VSO® LowPro  
Miniature Proportional Valve

Low Profile Proportional Valve

The VSO® LowPro is a miniature proportional valve that controls the flow rate of inert gases at pressures up to 100 PSIG (6.9 bar). Typical flow rates up to 57 SLPM with a typical power of 1 Watt at room temperature. At just 16 mm wide by 14 mm tall, the valve can be populated into the smallest portable device improving performance, size and weight. With orifice sizes ranging from 0.030” (0.76 mm) up to 0.080” (2.03 mm) and a weight of 12 g, the VSO® LowPro can perform the function of valves three times its size without sacrificing the power. Mounting only requires a simple, machined manifold.

Markets
- Portable Oxygen Concentrators
- Ventilators
- Patient Monitors

Typical Applications
- Pressure Control
- Volumetric Flow Control
- Pulse Dose Control

Product Specifications

Physical Properties

<table>
<thead>
<tr>
<th>Valve Type:</th>
<th>2-Way Normally Closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media:</td>
<td>Air, Oxygen or any non-reactive, non-condensing gases</td>
</tr>
<tr>
<td>Operating Environment:</td>
<td>32 to 131°F (0 to 55°C)</td>
</tr>
<tr>
<td>Storage Temperature:</td>
<td>-40 to 158°F (-40 to 70°C)</td>
</tr>
<tr>
<td>Length:</td>
<td>0.80 in (20 mm)</td>
</tr>
<tr>
<td>Width:</td>
<td>0.63 in (16 mm)</td>
</tr>
<tr>
<td>Height:</td>
<td>0.55 in (14 mm)</td>
</tr>
<tr>
<td>Porting:</td>
<td>Face Seal to Manifold with integrated FKM seal</td>
</tr>
<tr>
<td>Weight:</td>
<td>0.42 oz (12 g)</td>
</tr>
</tbody>
</table>

Electrical

| Power:               | 1.0 Watt Typical 2.0 Watt Maximum |
| Voltage:             | 5, 12 and 24 VDC See Table 2 |
| Electrical Termination: | 4.5” (114 mm) Wire leads [26 AWG] with Molex 50-57-9402 connector |

Wetted Materials

| Body & Cover:        | Aluminum 430 Stainless Steel |
| Armature & Spring:   | Carbon Steel (Nickel Plated) Stainless Steel |
| Coil:                | Urethane Polyvinyl Butyral |
| All Others:          | FKM, Epoxy |

Regulatory:
- Compliant with RoHS directive (2002/95/EC), REACH EC 1907/2006, ISO 15001, IP65(IEC/EN 60529), and CE
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Performance Characteristics

Leak Rate: *
- Internal: 0.5 SCCM of Air with a differential pressure of 100 psid (6.9 bar)
- External: 0.2 SCCM of Air with a differential pressure of 100 psid (6.9 bar)
- * The leakage shall not exceed the above values.

Operating Pressure: See Table 1
- 0 - 100 psi (6.9 bar)

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

Proof Pressure:
- 300 psi (20.7 bar)

Orifice Sizes:
- 0.030 in (0.76 mm)
- 0.040 in (1.02 mm)
- 0.050 in (1.27 mm)
- 0.080 in (2.03 mm)

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

Recommended Filtration:
- 40 μm (not supplied)

Response time:
- 10 ms Typical

Reliability:
- 100 Million Cycles
- 0.96 Reliability Factor
- 99% Confidence Interval

**VSO® LowPro** Low Profile Proportional Valve

Typical Flow Curve

The curve below shows the maximum output flow for each orifice size as a function of inlet pressure up to the maximum rated pressure for the valve.

Pressure vs Flow Curve

Pressure and Flow Capabilities

| Table 1 |
| --- | --- | --- | --- | --- |
| **Model No.** | **Orifice Diameter** | **Cv at Maximum Pressure** | **Maximum Inlet Pressure** | **Maximum Differential Pressure** |
| 3 | 0.030” (0.76 mm) | 0.015 | 100 psi (6.9 bar) | 100 psig (6.9 bar) |
| 4 | 0.040” (1.02 mm) | 0.022 | 100 psi (6.9 bar) | 100 psig (6.9 bar) |
| 5 | 0.050” (1.27 mm) | 0.027 | 100 psi (6.9 bar) | 100 psig (6.9 bar) |
| 8 | 0.080” (2.03 mm) | 0.045 | 100 psi (6.9 bar) | 50 psig (3.4 bar) |
VSO® LowPro Low Profile Proportional Valve

