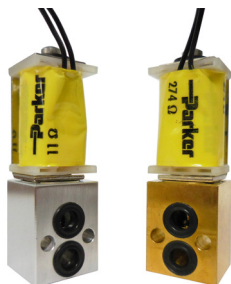


VSO[®] MAX HP

Miniature High Flow Proportional Valve

High Flow Proportional Valve



Markets

- Respiratory
- Surgical (High Flow)

Applications

- Ventilators
- Insufflators
- Anesthesia Delivery & Monitors
- Pressure and Flow Control

Product Specifications

Physical Properties

Valve Type:	2-Way Normally Closed
Media:	Air, Oxygen, Nitrous Oxide, Carbon Dioxide, Heliox & other medical gases
Operating Environment:	41 to 131°F (5 to 55°C)
Storage Temperature:	-40 to 158°F (-40 to 70°C)
Length:	2.02 in (51.4 mm)
Width:	0.63 in (15.9 mm)
Height:	0.69 in (17.4 mm)
Porting:	Manifold mount
Weight:	2.45 oz (69.5 g) Brass 1.41 oz (40.0g) Aluminum

The VSO[®] MAX HP series is a miniature high flow proportional valve that provides flow capabilities to meet your OEM application needs. The valve delivers a high range of controllable flow while consuming 25% less power than comparable miniature proportional solenoid valves, assisting with battery life savings. VSO[®] MAX HP Model 2 delivers a flow at 200 slpm at 45 PSI and is designed for higher range of operating pressures 120 psi (8.27 bar) commonly found on systems without a regulator. Model 4 delivers a flow of 180 slpm at 25 PSI and is designed for higher flow at lower pressure commonly found on systems with regulators. This translates to a smaller, sleek medical device design and offers potential savings and features three standard control voltage ranges (5, 12 and 24 VDC).

Features

- Low power consumption generates less heat
- Proven performance tested to 100 million life cycles
- Cleaned for Oxygen use per ISO 15001
- Meets ISO 10993 and ISO 18562 Biocompatibility (aluminum body version only)
- Reach and RoHS compliant



Electrical

Power:	2.0 Watts Typical @ 20°C Model 2 2.2 Watts Typical @ 20°C Model 4
Voltage:	5, 12, 24 VDC
Electrical Termination:	18 in Wire Leads

Wetted Materials

Body:	Brass or Aluminum
Stem Base:	430 FR Stainless Steel Brass or Aluminum
All Others:	FKM; 430 FR Stainless Steel; Stainless Steel; Aluminum
Contact factory for customized configurations: eg custom calibration and electrical connections.	

Performance Characteristics

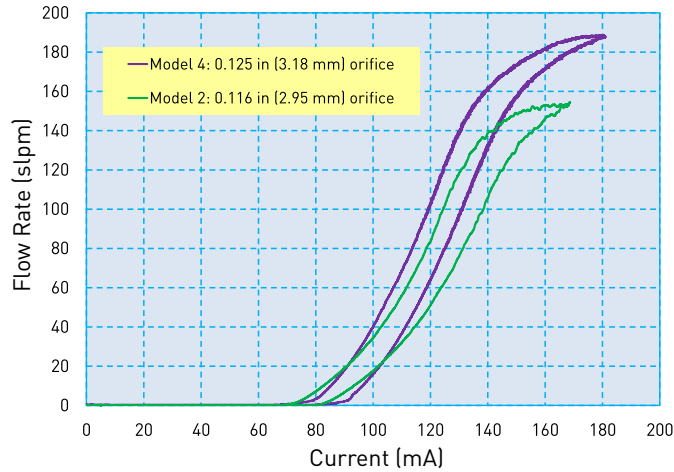
Leak Rate:	The leakage shall not exceed the following values: Internal: 5.0 sccm of Air up to 120 psi (8.27 bar) External: 0.5 sccm of Air up to 120 psi (8.27 bar)
Operating Pressure:	Model 2: 0 - 120 psi (0 - 8.27 bar) Model 4: 0 - 101 psi (0 - 7 bar) Proof: 300 psi (20.7 bar)
Orifice Sizes:	Model 2: 0.116 in (2.95 mm) effective Model 4: 0.125 in (3.18 mm) effective
Hysteresis:	7% of full scale current (Typical) 15% of full scale current (Max)
Recommended Filtration:	Optional Integrated Filtration 400 µm
Response time:	10 ms Typical
Reliability:	100 Million Cycles 0.95 Reliability Factor 95% Confidence Interval

VSO is a registered trademark of Parker Hannifin Corporation.

