

## **Precision Stability and High Productivity that Surpasses Conventional Machines**

### **Societal Issues Solved by Superior Decarbonization Technology and DX**

#### **High-Precision Vertical Machining Center**

# **MB-46V II**

Okuma Corporation has developed the MB-46V II as the latest model in the MB-V high-precision, vertical machining center series.

The best-selling MB-V series which has cumulative sales of 11,000 units are highly valued by the market for its superior precision stability.

The newly developed MB-46V II has even better precision stability than the conventional models and has advanced decarbonization technology to achieve decarbonization, high precision, and high productivity at a high level. Moreover, its innovative operation makes it possible for anyone to execute advanced machining simply and its front loading with a digital twin allows for even greater productivity.

This Green-Smart Machine uses the next-generation OSP-P500 CNC to help to solve the societal issues (decrease in the working population, transferring skills to the next generation of workers, and decarbonization) confronting the manufacturing industry.

#### **Background**

In recent years, there has been a higher demand for decarbonization in the entire manufacturing industry supply chain. Together with higher energy prices, the global movement toward decarbonization and energy conservation has grown stronger. Manufacturing companies have been searching for ways to achieve decarbonization while maintaining high productivity.

Additionally, the lack of labor has been accelerating and the retirement of skilled workers has had an adverse effect on the passing down of their skills. This has made it even more difficult to recruit human resources with the requisite skills. As a result, the need for reform in manufacturing shops through automation and DX solutions has become heightened even among small and medium-sized companies.

Because these societal issues are becoming more serious, there is a growing need for machine tools that can reduce the burden on workers and achieve both decarbonization and improve productivity while being able to handle a wide range of workpieces and machining.

#### **Development goals**

The newly developed MB-46V II has taken our conventional machines to the next level. This machining center is a high-precision vertical machining center with the highest level of precision stability in the world. Furthermore, it solves societal issues that are sure to become more serious in the future, such as decarbonization and the lack of labor. At the same time, it also achieves greater productivity.

The MB-46V II has been developed on the following concepts to become the global standard of next-generation monozukuri.

- (1) Achieves even high accuracy and higher productivity. Superior basic performance surpasses conventional machines.
- (2) Flexible automation that can fit any customer ' s production format.
- (3) A diverse specification lineup that meets a wide range of machining needs.
- (4) These machines are Green-Smart Machines that achieve both autonomous decarbonization and high precision.
- (5) The next-generation CNC, the OSP-P500, uses DX to maximize the operating rate of our customers' factories.

## **Features and New Technology**

### **(1) Higher precision and higher productivity. Superior basic performance surpasses conventional machines.**

- Compatible with increasingly precise parts, such as parts used for semiconductor manufacturing equipment.

Achieves the best precision stability in the world even in general factory environments.

Elapsed machining dimension changes: **5 μm or less (Improved 38%** from the 8 μm of conventional machines.)

Our original intelligent “Thermo-Friendly Concept” technology allows machines to autonomously and stably maintain high accuracy.

- Productivity is greatly improved. **Throughput improved by 14%** (Actual measured value using a sample workpiece).

Feed shaft performance improved.

A standard power ATC shutter **decreases** tool exchange time (CTCmin) **by 30%** compared with conventional machines.

Residual spindle coolant discharge time: **0.6 second**

- High-efficiency machining using the high output/high torque No.40 spindle (special specification) with maximum rotational speed of 15,000 min<sup>-1</sup>.

Spindle output: **33 kw (Improved 50%** from conventional machines); **Torque 242 Nm (Improved 21%** from conventional machines)

Cutting: **604 cm<sup>3</sup>/min** (S45C,φ100 milling) (Improved **20%** from conventional machines)

- A new design that achieves harmony between people and machines has been adopted.

A work area based on ergonomics makes this machine easier to use for customers.

### **(2) Flexible automation that fits a customer's production format**

- The “**mobile collaborative robot**” automates the necessary machine tool at the necessary time with a single action to cope with changes in production volume.

A simple and safe automated cell can be constructed by moving a trolley that combines a collaborative robot and workpiece stocker next to a machine tool and connecting it.

- **Thirteen internal pipes** that supply jigs that automatically clamp the workpieces (special specification).

