Unprecedented Flexibility for Industry 4.0

Planar Motor Incorporated

Gold Award
2018 Design News Award
GOLD WINNER
of Automation & Motion Control: Motors and Mechanical Motion Devices
Our smart robotic system XBot® redefines intelligent transportation systems for smart manufacturing, with unprecedented flexibility, reliability, agility, and efficiency to meet your dynamic market needs.

<table>
<thead>
<tr>
<th>Mover Types*</th>
<th>Dimensions</th>
<th>Payload</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120 x 120 mm²</td>
<td>0.6 kg</td>
</tr>
<tr>
<td></td>
<td>120 x 180 mm²</td>
<td>1 kg</td>
</tr>
<tr>
<td></td>
<td>210 x 210 mm²</td>
<td>2.4 kg</td>
</tr>
<tr>
<td></td>
<td>120 x 210 mm²</td>
<td>5 kg**</td>
</tr>
</tbody>
</table>

**More Mover types available on page 5**

**Mover is not levitated

**Stator Module**

240 x 240 x 70 mm³

*Your preferred control Hardware/Software
  - Siemens  
  - Omron  
  - Beckhoff  
  - B&R  
  - Rockwell  
  - Codesys  
  - Schneider  
  - Others

*Sample projects and supporting function block library provided
ABSOLUTE TRACEABILITY
UNIQUELY IDENTIFIABLE AT ALL TIMES

UNLIMITED FLEXIBILITY
DRIVE ANYWHERE ALONG ANY PATH

HYGIENIC DESIGN
DESIGNED FOR WASHDOWN

6 DOF VERSATILITY
INTEGRATED ROBOTICS FUNCTIONALITY

MAINTENANCE FREE
CONTACTLESS MOTION, WORKS ANYWHERE

BUILT-IN INTELLIGENCE
AUTOMATIC ROUTING WITH OBSTACLE AVOIDANCE

PRECISE
Up to 1 μm
HIGH REPEATABILITY IN ALL AXES

NUMEROUS SIZES
PAYLOAD CAPACITY FROM 0.6KG TO 14KG

EASY TO USE
MASTER THE CONTROLS WITHIN HALF A DAY OF TRAINING
<table>
<thead>
<tr>
<th>Linear Motor Based Fixed Track Solution</th>
<th>VS.</th>
<th>Planar Motor Based Trackless Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Image" alt="Linear Motor Diagram" /></td>
<td></td>
<td><img src="Image" alt="Planar Motor Diagram" /></td>
</tr>
<tr>
<td>Not Possible</td>
<td></td>
<td>Not Possible</td>
</tr>
<tr>
<td>Not Possible</td>
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<tr>
<td>Not Possible</td>
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<td>Not Possible</td>
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</tbody>
</table>
## Planar Motor Specifications

### XBot® System

<table>
<thead>
<tr>
<th>Technical Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of Stator</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Maximum number of Mover</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Speed</td>
<td>&gt; 2 m/s*</td>
</tr>
<tr>
<td>Acceleration</td>
<td>&gt; 20 m/s²*</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; 5 µm*</td>
</tr>
<tr>
<td>Flying Height</td>
<td>0.5 – 4 mm*</td>
</tr>
<tr>
<td>Mover Payload Capacity</td>
<td></td>
</tr>
<tr>
<td>M3-06, 120 x 120 x 10 mm³</td>
<td>0.6 kg</td>
</tr>
<tr>
<td>M3-08, 120 x 180 x 10 mm³</td>
<td>1.0 kg</td>
</tr>
<tr>
<td>M3-10, 180 x 180 x 10 mm³</td>
<td>1.8 kg</td>
</tr>
<tr>
<td>M3-11, 180 x 210 x 10 mm³</td>
<td>2.0 kg</td>
</tr>
<tr>
<td>M3-12, 210 x 210 x 10 mm³</td>
<td>2.4 kg</td>
</tr>
<tr>
<td>M3-13, 240 x 240 x 10 mm³</td>
<td>3.6 kg</td>
</tr>
<tr>
<td>M3-15, 210 x 330 x 12 mm³</td>
<td>4.2 kg</td>
</tr>
<tr>
<td>M3-17, 300 x 300 x 12 mm³</td>
<td>6.0 kg</td>
</tr>
<tr>
<td>M3-18, 330 x 330 x 12 mm³</td>
<td>7.2 kg</td>
</tr>
<tr>
<td>M3-25, 450 x 450 x 16 mm³</td>
<td>14.4 kg</td>
</tr>
<tr>
<td>Stator Dimension</td>
<td>240 x 240 x 70 mm³</td>
</tr>
<tr>
<td>Wash Down</td>
<td>Yes</td>
</tr>
<tr>
<td>Auto Routing</td>
<td>Yes</td>
</tr>
<tr>
<td>Collision Avoidance</td>
<td>Built In</td>
</tr>
</tbody>
</table>

*Other options or higher performance possible. Contact us with application details.*
K3-100 system is a 100-Mover system, including:

- 100 Mover M3-06
- 100 Stator S3-A
- configurable into many layouts, only a few examples shown on the left
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
64-Mover System K3-64

K3-64 system is a 64-Mover system, including:

- 64 Mover M3-06
- 64 Stator S3-A
- configurable into many layouts, only a few examples shown on the left
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
K3-32 system is a 32-Mover system, including:

- 32 Mover M3-06
- 32 Stator S3-A
- configurable into many layouts, only a few examples shown on the left
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
16-Mover System K3-16

K3-16 system is a 16-Mover system, including:

