Powerful and Precise Linear Motion
The brushless DC tubular linear motor’s shaft contains rings of powerful rare earth magnets that interact with the stator coils to produce rapid, precise and powerful motion. The stator’s length and diameter determine the force level, while the shaft length determines the stroke.

Linear motion is initiated by a motion controller, which relays detailed move profiles to the motor. A precision encoder reports motor position to the controller for closed loop control. The motor’s position and force are fully programmable and there is no backlash or compressibility to compromise position accuracy. Common names for this type of device include linear motor, linear servo, brushless motor, and linear servo motor.

Contact us to discuss your application requirements.
WHAT IS A TUBULAR LINEAR SERVOMOTOR?

The Moog linear motor is essentially a conventional brushless motor with an unconventional twist.

The design of Moog’s core patent began with the magnetic design of a rotary brushless motor. Engineers cut the rotor lengthwise, laid it out flat, and then curled the assembly into a tube from the other direction. The permanent magnets now formed a stack of rings in alternating magnetic polarity. Engineers suspended the magnetic shaft in a column of current-carrying coils held in slots along a metallic core – the stator.

The company’s engineers then rebuilt the shaft using more powerful magnets to increase the force produced, and lengthened the motor to create a longer stroke.

The result of these design improvements is the Moog linear motor: a compact motor with all the advantages of existing technology and none of the disadvantages.

In short: a motor poised to replace a portion of today’s pneumatic and ball screw, as well as some hydraulic motion control technology.
PART NUMBERING SYSTEM

**STATOR SIZE**
(coil diameter)
40 - 4 inches OD
50 - 5 inches OD

**SHAFT SIZE**
20 - 2 inches OD

**# COIL SETS**
(stator length)
2 - 6 coils
4 - 12 coils
6 - 18 coils

**STROKE LENGTH**
02 - 2 inches
04 - 4 inches
06 - 6 inches
08 - 8 inches
10 - 10 inches
12 - 12 inches
14 - 14 inches
16 - 16 inches
18 - 18 inches
20 - 20 inches
*Consult factory for additional lengths

**OPERATION VOLTAGE**
240 or 480 volts

**COOLING**
00 - No fins
CV - Convection
LQ - Liquid cooled (40204 and 40206 only)
FN - Fans (50204 and 50206 only)

**WINDING TYPE**
C - Standard winding
D - High response winding

**POSITION SENSOR / LINEAR ENCODER**
(count / in)
000 - None
LCA - Linear Encoder (5,080)
LCB - Linear Encoder (25,400)
LCC - Linear Encoder (50,800)
LCD - Linear Encoder (254,000)
LCE - Linear Encoder (Vpp sin / cos, 40 μm)
LPA - Linear Encoder (50204)

Note: All motors contain temperature switches.
Consult factory for controller and feedback devices available.

### SPECIFICATIONS

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<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>2C</th>
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<tr>
<td>(add 0.62 lbm for each inch of stroke)</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>(add 0.11 kg for each centimeter stroke)</td>
<td>kg</td>
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*Consult factory for continuous force capability of standard configuration motors as well as fan and liquid cooled options.
**Consult factory for stroke lengths in excess of standard values.

Moog Components Group   •   www.moog.com/components
Linear Motors

DIMENSIONS

Model 4020

Dimensions are in inches [mm]

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<td>40206</td>
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Note: For electrical performance see page 3.

Model 5020

Dimensions are in inches [mm]

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<td>14.3 [363.2]</td>
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</tbody>
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Note: For electrical performance see page 3.
FORCE-VELOCITY CURVES - 220 VOLT MOTORS

Performance obtained with Delta Tau PMAC2 controller and MTS Powerblock amplifier powered by 220 V 3-phase mains. Motors mounted to an aluminum plate. Allowed coil temperature rise is 75°C.
FORCE VELOCITY CURVES - 480 VOLT MOTORS

Linear Motors

FORCE LB vs VELOCITY in/s

40202

50202

40204

50204

40206

50206
## SPECIFICATIONS - LIQUID COOLING

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<td>45</td>
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<td>kg</td>
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<td>26.76</td>
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*Consult factory for continuous force capability of standard configuration motors as well as fan and liquid cooled options.

Performance parameters and velocity curves are based on a 5°C coolant inlet temperature and a 2 GPM flow rate.