VSO® LowPro Sizing Charts

Model 3 - 0.030” (0.76mm) Orifice

Pressure (bar)

Flow Rate (slpm)

Model 4 - 0.040” (1.02 mm) Orifice

Pressure (psi)

Flow Rate (slpm)
VSO® LowPro Low Profile Proportional Valve

VSO® LowPro Sizing Charts

Model 5 - 0.050” (1.27 mm) Orifice

Flow Rate [slpm] vs. Pressure [bar]

Model 8 - 0.080” (2.03 mm) Orifice

Flow Rate [slpm] vs. Pressure [bar]
**VSO® LowPro** Low Profile Proportional Valve

**Pneumatic Interface**

**VSO® LowPro Manifold Mount**

**Mechanical Integration**

**Dimensions**

**VSO® LowPro Basic Valve Dimensions**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø.625 [Ø15.87]</td>
<td>IN [MM]</td>
</tr>
<tr>
<td>.53 [13.5]</td>
<td></td>
</tr>
<tr>
<td>.066 [1.68]</td>
<td></td>
</tr>
<tr>
<td>Ø.800 [Ø20.32]</td>
<td></td>
</tr>
<tr>
<td>Ø.400 [Ø10.16]</td>
<td></td>
</tr>
<tr>
<td>2X Ø.090 [Ø2.29]</td>
<td></td>
</tr>
<tr>
<td>PORT 1 (OUTLET)</td>
<td></td>
</tr>
<tr>
<td>Ø.200 [Ø5.08]</td>
<td></td>
</tr>
<tr>
<td>PORT 2 (INLET)</td>
<td></td>
</tr>
</tbody>
</table>
**VSO® LowPro** Low Profile Proportional Valve

**Electrical Interface**

MOLEX HOUSING #50-67-9402  
MOLEX CONTACTS #16-02-0098

4.5 ± 0.25  
[114 ± 8.4]

45° ± 5°

2X UL 1428-26-7  
BLACK IRRADIATED PVC

**Electrical Requirements**

<table>
<thead>
<tr>
<th>Rated Voltage</th>
<th>Nominal Coil Resistance at 20°C</th>
<th>Control Current at Maximum Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Model 3</td>
</tr>
<tr>
<td>5 VDC</td>
<td>10 Ω</td>
<td>275 mA</td>
</tr>
<tr>
<td>12 VDC</td>
<td>61 Ω</td>
<td>112 mA</td>
</tr>
<tr>
<td>24 VDC</td>
<td>179 Ω</td>
<td>65 mA</td>
</tr>
</tbody>
</table>

**Installation and Use**

**Typical Valve Set-up**

**Valve Electrical Control**

**Basic Control:**  
The VSO® LowPro 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 10 kHz or greater. Optimum frequency will be application dependent.
**VSO® LowPro** Low Profile Proportional Valve

**Installation and Use**

**Suggested VSO® LowPro Current Driver Schematic**

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

Table 3 (below) describes the recommended R1 and R2 resistor values based upon the full shut-off current.

**Table 3: Selectable Resistor Values for a Low Current (1 mA) LM358-Based Current Driver (All Models)**

<table>
<thead>
<tr>
<th>Maximum Solenoid Voltage (VDC)</th>
<th>Circuit Supply Voltage (VDC)</th>
<th>Nominal Coil Resistance @ 20 °C (Ohms)</th>
<th>Maximum Output Current from Circuit (mA)</th>
<th>R1 (Ohms)</th>
<th>R2 (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>8.0</td>
<td>10.1</td>
<td>396</td>
<td>4910</td>
<td>422</td>
</tr>
<tr>
<td>13.0</td>
<td>15.0</td>
<td>61.3</td>
<td>160</td>
<td>3320</td>
<td>110</td>
</tr>
<tr>
<td>22.0</td>
<td>24.0</td>
<td>178.5</td>
<td>94</td>
<td>2100</td>
<td>40.2</td>
</tr>
</tbody>
</table>
VSO® LowPro  Low Profile 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.