It is possible to increase the number of independent jig movements. Can cope with various automation needs, such as automatic attachment/detachment of multiple workpieces by robots and avoiding interference between tools and jigs when jigs are being operated in the machining chamber.

- The **smarTwinCELL** smart machining cell controller makes it possible for anyone to easily operate a machining cell.  
A machine operator can operate peripheral equipment, robots, and entire cells in the same way that they operate their machines.
- For customers who are looking to automate in the future, robots can be retrofitted after these machines are delivered.
- Interior chip processing performance that supports stable operation over long periods.  
Chip cleaning considers the environment and conducts the necessary cleaning in the necessary areas. Y-axis cover cleaning is a standard feature.
- The “**sludgeless tank** (special specification)” drastically reduces the coolant tank cleaning frequency.  
The coolant flow in the tank is controlled by eliminating stagnation so that the sludge in the coolant is automatically and efficiently recovered. This dramatically reduces the manual labor needed to clean the tank.  
**Sludge recovery 98%** (Actual value for machined casting and aluminum)  
**No coolant tank cleaning for 3 years, no coolant exchange for 3 years**  
(Actual value for in-house equipment)

### (3) A rich specification lineup to meet a wide range of machining needs

- Spindles that best meet a customer's workpieces and machining can be selected.  
No. 40 spindles, No. 50 spindles, a total of **nine types** available.  
A new 30,000 min<sup>-1</sup> spindle for dies (special specification) added to our lineup.  
Spindle cooling that minimizes joints after a spindle warm-up operation of **only 3 minutes** has been adopted.
- A “**wireless laser scanner**” achieves on-machine die measurements with high measurement accuracy.  
Die shapes are measured in a short time with high accuracy. Because measurements are made on the machine, setting up again is not necessary for additional machining.

### (4) Green-Smart Machine: A machine autonomously achieves both decarbonization and high precision

- The decarbonization effect of a Green-Smart Machine with OSP-P500.  
Compared with a machine without any energy-saving technology, power consumption is **reduced by 15%**. (Okuma estimate))
- **Thermo-Friendly Concept**: Intelligent technology that allows a machine to autonomously maintain high precision and stability.  
Because there is no need to maintain a room at a constant temperature, factory equipment expenses, and power consumption are greatly reduced.  
Operating time for warming up and correcting dimensions is greatly reduced so that power consumption is reduced.
- The “**ECO suite plus**” energy-saving system is standard.  
The “**ECO idling stop**” energy-saving function is an application of the Thermo-Friendly Concept. The machine itself decides if cooling is needed and it can maintain high accuracy while stopping cooling equipment from idling.
- The **newly developed grease spindle** (special specification) reduces compressed air usage and **reduces power consumption by 7%** (Okuma estimate).  
Because compressed air is not used for oil lubrication, machining is more

environmentally friendly.

- An electric ATC shutter for hydraulic oil-less and compressed air-less operation is standard.

ATC shutter opening/closing power consumption is reduced by **74%** (Okuma estimate).

**(5) The next-generation CNC OSP-P500 maximizes the operating rate at customer factories by using DX**

- **Digital twin** is an **innovative** technology that greatly reduces machining preparation time.

“**Two digital twins**” can synchronize information and things; something that is only possible by Okuma which develops both machines and CNCs.

Ultra-high speed (**1/1000 of the actual machining time**) and ultra-high precision (**errors under 1%**) simulations can be achieved in both machining floor CNCs and office PCs. Highly accurate production plans can be made quickly.

**“Digital Twin on Machine”**

Ultra-high speed and ultra-high precision simulations can be executed on the CNCs on the actual machine tools to minimize the machining preparation time. Machining can start immediately, thereby machine operation rates and productivity are both improved greatly.

**“Digital Twin on PC”**

Because confirmation can be conducted on an office PC in the same way as on the machine CNC, further productivity increases are possible with accurate front loading.

Highly accurate pre-verification can minimize machine stoppage times without any trial and error.

- **“Smart OSP Operation”** allows even beginners who do not know anything about machining programs **to make a program and machine their first workpiece in a day**. We provide an innovative HMI (human-machine interface) that allows anyone to input the blueprint information according to the instructions and easily determine the machining process.