- 16 Mover M3-06
- 16 Stator S3-A
- configurable into many layouts, only a few examples shown on the left
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
K3-8 system is an 8-Mover system, including:

- 8 Mover M3-06
- 8 Stator S3-A
- configurable into many layouts, only a few examples shown on the left
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
Turnkey Systems

**4-Mover System K3-4A**

K3-4A system is a 4-Mover system, including:

- 4 Mover M3-06
- 4 Stator S3-A
- configurable into many layouts, examples shown on the left
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
K3-4B system is a 4-Mover system, including:

- 4 Mover M3-06
- 2 Stator S3-A
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
More Turnkey Systems

2-Mover System K3-2A
Including:
- 2 Mover M3-06
- 2 Stator S3-A
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service

2-Mover System K3-2B
Including:
- 2 Mover M3-06
- 1 Stator S3-A
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service

1-Mover System K3-1
Including:
- 1 Mover M3-06
- 1 Stator S3-A
- Control system hardware and software
- PLC interface via PROFINET RT/IRT, EtherCAT, POWERLINK, or EtherNet/IP
- Real-time emulator
- Configuration and diagnostic tools
- On-site training and one-year development support service
Frequently Asked Questions

System Configuration

What is the limit on the number of Stators and the number of Movers in a system?

No technical limit on the number of supported Stators. No limit on the number of Movers, as long as the Movers can geometrically fit inside the Stator working area.

Any limit on the layout of Stators?

All Stators should be aligned with their neighbor Stators; other than that, there is no limit.

How should the Stators be mounted?

Customers will be provided a template to make their own application-specific mounting plate. The template will match the four M8 threaded holes in the Stator bottom side. In each Stator, one 4 mm pin hole and one 4-mm wide slot are used for alignment on the mounting plate.

What is the tooling mount on Movers?

Our Movers come with standard tooling mount including threaded holes and dowel pin holes. We can provide Movers in customer specified tooling mount as well.

Features and Performance

Is position feedback incremental or absolute? How about homing procedure?

The built-in position sensors provide absolute positions for each Mover instantly after system power up. No homing or initialization process is needed.

Other than going along X or Y, can the Movers move diagonally?

Yes. Each Mover can go along an arbitrary path, specified by external position setpoint stream, pre-configured trajectory, or motion commands.

What is the positioning repeatability of Movers?

Mover repeatability is less than 5 micron in all directions. Movers with less than 1 micron repeatability are also available.

How are Movers identified?

Our Stator built-in sensors not only measure 6-axis position, but also detect unique “fingerprint” on each Mover right after system power up. With absolute ID feature, each Mover is assigned a unique and consistent ID, in despite of power cycles.
Frequently Asked Questions

**Operation**

**What is the operating principle?**

Movers are propelled by controllable three-dimensional magnetic fields generated from a two-dimensional coil matrix. The resulting forces are used to control the position of the Movers in X, Y, Z and in Rx, Ry, Rz, namely the rotary motion around X, Y, Z, respectively.

**How should my machine controller interface with the Planar Motor System?**

Planar motor systems support all major industry standard communication interface, such as PROFINET RT/IRT, EtherCAT, POWERLINK, and EtherNet/IP. We support all control platform whenever possible. Our customers can use the controller hardware/software that they are most comfortable with, and there is no need to learn or adapt to a new programming environment.

**What drives should I use to drive the Planar Motor?**

No additional drives are required. All drive electronics are integrated inside Stator modules.

**How should I control the Movers to avoid collision?**

Our system automatically manages collision avoidance without user intervention.

**What is the typical learning curve of controlling the planar motor system?**

Based on our previous experience of system commissioning in America, Asia, Europe, typically our customers can master the control/operation of our Planar Motor Systems in a few hours.

**What is the power consumption?**

Each Stator consumes about 6W at standby; each Mover M3-06 may consume about 13~20W at stationary 1-mm levitation without load and up to 100W momentarily at high acceleration with payload.

**What is the operating voltage of the Stator module?**

The Stators are powered with low voltage DC. The standard supply voltage is 48V DC; on request, we can supply low-voltage version Stators using 24V DC.

**Which environments are Planar Motor systems suited for?**

Planar motor system are well suited for most industrial environments: from harsh/dirty environments to ultra-clean (food, pharmaceutical, aseptic, vacuum) environments. Planar Motor systems cannot operate in an environment with an abundance of ferrous debris, as ferrous particles will be attached to the Mover magnet.
Reliability and Maintenance

What is the maintenance schedule?

No maintenance requirement, no periodic lubrication, no tightening/alignment effort. Truly maintenance free.

What reliability tests have you done?

Internally, we tested our evaluation system for over 30,000 hours without any failure.

What materials are used to cover Stator modules?

303/304/316L stainless steel, aluminum, plastic, glass.

Where are planar motors manufactured?

Planar motors are invented, designed, and manufactured in Vancouver, Canada.

Is there a strong magnet field surrounding the Movers?

Mover design ensures magnetic field is confined inside the gap below. Minimum leakage from Mover top and side surfaces.

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Other

What is the typical application?

Packaging, assembly, inspection, testing, semiconductor, and various other automated procedures in the factory.

Under a payload, will the levitation height change?

No. Each Mover’s are precisely controlled in 6 axis. An off-center payload won’t affect the X/Y/Z and pitch/yaw/roll position at all.

How about cooling requirements?

Passive cooling by natural convection is usually sufficient. Each Stator is equipped with push-to-connect fittings. In applications requiring better temperature management or higher acceleration/payload, air or water can be optionally pumped through heat exchange channels inside Stators.