

Significantly reduce manual finishing work for press dies
Roughing, finishing, and on-machine measurement can be
completed on one machine

A high-accuracy double column machining center
for entire workspace press die manufacturing

MCR-S (Super)

For advanced press die applications, Okuma has launched the **MCR-S (Super)**, a highly accurate double column for "entire workspace" machining.

By installing the **Accuracy Stability Diagnosis Function** to self-diagnose machine accuracy stability, and **3D Calibration** which allows any operator to easily calibrate volumetric accuracies using the MCR-S itself as a super-large and highly accurate 3D measuring machine—these two newly developed Options provide significantly better accuracies and shorter lead times. We are firmly committed to supporting production innovations in press die machining.

Background

Cost reduction and lead time reduction are eternal issues in the manufacture of press dies for automobiles. On the other hand, the diversification and differentiation of automobile design has led to extremely high shape accuracy and machined surface quality requirements for press dies. While the skillful know-how necessary for hand finishing work such as polishing and mold matching is being lost, high-quality and highly accurate die machining must be maintained and coexist with shorter lead times.

In large press die manufacturing, a lot of time is required to transport the workpiece from the machine to the measuring devices and for resets when corrective machining is required. These can be shortened by performing on-machine measurement, but with auto on-machine measurement on conventional large machines, shop floor levelness (FL) was affected by changes in room temperature and seasonal changes. It was difficult to obtain highly reliable measurements.

Development Objectives

Okuma products are equipped with a function that allows even an inexperienced operator to easily maintain high accuracy throughout the entire workspace with highly stable spatial accuracy, so that even higher-quality die machining with higher accuracy than our previous models can be achieved. We are launching the **MCR-S (Super), a high-accuracy double column** that provides superb accuracies in the **entire workspace** and even three-dimensional measuring—on just one machine.

- ① 3D on-machine measurement with improved accuracy and reliability
Quickly calibrate the machine accuracy affected by the level of the factory floor that changes throughout the year. The MCR-S itself is a highly reliable 3D machine that always ensures high spatial accuracy without using a separate 3D measuring machine—achieving on-machine measurements.
- ② Maintains high accuracy throughout a large workspace without constant temperature facilities even in drastically changing room temperature environments
- ③ Self-diagnosis of machine accuracy and floor levelness stability is performed and displayed in easy-to-understand format. Moreover, with optimal calibration notifications, any operator can reliably maintain high accuracy

By eliminating the problems in the transfer of knowledge and skills in die/mold manufacturing, and by innovating the die/mold manufacturing process, the total lead time can be drastically reduced.

This will contribute to the simultaneous launch of an expanding market for automotive press die applications.

Features and Key Enabling Technologies

① **Allowing any operator to easily check and calibrate the machine's spatial accuracy with 3D calibration**

- Highly accurate on-machine 3D measuring is possible. Eliminating Transport of large dies to a 3D CMM and set-up work at the measuring machine--when necessary, doing corrective machining as is, on the MCR-S. Total lead time reduced.
- Calibrates the machine accuracy of large machines that are affected by floor levelness that varies throughout the year
- Measuring can be performed quickly (minimum 50 minutes) for auto compensation with an "accuracy master" and a touch probe, making calibration possible. Calibration achieves an accuracy of 11 μm (actual data) in a 2-m square space
- It is possible to reduce accuracy variation between different machines by calibrating with an accuracy master.
- Measured machining results and machine status during machining can be linked and recorded, facilitating analysis of machining improvement possibilities

② **Fusion of Okuma's Thermo-Friendly Concept of thermal deformation control and space correction technologies**

- Highly accurate spatial-error compensation of the six degrees of freedom*, by using independent spatial error models.
- With a sales record of 50,000 shipments, the Thermo-Friendly Concept now with AI-driven thermal displacement control, and under an ambient temperature change of 8°C has achieved a column tilt of **1.7 $\mu\text{m}/200\text{ mm}$ (1/5 of the previous model)**.
- A combination of spatial compensation and the Thermo Friendly Concept, entire workspace high machine accuracy can be maintained at low cost. No expensive constant temperature equipment is required

* 6 degrees of freedom (6DoF): 3 movements in the X-, Y-, and Z-axis directions, and the rotation about each axis

③ **Self-diagnosis of machine accuracy stability, the machine “announces” the optimal condition with the “accuracy stability diagnosis function”**

- A unique algorithm built from big data accumulated during the development of thermal deformation control technology estimates changes in floor levelness and machine accuracy.
- Digitally visualizes the stable state of floor levelness and machine accuracy
- "Announces" the best timing for machining, measuring, and calibrating
- Diagnosis results can be analyzed using our IoT solution, Connect Plan.

Promoting the improvement of factory environments