- **“Strong Security”** protects machine operation, programs, and other important assets from cyberattacks.

The digital twin environment that integrates the customer's know-how is securely and safely constructed from the points of view of defense, protection, and recovery.

- **“AI Machine Diagnosis”** grasps malfunction predictions from changes in machine status to.

Machine status is visualized through simple operations to prevent unexpected production losses caused by machine errors.

Please use this information to introduce this new product.

[Spindle Specifications]

| Spindle specifications |   | Max. rotational speed    | Maximum output           | Maximum torque           |
|------------------------|---|--------------------------|--------------------------|--------------------------|
| No. 40 Spindle         | Wide-range spindle (Standard specification) | 15,000 min <sup>-1</sup> | 22/18.5 kW (10 min/cont) | 199/146 N·m (5 min/cont) |
|                        | High power spindle                          | 8,000 min <sup>-1</sup>  | 11/7.5 kW (10 min/cont)  | 198/135 N·m (5 min/cont) |
|                        | High power spindle                          | 15,000 min <sup>-1</sup> | 33/26 kW (10 min/cont)   | 242/146 N·m (20%ED/cont) |
|                        | High-speed spindle                          | 20,000 min <sup>-1</sup> | 30/22 kW (10 min/cont)   | 83/54 N·m (5 min/cont)   |
| No. 50 Spindle         | High power spindle                          | 6,000 min <sup>-1</sup>  | 11/7.5 kW (10 min/cont)  | 198/135 N·m (5 min/cont) |
|                        | High-speed spindle                          | 12,000 min <sup>-1</sup> | 26/18.5 kW (10 min/cont) | 199/146 N·m (5 min/cont) |
|                        | High power spindle                          | 12,000 min <sup>-1</sup> | 33/26 kW (10 min/cont)   | 302/148 N·m (10%ED/cont) |
| HSK-F63 Spindle        | High-speed spindle                          | 30,000 min <sup>-1</sup> | 15/11 kW (10 min/cont)   | 29/20 N·m (10 min/cont)  |
|                        | High-speed spindle                          | 35,000 min <sup>-1</sup> | 15 kW (cont)             | 4.09 N·m (cont)          |

[Product specifications] The figures in the bracket are optional specifications.

| Item                                    |                                       | MB-46V II <MB-46VE II >                              |               |
|---|---------------------------------------|--|---------------|
|   |                                       | No.40 spindle  | No.50 spindle |
| Travel                                  | X-axis travel (ram saddle L/R)        | 560 mm <762 mm>                                      |               |
|   | Y-axis travel (table head front/back) | 460 mm   |               |
|   | Z-axis travel (spindlehead up/down)   | 460 mm   |               |
| Distance from table top to spindle nose |                                       | 150 to 610 mm  |               |
| Distance from floor to table top        |                                       | 800 mm   |               |
| Table                                   | Work area                             | 760 × 460 mm <1,000 × 460 mm>                        |               |
|   | Maximum loading mass                  | 500 kg <700 kg>                                      |               |
| Rapid traverse                          |                                       | X-axis: 42 m/min, Y-axis: 42 m/min, Z-axis: 36 m/min |               |

| Item         |  | MB-46V II <MB-46VE II >                      |   |
|--------------|--|--|---|
|              |  | No.40 spindle                                | No.50 spindle                                 |
| ATC          | No. of tools stored*                     | 20 [32]<br><20 [32, 48]>                     | 20 [32]                                       |
|              | Maximum tool diameter                    | φ90 mm<br>(No neighboring tools:<br>φ125 mm) | φ100 mm<br>(No neighboring tools:<br>φ152 mm) |
|              | Maximum tool length                      | 300 mm                                       |   |
|              | Maximum tool mass                        | 8 kg   | 12 kg   |
| Machine size | Machine height                           | 2,746 mm                                     |   |
|              | Required floor space<br>(length x width) | 1,950 × 2,810 mm<br><2,210 × 2,810 mm>       | 2,000 × 2,810 mm<br><2,210 × 2,810 mm>        |
|              | Machine mass                             | 7,300 kg <7,500 kg>                          | 7,550 kg <7,750 kg>                           |

\* Matrix magazine specification for 60 or more tools.