## DIMENSIONS - LIQUID COOLING

Dimensions are in inches [mm]

**Note:** For electrical performance see above specifications.

Moog Components Group • www.moog.com/components

---

**PART NUMBER** | "L" in [mm]
---|---
40204 | 10.6 [269.2]
40206 | 14.3 [363.2]
Linear Motors

FORCE-VELOCITY CURVES - LIQUID COOLING

40204

40206
TECHNOLOGY COMPARISON

Tubular linear servomotors offer an advantage in weight, size, maintenance costs, environmental considerations, precision, speed, control, programmability, reliability and noise. The patented technology offers the motion control industry an alternative to hydraulic, pneumatic and mechanical power sources for linear motion control. The linear motors are easy to install and integrate. Position and force are fully programmable and there is no backlash or fluid compressibility to compromise position accuracy.

The superior performance of Moog’s linear servomotor results in improved profitability for a broad range of industrial motion control applications. The linear motor’s high velocity enables manufacturers to increase throughput. At the same time, its high accuracy and consistent repeatability contribute greatly to improved product quality.

Its unique design incorporates the important features of a single moving part, integral bearings, compact size, and exceptionally high force per volume. These features deliver significant advantages, including cost savings, over not only traditional approaches including hydraulics, pneumatics, ball screws and other electromechanical systems, but also when compared to other linear motors.

With its single moving part and integral bearing system, the Moog linear motor is remarkably easy to install. Its simple design provides robust, reliable operation, and lowers life cycle costs. Its cylindrical configuration yields a highly efficient generation of force, enabling the motor to accelerate quickly to high velocities, even when handling heavy loads.

The linear motor compared to the alternatives:
• Hydraulic systems are environmentally unfriendly, require an external power supply, and cannot match the programmability or reliability of the Moog motor.
• Mechanical devices such as ball screws, cams and pulleys have high maintenance requirements, limited programmability, and lack the velocity that can be achieved with the Moog motor.
• Pneumatic systems cannot achieve the accuracy, velocity, programmability or reliability of the Moog motor, and present environmental concerns similar to those of hydraulic systems.
• Competing linear motors are more costly, more difficult to integrate, and lack the Moog motor’s integral bearing system. The external bearing system required for competing flat linear motors can cost as much as the motor alone.

<table>
<thead>
<tr>
<th>Typical Linear Drive Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Stiffness</td>
</tr>
<tr>
<td>Friction</td>
</tr>
<tr>
<td>Temperature Range</td>
</tr>
<tr>
<td>Efficiency</td>
</tr>
<tr>
<td>Noise</td>
</tr>
<tr>
<td>Speed</td>
</tr>
<tr>
<td>Accuracy</td>
</tr>
</tbody>
</table>

For technical assistance please call: 610-328-4000.
TYPICAL APPLICATIONS

Conveyor

The Function
A fast-back conveyor moves dry goods along a production line, moving the product slowly in one direction and then reversing the conveyor back at high speed. The conveyor motion can be gentle in moving the product without shaking it too much.

This type of conveyor is used to move:
• Potato chips and seasoned foods – flavored potato chips or cereal, seasoned nuts
• Pharmaceuticals
• Rice and grains
• Small finished metal parts

The Problem
Producing just the right type of movement without damaging the product is a complex engineering problem that usually requires intricate mechanical solutions.

The Solution
As part of a linear servo system, the Moog motor’s programmability produces optimum motion for any product without the expense and high maintenance of complex mechanical systems. The Moog motor also is used with vibratory conveyors.

The Result
• Faster conveyance speed, even up slopes
• Easy modification of motion profile for products requiring different motion

Moog motors can even be electronically geared together to drive large conveyors – impractical to impossible for mechanical systems to accomplish.
TYPICAL APPLICATIONS

**Flying Die**

Plastic and metal forming industries rely on motors to manipulate, hold and move product parts.

**The Function**
A flying die stamps or cuts a product while the product is in motion. The die is accelerated to match product speed, stamps or cuts the product and then returns to its original position. Flying dies are typically found in plastic and metal extruders, metal stamping and embossing.

**The Problem**
Synchronizing production line speed and die speeds at a precise location is an engineering challenge.

**The Solution**
The Moog linear motor automatically tracks and matches line speed.

**The Result**
- Faster throughput
- Reduced error and scrap rate
- Improved consistency

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**Destacker**

**The Function**
Many raw materials are supplied in large quantity bulk stacks. A destacker unstacks products consistently and precisely for production. Destackers are common in lamination production and in manufacturing CDs, packaging materials, food products, etc.

**The Problem**
To avoid damaging the product, a destacker must make short, precise movements and stay perfectly in step with a pusher axis.

**The Solution**
A servo system with Moog motors is fully programmable for a precisely matching product thickness and finely tuned coordination between the axes.

**The Result**
- Faster line speeds
- Reduction of product damage

Specifications and information are subject to change without prior notice.

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