

Floor Type Horizontal Boring Mill “MAF150R”: Providing the Highest Machining Efficiency in Its Class



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In recent years, customer demand has been increasing for machine tools that offer higher cutting performance and productivity, in addition to shorter air-cutting time, in the fields of medium- and large-part machining too. To address such machining needs in manufacturing facilities, Mitsubishi Heavy Industries, Ltd. (MHI) has developed the MAF150R, a floor type horizontal boring mill that realizes both heavy-cutting performance and reduced air-cutting time.

1. Specifications

Table 1 lists the main specifications of the MAF150R.

Table 1 Main specifications of the MAF150R

Boring spindle diameter		(mm)	Ø 150		
Spindle taper			7/24 taper ISO 50		
Ram size		(mm)	400 x 400		
Spindle speed		(min ⁻¹)	7 - 3 000		
Spindle torque		(N·m)	2 445		
Spindle motor output		(kW)	30/37 (Continuous/30-min rating)		
Axis travel	Column, longitudinal X	(mm)	5 000 to 9 000 (in steps of 1 000)		
	Saddle, vertical Y	(mm)	2 500	3 000	3 500
	Ram, in/out Z	(mm)	700		
	Boring spindle, in/out W	(mm)	700		
Rapid traverse	Column X	(mm/min)	24 000 (when X = 5 000 or 6 000mm)		
	Saddle Y	(mm/min)	20 000		
	Ram Z	(mm/min)	20 000		
	Boring spindle W	(mm/min)	10 000		
Cutting feed rate		(mm/min)	1 to 10 000		
Feed thrust	Z, W	(N)	29 400		
	X, Y	(N)	19 600		
Right-angle head	Spindle diameter		(mm) Ø 110		
	Spindle end taper		7/24 taper ISO 50		
	Spindle speed		(min ⁻¹) 7 - 3 000		
	Allowable spindle output		(kW) 30		
Automatic tool changer (ATC)	Tool storage capacity (No. of tools)		60 (Optional: 80 or 100)		
Machine size	Machine mass (excluding table)		(kg) 35 000 or more		
	Machine height		Y-axis direction (mm) 6 200 to 7 200		
	Required floor area	Z-axis direction (mm)		3 500	
		X-axis direction (mm)		10 500 to 15 500	

2. Features

2.1 Large heavy-cutting capacity

The main components of the MAF150R are built using three-dimensional finite element method (FEM) analysis technology and rationally formed and arranged ribs, thereby ensuring that the MAF150R is highly rigid.

Figure 1 shows the FEM analysis model of the MAF150R. The use of "cast iron" for all the main components enabled the construction of this logical structure, which has a cross-sectional rigidity that is 1.6 times greater than that of conventional models. Moreover, ductile cast iron

(FCD600) with an elastic modulus equivalent to iron steel is used for the 400-mm (16") square ram located close to the cutting point, which improves the cutting performance when the ram is extended. The X- and Y-axes, which support the mass of the machine components, use casting-integrated wide square slideways and opposed hydrostatic bearings for high-accuracy machining, enabling smooth axis feed over all speed ranges from the lowest to the highest while maintaining a high supporting rigidity.

Thanks to these enhancements, the machine has an excellent rigidity that supports both heavy cutting and high-accuracy machining, even when the main spindle is at high in the column and at maximum ram extension. In addition to the powerful main spindle, the MAF150R has a $\varnothing 150$ mm (6") boring spindle that offers a maximum revolution speed of $3,000 \text{ min}^{-1}$, a maximum torque of $2,445 \text{ N}\cdot\text{m}$ (1,804 ft·lb), and a spindle motor output of 37 kW (50 HP) as standard, thus achieving the highest machining performance in this class of machines.

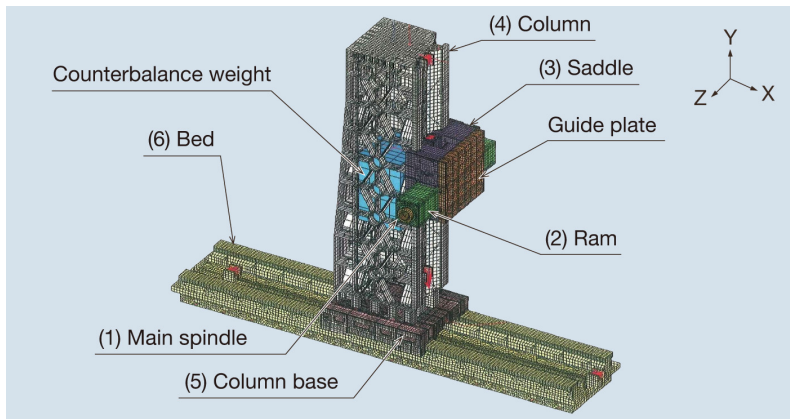


Figure 1 Three-dimensional FEM analysis model

2.2 High productivity through reduction of air-cutting time

Improvements have been made to the rapid traverse of the machine to reduce the time required for positioning in axis feeds over a wide area. The MAF150R was designed to provide a rapid traverse of 20 m/min (787 ipm) or more, especially for the X-, Y-, and Z-axes that are used most frequently, resulting in an approximate 20% reduction in the total cutting time for a given machining program (rapid traverse of 20m/min on X axis is applicable up to 8m). Moreover, the right-angle head, which has automatic indexing capability, and the abundant machining support software including 5-face machining and simple centering programs realize an automated setup, which also contributes to the reduction of the setup time.

2.3 User-friendly

With recent improvements in productivity, customer demand has been increasing for easy maintenance and operation. To address this issue, the MAF150R adopts a centralized arrangement of all lubrication devices to facilitate refilling and draining of lubricating oil, maintenance of these devices, and other maintenance tasks. In addition, for periodical maintenance items, the machine is designed to alert the operator by displaying the necessary information on the machine operation panel whenever maintenance is required.

For operability, the machine offers 5-face machining software (work surface coordinate programming type), which allows the operator to program not only the four sides of the part, but also an additional inclined surface on the assumption that it is also an X–Y plane. Patterned subprograms are also available, such as one for a bolt-hole circle.

3. Future prospects

The MAF150R is a cutting-edge machine that meets the diversified machining needs in the actual manufacturing facilities. MHI identified these needs through long-term market research. The demand for the MAF150R is expected to be focused in a variety of industrial fields, ranging from the machining of general machining parts and construction machine parts to the machining of wind- and solar-power generator parts. MHI will not only promote its sales in the domestic market, but will also actively expand its sales activities in overseas markets centered in US, Europe, BRIC's and other emerging countries around the world.