LINEAR MOTOR SINGLE-AXIS ROBOTS

No limit on critical speed even when using a long stroke of 4 m. "PHASER" series delivers superb performance during long distance transfer.
Critical speed is not restricted and high-speed long-stroke transfer is possible.

**MF type**

*High-power and long-stroke using flat motor with core*

- Maximum stroke: 4050 mm
- Maximum speed: 2500 mm/s
- Repeated positioning accuracy: +/-5 μm
- Maximum payload: 7 to 160 kg

**MR type**

*Lightweight, compact, and low cogging by shaft motor drive*

- Maximum stroke: 1050 mm
- Maximum speed: 2500 mm/s
- Repeated positioning accuracy: +/-5 μm
- Maximum payload: 5 kg

<table>
<thead>
<tr>
<th>Type</th>
<th>Size (mm) Note 1</th>
<th>Model</th>
<th>Carrier</th>
<th>Maximum payload (kg)</th>
<th>Maximum speed (mm/sec.)</th>
<th>Stroke (mm)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MF type</strong></td>
<td>W85 × H80</td>
<td>MF7</td>
<td>Single</td>
<td>10 (7) Note 2</td>
<td>2500</td>
<td>100 to 4000</td>
<td>P.220</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MF7D</td>
<td>Double</td>
<td>30 (15) Note 2</td>
<td></td>
<td>100 to 3800</td>
<td>P.226</td>
</tr>
<tr>
<td>Flat type with core Linear motor specifications</td>
<td>W100 × H80</td>
<td>MF15</td>
<td>Single</td>
<td>40 (20) Note 2</td>
<td>2500</td>
<td>150 to 4050</td>
<td>P.230</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MF15D</td>
<td>Double</td>
<td>60 (30) Note 2</td>
<td></td>
<td>150 to 3850</td>
<td>P.233</td>
</tr>
<tr>
<td></td>
<td>W150 × H80</td>
<td>MF20</td>
<td>Single</td>
<td>160 (75) Note 2</td>
<td></td>
<td>100 to 4000</td>
<td>P.236</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MF20D</td>
<td>Double</td>
<td></td>
<td></td>
<td>150 to 3750</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W210 × H100</td>
<td>MF75</td>
<td>Single</td>
<td></td>
<td></td>
<td>1000 to 4000</td>
<td></td>
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<td></td>
<td></td>
<td>MF75D</td>
<td>Double</td>
<td></td>
<td></td>
<td>680 to 3680</td>
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<tr>
<td><strong>MR type</strong></td>
<td>W60 × H80</td>
<td>MR12</td>
<td>Single</td>
<td>5</td>
<td></td>
<td>50 to 1050</td>
<td>P.238</td>
</tr>
<tr>
<td>Shaft type Linear motor specifications</td>
<td></td>
<td>MR12D</td>
<td>Double</td>
<td></td>
<td></td>
<td>50 to 1050</td>
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</tr>
</tbody>
</table>

**Note 1.** The size shows approximate maximum cross sectional size.

**Note 2.** When using at the maximum speed, the maximum payload becomes the value in ( ).
**POINT 1**

**Maximum speed 2.5 m/sec. and no critical speed limit**

The ultimate appeal of the linear motor single-axis robot is that there are restrictions on critical speed like ball screw. The maximum speed does not decrease even with long-distance transfer. Additionally, the maximum stroke of the MR type is set to up to 1050 mm and that of the MF type is set to up to 4000 mm with standard settings. In particular, the cycle time of the long-distance transfer is greatly improved.

**POINT 2**

**Suitable for heavy object transfer. Maximum payload 160 kg**

The maximum payload of the MF type using a flat magnet is 160 kg. The robot can transfer a heavy object, such as large LCD panel at a high speed with high accuracy. (In the payload range of some MF types, the maximum speed may be restricted. For details, refer to the specification page of each model.)

**POINT 3**

**Effective use of stroke**

As the linear motor single-axis robot incorporates a coil that is the drive part inside the table, dead spaces are eliminated to maximize the stroke. Additionally, as the main body is symmetrical, the flexibility of the layout is improved.

**POINT 4**

**In-house manufacturing of major parts achieves low costs.**

Magnetic scales are developed and manufactured at YAMAHA. In-house manufacturing of other major parts achieves large cost reduction. Nowadays, the linear motor is not a special mechanism. The customer can select the linear motor or ball screw in the similar way according to the customer's needs. In particular, when performing a high-speed and long-distance transfer of a light workpiece, selecting linear motor robots may reduce the cost.

<table>
<thead>
<tr>
<th>Model name</th>
<th>Main body price Note 1</th>
<th>Maximum speed (mm/sec.)</th>
<th>Maximum payload (kg)</th>
<th>Repeated positioning accuracy (μm)</th>
<th>Maximum stroke (mm)</th>
<th>Maximum cross-sectional dimension (mm) Note 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF7-1500</td>
<td></td>
<td>2500</td>
<td>10 (7)</td>
<td>+/- 5</td>
<td>4000</td>
<td>W85 × H80</td>
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<tr>
<td>F17-40-1450</td>
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<td>720 Note 4</td>
<td>40</td>
<td>+/- 10</td>
<td>1450</td>
<td>W168 × H100</td>
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<tr>
<td>B10-1450</td>
<td></td>
<td>1850</td>
<td>10</td>
<td>+/- 40</td>
<td>2550</td>
<td>W100 × H81</td>
</tr>
</tbody>
</table>

Note 1: The prices are compared with the strokes shown above.
Note 2: Cable carriers are not included.
Note 3: The payload is 7 kg when the maximum speed is 2500 mm/s. (10 kg-payload: 2100 mm/s)
Note 4: This value is obtained by considering the critical speed with a stroke of 1450 mm.

**POINT 5**

**Double-carrier available as standard**

Double-carrier specifications that operate two carriers on one robot are available as standard. High effects, such as space saving, cost reduction, and tact improvement are obtained when compared to two single-axis robots. Furthermore, no axis alignment is needed and tools are commonly used to shorten the setup time. (When using the RCX series controller, an anti-collision function can be used.)

- **Layout using two ball screw single-axis robots**
- **Space saving using double-carrier**
Applicable to multi-carrier operation

The PHASER series also supports "multi-carrier" operation that allows using three or more carriers on one robot. This "multi-carrier" operation drastically extends applications due to its high effect in improving tact time and saving space.

Applicable to dual-drive

As a dual-drive that simultaneously drives two axes, high-speed transfer and heavy object transfer are possible in a wide area. YAMAHA can propose an optimal control method according to the robot linkage rigidity.

POINT 8

Dust-proof structure

All YAMAHA's linear motor robots use a stainless steel shutter. This prevents entry of foreign objects. Additionally, these shutters are made of tough stainless steel with an extremely high fatigue strength to support high-speed and long-stroke operation.

Magnetic signals recorded in the magnetic scale are detected and interpolated to achieve a highly accurate resolution of 1 μm.

Repeated positioning accuracy: +/-5 μm

A fully-closed control that always feeds back the table position provides high accuracy steadily. Additionally, there are no mechanical backlashes, such as ball screws or timing belts.

POINT 7

Silence and long service life

Unlike ball screw type robots, there are few sliding and rotating parts. So, the operation is very quiet. Moreover, as the coil is not in contact with the magnet, they are not worn out and can be used for an extended period of time.

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HIGH RESOLUTION 1 μm

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