Parker LM-Pro Miniature Proportional Valve

Linear Motor Proportional Valve

The Parker LM-Pro miniature proportional valve provides unparalleled flow control capabilities to meet your OEM application needs. The LM-Pro uses a patent pending linear motor actuation technology that provides exceptional resolution over a longer stroke and lower power consumption than traditional solenoid or voice coil actuation. With a linear controllable flow up to 540 slpm, pressure capability up to 100 PSIG (6.9 Bar), and typical power consumption of less than 2 Watts, the LM-Pro is a true, one-size-fits-all proportional valve. This unrivaled performance capability combined with the simplicity of a face-mounted/ported design make the LM-Pro valve an ideal solution for your dynamic flow control needs.

Features
- Large linear flow control range spanning 70% of the current rating enabling accurate low and high flow rate control
- Low power consumption: Typical operation under 2 Watts
- Proven performance: Life cycle rated to 100 million cycles (.95 Reliability factor. 95% confidence interval)
- Face mount porting and optional integrated filter simplifies integration and reduces manifold complexity
- Cleaned for Oxygen use per ISO15001:2010 and meets ISO10993 Biocompatibility
- Reach and RoHS compliant

Markets
- Respiratory
- Anesthesia
- Patient Therapy

Applications
- Ventilators (Gas Blending & Delivery)
- Insufflators
- Anesthesia Delivery
- Pressure and Flow Control

Product Specifications

- Valve Type: 2-Way Normally Closed
- Media: Air, Oxygen, Nitrous Oxide, Carbon Dioxide, Heliox and other medical gases
- Operating Environment: 32 to 131°F (0 to 55°C)
- Storage Temperature: -40 to 158°F (-40 to 70°C)
- Length: 1.57 in (39.9 mm)
- Width: 0.72 in (18.3 mm)
- Height: 1.44 in (36.5 mm)
- Porting: Face Seal to Manifold with integrated FKM seal and optional inlet filter
- Weight: 1.29 oz (36.6 g)

Power:
- 2.0 Watt Typical
- 3.0 Watt Maximum

Voltage:
- 5, 12 and 24 VDC

Electrical Termination:
- Latching Receptacle

Wetted Materials
- Valve Element: Aluminum, FKM Elastomer, Fluorosilicone Elastomer, Stainless Steel

Leak Rate: *
- Internal: 1 SCCM
- External: 1 SCCM

Performance Characteristics
- The leakage shall not exceed the above values with Air at a rated pressure of 100 psid (6.9 bar) for Model 2 and 50 psid (3.45 bar) for Model 4

Operating Pressure:
- Model 2: 0 - 100 psig (6.9 bar), Model 4: 0 - 50 psig (3.45 bar)

Vacuum:
- 0 - 27 in Hg (0-686 mm Hg)

Proof Pressure:
- Model 2: 150 psig (10.39 bar), Model 4: 110 psig (7.6 bar)

Orifice Sizes:
- Model 2: 0.121 in (3.07 mm) effective, Model 4: 0.134 in (3.40 mm) effective

Hysteresis:
- 10% of full scale current (Typical)
- 15% of full scale current (Maximum)

Optional Filtration:
- 400 µm

Response time:
- <10 ms Typical at 20°C

Parker is a registered trademark of Parker Hannifin Corporation.
Miniature Proportional Valves

Parker LM-Pro Linear Motor Proportional Valve

Typical Flow Curve

*During operation at 50psi, a flow shift of up to 5% over the life of the valve may occur.