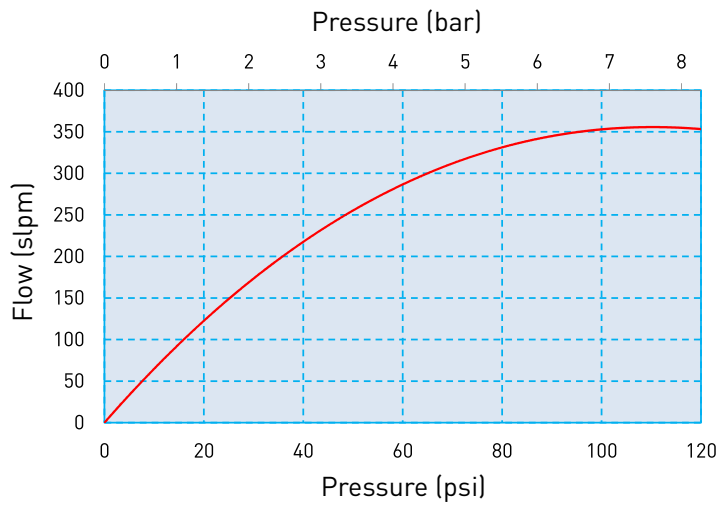


VSO® MAX HP Miniature High Flow Proportional Valve Typical Flow Curves

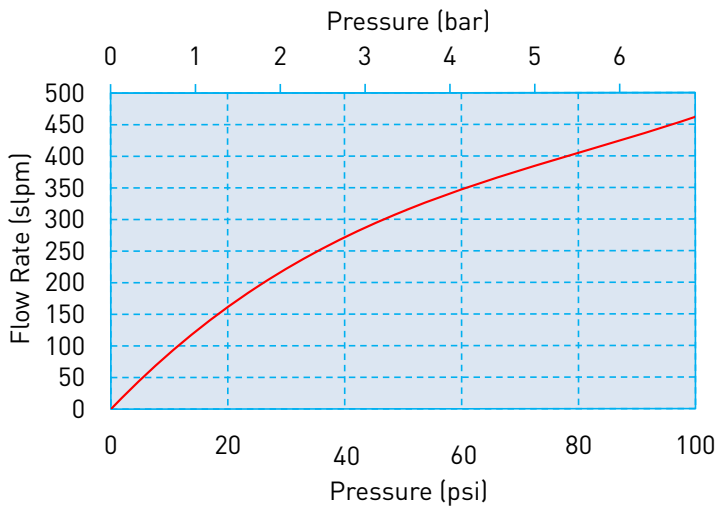
VSO® MAX HP Current vs. Flow with 12 VDC Coil @ 25 psid (1.7 bar)