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UNITS

IN [MM]

- \(0.220 \pm 0.010\) [5.59 ±0.25]
- \(0.500 \pm 0.005\) [12.70 ±0.13]
- \(Ø0.246 \mp 0.270 \pm 0.010\) [Ø6.25 ± 6.86 ±0.25]
- \(1/16 \times 27\) NPT \(\mp 0.261\) MIN.
- \(2\times Ø0.100 \pm 0.005 \mp 0.375 \pm 0.010\) [Ø2.54 ±13 \mp 9.53 ±25]
- \(0.800 \pm 0.003\) [20.32 ±0.08]
- \(0.400 \pm 0.003\) [10.16 ±0.08]
- \(0.75 \pm 0.01\) [19.1 ±0.3]
- \(4\times Ø0.375 \pm 0.005\) [9.53 ±0.13]
- \(0.500 \pm 0.005\) [12.70 ±0.13]
- \(0.200 \pm 0.003\) [5.08 ±0.08]
- \(0.700 \pm 0.005\) [17.78 ±0.13]
- \(2\times #2-56\) UNF-2B \(\mp 0.188\) [4.77] MIN. THREAD
  OR M2 \(\times 0.4\) \(\mp 0.188\) [4.77] MIN. THREAD
  HOLES NOT TO BREAK THROUGH
- \(1/16 \times 27\) NPT \(\mp 0.261\) MIN.
VSO® LowPro Low Profile Proportional Valve

Typical Flow Diagram

Oxygen Concentrator Application

COMPRESSOR

ELECTRONIC CONTROL CIRCUIT

AIR IN

SERIES MX VALVE

SWITCHING VALVE

SERIES MX VALVE

SWITCHING VALVE

SERIES MX VALVE

SERIES MX VALVE

NITROGEN VENT TO ATM

MOLECULAR SIEVE BED (1)

S-11 CROSS OVER VALVE

MOLECULAR SIEVE BED (2)

PRODUCT TANK

VSO® LowPro VALVE

OXYGEN OUT
VSO® LowPro Low Profile Proportional Valve

Accessories

12.5” Adapter Wire Leads
290-006061-003

Screw #2-56 x 3/16” Socket Head Cap Screw
191-000112-004

(note valve mounting recommendations above)

Single Station Manifold
890-009042-001

Manifold O-Ring (FKM)
190-007059-001

(see valve mounting recommendations above)

Ordering Information

<table>
<thead>
<tr>
<th>Sample Part ID</th>
<th>Description</th>
<th>Series</th>
<th>Isolation</th>
<th>Model Number</th>
<th>Elastomer</th>
<th>Voltage</th>
<th>Body Material</th>
<th>Pneumatic Interface</th>
<th>Electrical Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>290-006061-003</td>
<td>12.5 in (318 mm) Adapter Wire Leads</td>
<td>93</td>
<td>Non-Isolated</td>
<td>0</td>
<td>FKM</td>
<td>12: 12 VDC</td>
<td>Aluminum</td>
<td>0: Manifold Mount</td>
<td>0: Wire Leads w/ connector</td>
</tr>
<tr>
<td>890-009042-001</td>
<td>Manifold, Single Station, 1/8 in NPT</td>
<td>93</td>
<td>Non-Isolated</td>
<td>0</td>
<td>FKM</td>
<td>12: 12 VDC</td>
<td>Aluminum</td>
<td>0: Manifold Mount</td>
<td>0: Wire Leads w/ connector</td>
</tr>
<tr>
<td>190-007059-001</td>
<td>Manifold O-Ring (FKM)</td>
<td>93</td>
<td>Non-Isolated</td>
<td>0</td>
<td>FKM</td>
<td>12: 12 VDC</td>
<td>Aluminum</td>
<td>0: Manifold Mount</td>
<td>0: Wire Leads w/ connector</td>
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<tr>
<td>191-000112-004</td>
<td>Screw #2-56 x 3/16” Socket Head Cap Screw</td>
<td>93</td>
<td>Non-Isolated</td>
<td>0</td>
<td>FKM</td>
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<td>Aluminum</td>
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Accessories

290-006061-003: 12.5 in (318 mm) Adapter Wire Leads
890-009042-001: Manifold, Single Station, 1/8 in NPT
190-007059-001: Manifold O-Ring (FKM)
191-000112-004 Screw #2-56 x 3/16” Socket Head Cap Screw

**Not supplied with the valve.**

**Supplied with the valve.**

**Not supplied with the valve. See Valve Mounting Recommendations above**

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

Please click on the Order On-line button to configure your VSO® LowPro Proportional Valve (or go to www.parker.com/precisionfluidics/VSOLowProMiniatureProportionalValve). For more detailed information, visit us on the Web, or call and refer to VSO® LowPro Performance Spec. 790-002490-001.

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