**A Fusion of "Machining" and "Measurement" by Thoroughly Pursuing
Highly Accurate and Efficient Production
A Double Column Machining Center for 5-Face Applications
Optimized for Machining a Variety of Large Parts**

MCR-BⅤ

 Okuma Corporation has developed and started selling the MCR-BV (MCR-B5), a high-efficiency, high-accuracy double column machining center for 5-face machining applications.
 In our double column machining center series, which boasts a cumulative sales volume of more than 9,500 units, the machining capacity and accuracy stability of the flagship model, the MCR-B Series, has been further improved, making it possible to achieve the "fusion" of machining and measuring. In addition, more than 100 types of spindle-head attachments can be used, and various complicated large parts can be completed with one machine. We provide high productivity by optimizing for machining large parts required in a wide range of industrial machines, including the semiconductor manufacturing equipment, energy-related, and aerospace fields.

Development Objectives

 Low-carbon energy markets like the semiconductor manufacturing equipment, wind, solar and in gas power generation are expanding rapidly around the world. As the field of industrial machinery that handles large parts expands, there is a demand for versatile large-scale machining equipment that can cut a wider range of workpieces and use various processing applications with high accuracy and efficiency.
 In addition, the transfer of experience and know-how that has maintained the high quality required for processing large parts has become an issue, and the machine can autonomously maintain quality without relying on skilled technicians. The need for functional large processing machines is increasing.
 The MCR-BV has been developed as a machine for any operator to easily achieve and maintain the high accuracy levels of large machine tools that until now had required the skills of machinists using the various Okuma Intelligent Technologies. For processing a variety large parts, in addition to roughing, finishing, and performing complicated multi-face operations, Okuma made it possible to process parts up to the final product, including measuring, on one machine using high levels of process-intensive machining.

① Based Okuma's technologies, the machine is equipped with a fusion of "machining" and "measurement" functions that enable the machine to autonomously maintain high accuracy in a stable manner.

・Intelligent Technology

・3D Calibration (standard)

・Accuracy Stability Diagnosis Function (standard)

・Dimension measurement comparable to that of a 3D measuring machine is possible without mounting 3D-CMM equipment on the machine.

② Achieving both highly efficient heavy-duty cutting and high-accuracy finishing with large spindle capacity and highly-rigid mechanical structures.

・Able to handle various complex shape parts including 5-axis machining with a selection of various spindle-heads backed by an abundant number of track records.

・Shorter total lead time by speeding up rapid traverse (X-axis: 2 times, Y-axis: 1.6 times compared to the previous machine) and operating with less non-cutting time.

③ Being environmentally friendly, and providing excellent maintainability that reduces the burden on operators.

Features and Key Enabling Technologies

① **The machine autonomously maintains stable high accuracies, with a number of Intelligent Technologies that made possible machining-to measuring operations possible—on the machine—are now standard equipment**

1. 3D Calibration—Standard feature
New Intelligent Technology that maintains high volumetric accuracy in the big machining area of large machines.
Semi-auto and easy calibration of machine accuracy deterioration due to the influence of machine installation floor surfaces that change throughout the year.
It is possible to measure at the same accuracy level as if using a 3D measuring machine without changing the setup on the machine after an operation.

2. Accuracy Stability Diagnosis Function—Standard feature
The machine itself self-diagnoses the stability of machine accuracy and visualizes it with quantified data.
Furthermore, the machine itself "announces" the optimum timing for accuracy calibration.

3. Thermo-Friendly Premium specifications—Standard feature
Dimensional change over time due to ambient temperature change: **16 μm (X-axis direction); less than half** of the standard specifications of the previous model.
In addition to the spindle and table, theThermo Active Stabilizer—Construction for large machines (TAS-C^2) expands the thermal deformation control range for columns and other parts to achieve high accuracy and stability without "human awareness."

4. AbsoScale—Standard feature for all axes (X, Y, Z, W)
Achieves highly accurate positioning detection over the entire travel distance of the machine at the absolute positions and eliminates ball screw thermal deformation.

② **High-output integral motor/spindle achieves high efficiency, high-quality and process-intensive machining**
Accepts various changeable spindle-heads, X-axis travel extension and faster rapid traverse

1. High output 43 kW (10 min) / 37 kW (cont) integral motor/spindle (6,000 min^{-1})—Standard feature
Chip discharge amount by face mill: **1,170 cm³/min** （work material: S45C）**33% improvement** compared to the previous model

2. Highly rigid double column structure with diagonal ribs and a highly rigid saddle with expanded "guide spans"
   Highly rigid table firmly holds the weight of large workpieces and high cutting forces
   Thickness 30% higher than the previous model.

3. More than 100 types of spindle-head attachments that have been proven in previous Okuma machines can be selected
   With easy-change spindle-heads, it is possible to handle various complicated machining in one chucking.

4. With 100 mm effective width between columns, 200 mm table work surface length, X-axis travel has become 200 mm longer compared to the previous model.
   The component size that can be mounted has been expanded to support a wider range of workpieces

5. Significantly improved rapid traverse of the X-axis at 30 m/min (**twice the previous model**), and the Y-axis at 32 m/min (**1.6 times the previous model**)

③ **Excellent maintainability reduces both the environmental impact and the burden on operators**

1. Chip discharge capacity in the machining room of 0.53 m^3/hr is **twice the previous model.**

2. The amount of coolant discarded is drastically reduced, and the burden of cleaning the inside of the coolant tank has also been greatly reduced.
   Sludge-less tank (Optional) significantly suppresses sludge accumulation in the coolant tank.

We look forward to your favorable reviews.