VSO® MAX HP Model 2 Pressure vs. Flow Curve



VSO® MAX HP Model 4 Pressure vs. Flow Curve



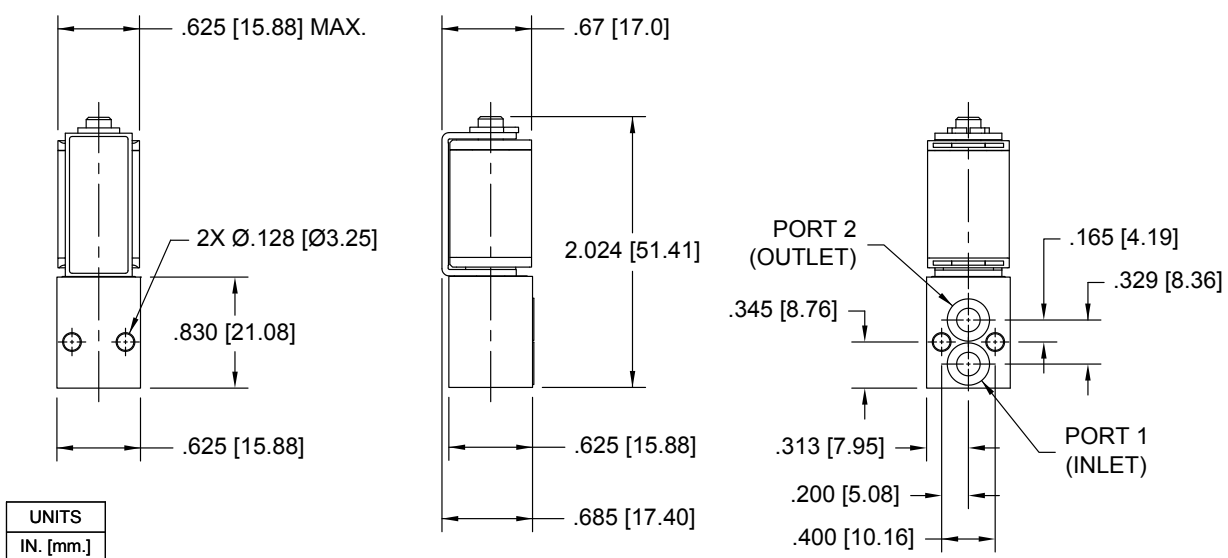
VSO® MAX HP Miniature High Flow Proportional Valve Pneumatic Interface

VSO® MAX HP Manifold Mount



Mechanical Integration Dimensions

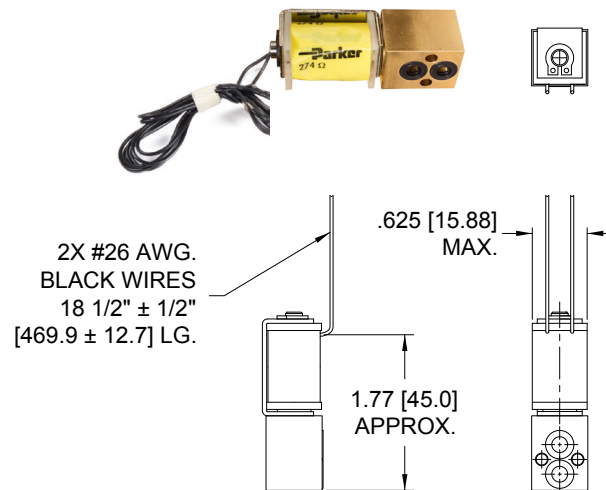
VSO® MAX HP Manifold Body Basic Valve Dimensions



VSO® MAX HP Miniature High Flow Proportional Valve Electrical Interface

VSO® MAX HP Manifold Mount

Coil Type: 18 in Wire Lead



Contact factory for customized lead wire lengths.

Electrical Requirements

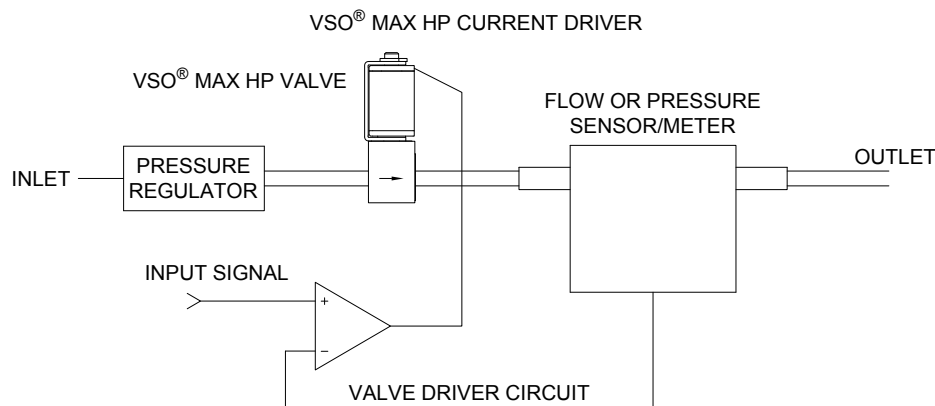
Table 1

Nominal Supply Voltage (VDC)	Nominal Coil Resistance (Ohms) @ 20°C	Model 2 Control Current at Maximum Flow (mA)	Model 4 Control Current at Maximum Flow (mA)
5	11.9	423	430
12	68.4	170	180
24	273.6	85	90

