | | | | | |
| Hyper-SurfaceⅡ | 3 linear axes, 3 linear axes + 2 rotary axes | | | | | | | | |
| **5-axis machining** | | | | | | | | | |
| Tool center point control Ⅱ (w/ tool tilt comp) | | | | | | | | | |
| Tool tilt command | | | | | | | | | |
| Cutting point command | | | | | | | | | |
| Tool side machining | | | | | | | | | |
| Leading edge offset | | | | | | | | | |
| Tool side offset | | | | | | | | | |
| Tool-axial tool length comp | | | | | | | | | |
| Manual feed | Manual tool feed (tool-axial), manual tool feed (right angle) | | | | | | | | |
| | Table origin coordinate system manual feed | | | | | | | | |
| | Tool center point manual feed | | | | | | | | |
| **ECO suite plus** | | | | | | | | | |
| ECO Power Monitor | On-machine wattmeter | | | | | | | | |
| Spindle Power Peak Limiter | | | | | | | | | |
| External output interface of consumed electricity | | | | | | | | | |
| **Other** | | | | | | | | | |
| Simultaneous 5-axis kit | | | | | | | | | |
| 5-Axis Auto Tuning SystemⅡ kit | | | | | | | | | |
| NC Gage kit | | | | | | | | | |
| Circuit breaker | | | | | | | | | |
| OSP-VPSⅡ (Virus Protection System) | | | | | | | | | |
| External M-codes [4 sets, 8 sets] | | | | | | | | | |

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

## MU-400V Ⅲ
## Dimensional/Installation Drawings



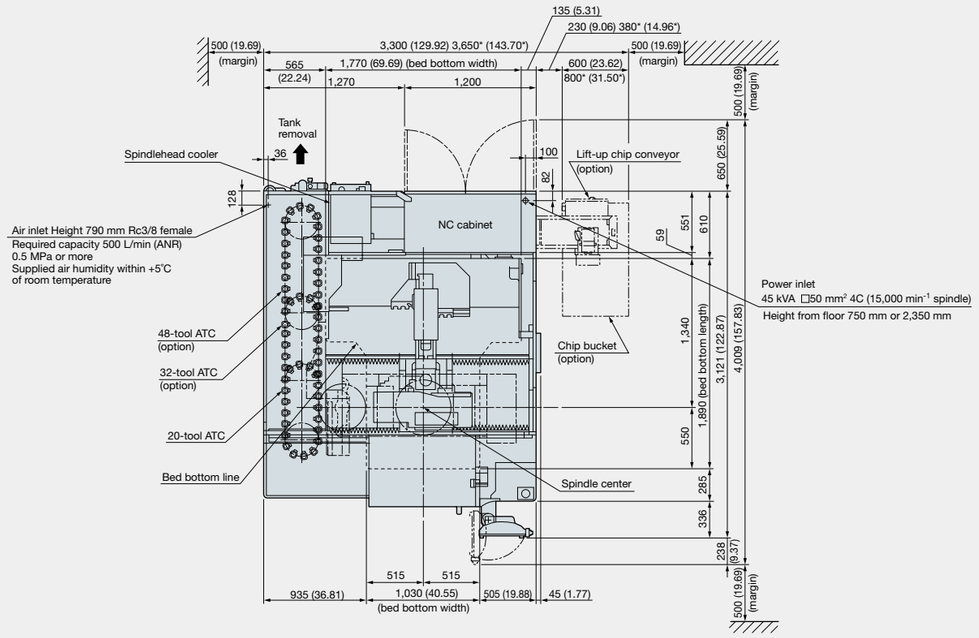

Notes: Lift-up chip conveyor: Height 750 mm
* Height 1,000 mm
Thru-spindle coolant: 1.5 MPa



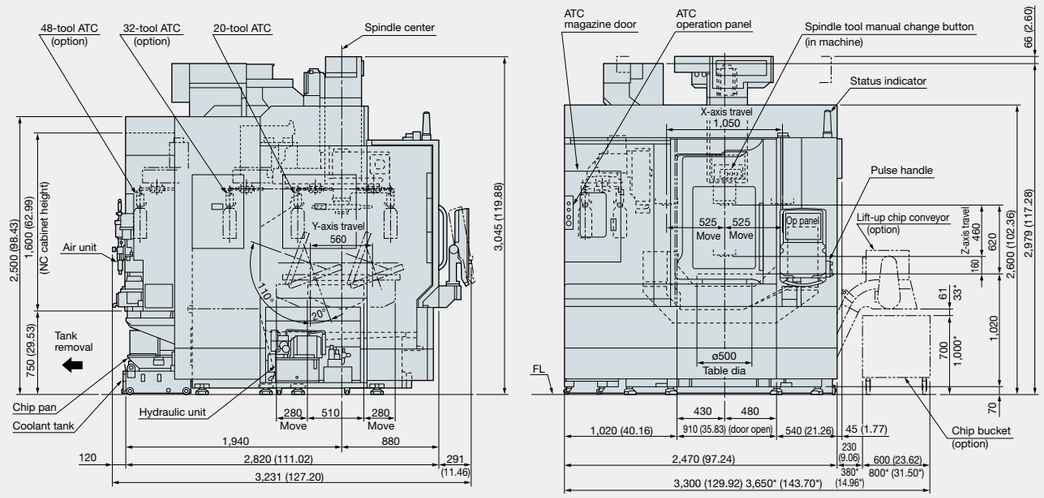

Unit: mm (in)



## MU-500V Ⅲ
## Dimensional/Installation Drawings




Note: Lift-up chip conveyor: Height 750 mm
* Height 1,000 mm




Unit: mm (in)

# MU-400V Ⅲ
# MU-500V Ⅲ

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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