*LM-Pro Model 2
Typical Air Flow with 12 VDC Coil

- 100 PSI (6.9 BAR)
- 38 PSI (2.6 BAR)
- 10 PSI (0.69 BAR)

*LM-Pro Model 4*
Typical Air Flow with 12 VDC Coil

- 50 PSI (3.4 BAR)
- 25 PSI (1.7 BAR)
- 10 PSI (.69 BAR)
**Parker LM-Pro** Linear Motor Proportional Valve

**Typical Flow Curve**

*During operation at 50psi, a flow shift of up to 5% over the life of the valve may occur.*

- **LM-Pro Model 2**
  - Typical Low Flow Control with 12 VDC Coil

- **LM-Pro Model 4**
  - Typical Low Flow Control with 12 VDC Coil

*During operation at 50psi, a flow shift of up to 5% over the life of the valve may occur.*
Parker LM-Pro Linear Motor Proportional Valve

Typical Flow Curve

Pressure vs Flow Curve
The curve below shows the typical output flow rate at maximum rated current as a function of inlet pressure.
**Parker LM-Pro** Linear Motor Proportional Valve

**Pneumatic Interface**

**Parker LM-Pro Manifold Mount**

**Mechanical Integration**

**Dimensions**

**Parker Parker LM-Pro Basic Valve Dimensions**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unit [IN]</th>
<th>Unit [MM]</th>
</tr>
</thead>
<tbody>
<tr>
<td>.375</td>
<td>0.53 mm</td>
<td>9.53</td>
</tr>
<tr>
<td>.625</td>
<td>15.88 mm</td>
<td>15.88</td>
</tr>
<tr>
<td>.435</td>
<td>11.05 mm</td>
<td>11.05</td>
</tr>
<tr>
<td>.717</td>
<td>18.21 mm</td>
<td>18.21</td>
</tr>
<tr>
<td>2X Ø.094</td>
<td>Ø2.39 mm</td>
<td>2.39</td>
</tr>
<tr>
<td>1.438</td>
<td>36.51 mm</td>
<td>36.51</td>
</tr>
<tr>
<td>1.003</td>
<td>25.46 mm</td>
<td>25.46</td>
</tr>
<tr>
<td>.313</td>
<td>7.94 mm</td>
<td>7.94</td>
</tr>
<tr>
<td>.218</td>
<td>5.52 mm</td>
<td>5.52</td>
</tr>
<tr>
<td>.153</td>
<td>3.89 mm</td>
<td>3.89</td>
</tr>
<tr>
<td>2X Ø.208</td>
<td>Ø5.28 mm</td>
<td>5.28</td>
</tr>
</tbody>
</table>

**Notes:**
- Valve connector housing: JST #SM02B-PASS-TB or equivalent
- Wire lead connector: JST housing #PAP-02V-S or equivalent
- JST Contacts #SPHD-002T-P0.5 or equivalent
- Valve is polarity sensitive, note markings on cover

**UNITS IN [MM]**

---

This document contains information that is confidential and proprietary to Precision Fluidics Division of Parker Hannifin Corporation (Parker). This document is published on the understanding that the document and the information it contains will not be copied or disclosed to others except with the written consent of Parker, and will not be used except for the direct benefit of Parker, and will be returned and all further use discontinued upon request by Parker. © Parker Hannifin Corporation 2003. All rights reserved.
**Parker LM-Pro** Linear Motor Proportional Valve

**Electrical Interface**

**Electrical Requirements**

<table>
<thead>
<tr>
<th>Related Voltage</th>
<th>Nominal Coil Resistance at 20°C</th>
<th>Control Current at Maximum Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 VDC</td>
<td>6 (\Omega)</td>
<td>555 mA</td>
</tr>
<tr>
<td>12 VDC</td>
<td>24 (\Omega)</td>
<td>280 mA</td>
</tr>
<tr>
<td>24 VDC</td>
<td>148 (\Omega)</td>
<td>115 mA</td>
</tr>
</tbody>
</table>

**Installation and Use**

**Basic Control:**
The Parker LM-Pro valve can be controlled by either voltage or current; however, it is highly recommended that current control be employed to ensure the most repeatable valve flow performance.

**PWM Control:**
For PWM control, the signal applied to the valve should have a frequency of 5 kHz or greater. Optimum frequency will be application dependent.
Parker LM-Pro Linear Motor Proportional Valve
Installation and Use

Suggested Parker LM-Pro Current Driver Schematic

This simple current driver circuit draws only 1 mA at the input control (0-5VDC) and provides control for any LM-Pro valve configuration regardless of valve voltage or resistance.

Table 2 (below) describes the recommended R1 and R2 resistor values based upon the full shut-off current.