[High output integral motor/spindle]
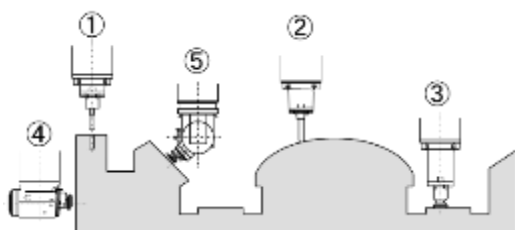
Output: 43 kW (10 min) / 37 kW (cont)
　　Torque: 1,406 N- m (10 min) / 981 N-m (cont)
Maximum spindle speed: 6,000 min^{-1}

[More than 100 types of spindle-heads can be used]

An example of complex shape machining with a wide variety of spindle heads

① Extension head (head length: 150 mm)
② Extension head (head length: 250 mm)
③ Extension head (head length: 350 mm)
④ 90° angular head
⑤ BC-axis universal index head

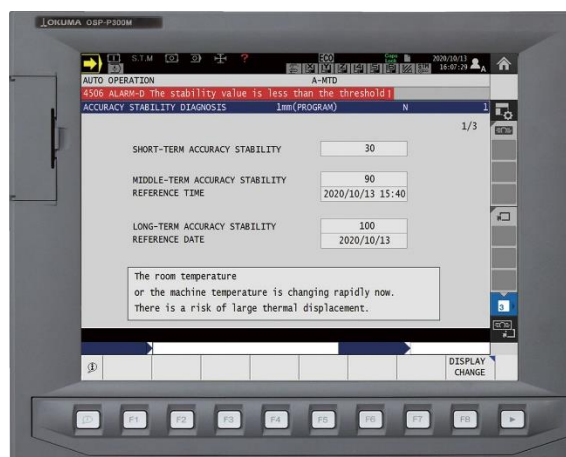[3D Calibration]
Accuracy master and a probe measurement
Semi-auto calibration of machine accuracy

Touch probe

Accuracy master
Ball beam　　Right angle master
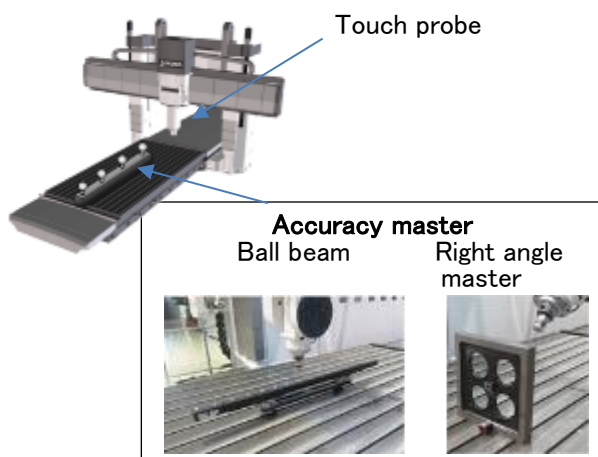
[Accuracy Stability Diagnosis Function]
Screen example on the operation panel display

Self-diagnosing accuracy stability, and displayed as a numerical value from 0 (unstable) to 100 (stable)
Outputs an alarm or message when it drops

[Machine size extensions]　　[○: Available,　 ─: Not available]

EW BC (mm)	Work surface width (mm)	Length / Col frame	Work surface L (mm) 3,000 ×30	4,000 ×40	5,000 ×50	6,500 ×65	8,000 ×80	10,000 ×100	12,000 ×120
2,650	2,000	25	○	○	○	○	○	─	─
3,150	2,500	30	─	○	○	○	○	○	○
3,650	3,000	35	─	─	○	○	○	○	○

EWBC: effective width between columns

Product Specs   [   ] indicate Optional

Item		MCR-BV				
		25×40	30×50	30×65	35×80	35×100
Travels (mm)	X-axis (table front/back)	4,200	5,200	6,700	8,200	10,200 mm
	Y-axis (spindlehead L/R)	3,200	3,700		4,200 mm	
	Z-axis (ram vertical)	800 [1,000]*[1]1				
	W-axis (crossrail vertical)	1,000	1,200			
Effective width between columns (mm)		2,650	3,150		3,650	
Table top to spindle nose (mm)		0～1,650 [0～1,550]*[2]	0～1,850 [0～1,750]*[2]		0～1,800 [0～1,700]*[2]	
Table	Work surface (mm)	2,000× 4,000	2,500× 5,000	2,500× 6,500	3,000× 8,000	3,000× 10,000
	Max load (kg)	22,000	33,000	43,000	47,000	61,000
Spindle	Max speed (min^{-1})	6,000 [10,000]*[2]				
	Max output (kW)	43 / 37 (10 min/cont) [26 / 22 (30 min/cont)]*[2]				
	Max torque (N-m)	1,406 / 981 (10min/cont) [735 / 622 (30 min/cont)]*[2]				
	Taper	7/24taper No. 50				
Feed rates	Rapid traverse (m/min)	X-axis: 30、Y-axis: 32、Z-axis: 15			X-axis: 20、Y-axis: 32、 Z-axis: 15	
	Cutting feed (m/min)	X-axis: 10、Y-axis: 10、Z-axis: 10				
ATC	Tool magazine	50 [80、100、120、180] tools				
Machine size (machine only)	Machine height (mm)	6,420 [6,620]*[1]	6,700 [6,900]*[1]			
	Floor space (mm)	7,370× 10,730	7,870× 12,830	7,870× 16,430	8,340× 19,430	8,340× 23,930
	Machine mass (kg)	46,000	58,000	67,000	89,000	99,000

*1. For 1,000 mm Z-axis travel

*2. For 10,000 min^{-1} spindle speed

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