Note: VSO® MAX HP Model 4 may require 20% higher voltage allowance to obtain maximum flow at high operating temperatures.

VSO® MAX HP Miniature High Flow Proportional Valve Installation and Use

Typical Valve Set-up



Valve Electrical Control

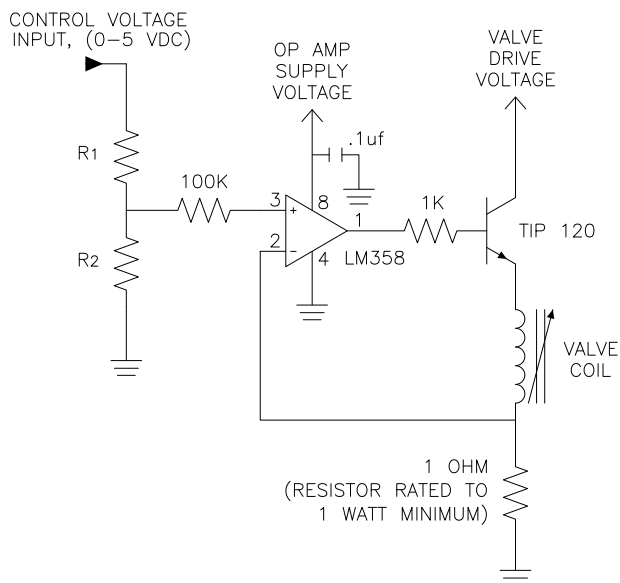
Basic Control:

The VSO® MAX HP 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. Optimal frequency will be application dependent.

Suggested VSO® MAX HP Current Driver Schematic



This simple current driver circuit draws only 1 mA at the input control (0-5VDC) and provides control for any VSO® MAX HP 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.

VSO® MAX HP Miniature High Flow Proportional Valve

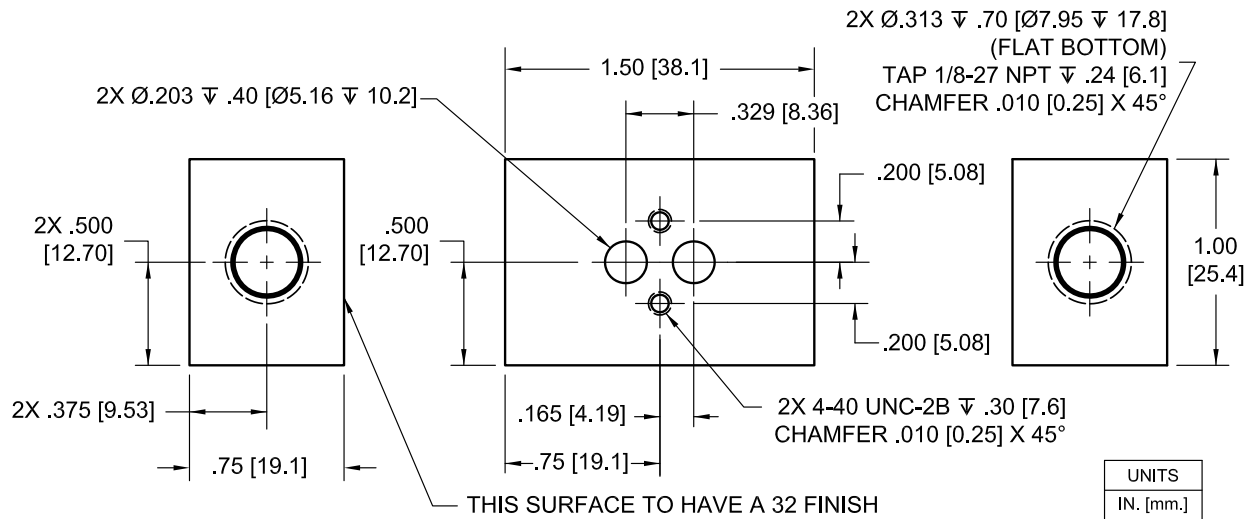
Installation and Use

Table 2: Selectable Resistor Values for a Low Current (1mA) LM358-Based Current Driver