<table>
<thead>
<tr>
<th>Valve Drive Voltage Input (VDC)</th>
<th>Valve Coil Voltage, Resulting (VDC)</th>
<th>Nominal Coil Resistance @ 20°C (Ohms)</th>
<th>Input Current for Full Flow (mA)</th>
<th>R1 [Ohms]</th>
<th>R2 [Ohms]</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>7</td>
<td>6</td>
<td>555</td>
<td>3920</td>
<td>499</td>
</tr>
<tr>
<td>12</td>
<td>14</td>
<td>24</td>
<td>280</td>
<td>3920</td>
<td>237</td>
</tr>
<tr>
<td>24</td>
<td>26</td>
<td>148</td>
<td>115</td>
<td>4320</td>
<td>102</td>
</tr>
</tbody>
</table>
Parker LM-Pro  Linear Motor Proportional Valve

Installation and Use

Manifold Dimensions & Design

Not shipped with valves.
Parker Precision Fluidics recommends 24 in-oz (17 N-cm) of torque for the screws.

---

UNITS
IN [MM]

---

Parker Precision Fluidics recommends 24 in-oz (17 N-cm) of torque for the screws.
**Parker LM-Pro** Linear Motor Proportional Valve

### Ventilator Inspiratory Flow

- Filtered/Pressure Regulated Air Source
- Flow Control Valve Parker LM-Pro
- Check Valve
- Flow Control Valve Parker LM-Pro
- Mass Flow Sensor
- Oxygen Sensor
- Auto Calibration Valve Parker X-Valve
- Pressure Relief Valve
- To Atmosphere
- To Patient Circuit

### Ventilator Expiratory Flow

- Flow Control Valve Parker LM-Pro
- Auto Calibration Valve Parker X-Valve
- Mass Flow Sensor
- Pressure Sensor
- To Atmosphere
- From Patient Circuit
**Parker LM-Pro** Linear Motor Proportional Valve

**Accessories**

- **12.5” Adapter Wire Leads**
  290-006061-004

- **Single Station Manifold**
  890-001184-001

- **Screw #2-56 x 3/4” Socket Head Cap Screw**
  191-000112-417

- **Manifold O-Ring (FKM)**
  190-007063-001
  (supplied with valve)

- **Optional Filter**
  195-000291-001

**Ordering Information**

<table>
<thead>
<tr>
<th>Sample Part ID</th>
<th>937-02-12-00-01-00</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Series - Model Number</td>
<td>Elastomer</td>
</tr>
<tr>
<td>Options</td>
<td>937</td>
<td>-</td>
</tr>
<tr>
<td>290-006061-004</td>
<td>12.5 in (317.5 mm) Wire Leads</td>
<td><strong>Not supplied with the valve</strong></td>
</tr>
<tr>
<td>890-001184-001</td>
<td>Manifold, Single Station</td>
<td><strong>Not supplied with the valve</strong></td>
</tr>
<tr>
<td>190-007063-001</td>
<td>Manifold O-Ring (FKM)</td>
<td><strong>Supplied with the valve</strong></td>
</tr>
<tr>
<td>191-000112-417</td>
<td>Screw #2-56 x 3/4, Socket Head Cap</td>
<td><strong>Not supplied with the valve. See valve mounting recommendations above</strong></td>
</tr>
<tr>
<td>195-000291-001</td>
<td>Optional Filter</td>
<td><strong>Supplied if selected option</strong></td>
</tr>
</tbody>
</table>

**NOTE:** In order to provide the best possible solution for your application, please provide the following requirements when contacting Applications Engineering:

- Media, Inlet & Outlet Pressures
- Minimum Required Flow Rate
- System Supply Voltage
- Media & Ambient Temperature Range

To order online go to www.parker.com/precisionfluidics/LM-Pro. For more detailed information, visit us on the Web, or call and refer to Parker LM-Pro Performance Spec. 790-002627-001.

Parker Hannifin Precision Fluidics Division reserves the right to make changes. Drawings are for reference only.

For more information call +1 603 595 1500 or email ppfinfo@parker.com
Visit www.parker.com/precisionfluidics