Specified Solenoid Voltage (VDC)	Circuit Supply Voltage (VDC)	Nominal Coil Resistance @ 20°C (Ohms)	R1 (Ohms)	R2 (Ohms)
5	7	11.9	4990	464
12	14	68.4	4990	178
24	26	273.6	4990	86.6

Installation and Use

VSO® MAX HP Manifold Dimensions & Design



Accessories

Manifold, Single Station, 1/8" NPT
890-009034-001



Screw 4-40 x 7/8"
Stainless Steel, Socket Head Cap
**Not supplied with the valve. Used to mount the valve to a manifold.
191-000214-002



Spare Manifold Gasket, Quad Ring FKM
*Supplied with the valve. Used as a seal between the valve body and manifold. (2 Required)
190-007060-001



Optional Filter
**Supplied if selected option
195-000291-001



VSO® MAX HP Miniature High Flow Proportional Valve

Ordering Information

Sample Part ID	921	2	1	1	05	1	000
Description	Series	Model Number: Operating Pressure / Orifice Size	Pneumatic Interface	Body /Elastomer	Coil Voltage	Electrical Interface	
Options		2: 120 PSI / 0.116 in (2.95 mm) 4: 101 PSI / 0.125 in (3.18 mm)	1: Manifold Mount 2: Manifold Mount with fliter	0: Aluminum / FKM 1: Brass / FKM Note: Only Option "0": Aluminum / FKM meets ISO 10993 and ISO 18562 Biocompatibility.	05: 5 VDC 12: 12 VDC 24: 24 VDC	1: Wire Leads, 18 in (45.7 cm)	

Accessories	
191-000214-002: Screw 4-40 x 7/8" Stainless Steel, Socket Head Cap**	**Not supplied with the valve. Used to mount the valve to a manifold.
190-007060-001: Spare Manifold Gasket, Quad Ring FKM*	*Supplied with the valve. Used as a seal between the valve body and manifold.(2 Required)
890-009034-001: Manifold, Single Station, 1/8" NPT	
195-000291-001: Optional Filter**	**Supplied if selected option

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 (or go to www.parker.com/precisionfluidics/vsomaxhp) to configure your VSO® MAX HP Miniature High Flow Proportional Valve. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002506-001 (Model 2) or Performance Spec # 790-002535-001 (Model 4) and Drawing #890-003423-001.

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

PPF-MPV-002/US April 2018

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



HF PRO High Flow Proportional Valve

Miniature Proportional Valve




Applications

- Ventilators
- O₂ Concentrators/Conservers
- Anesthesia Delivery
- Patient Monitors
- Pressure & Flow Control

The HF PRO is a miniature 2-way normally closed (NC) high flow proportional valve that controls gas flow proportionally to input current with flow rates up to 60 slpm at 50 psig. The valve can be controlled with either DC current or pulse width modulation along with closed loop feedback to deliver optimal system performance. The HF Pro miniature proportional valve is an ideal choice for applications that require repeatable pressure and flow control such as respiratory and patient monitoring applications.

Features

- Capable of controllable flow rates of up to 60 slpm and pressures of 50 psig
- Provides repeatability across its operating range for improved accuracy
- Available Oxygen Service use clean
- Proven performance tested to 35 million life cycles
- RoHS compliant 

Product Specifications

Physical Properties

Valve Type:	2-Way Normally Closed
Media:	Air, argon, helium, hydrogen, methane, nitrogen, oxygen, & others
Operating Environment:	32 to 131°F (0 to 55°C)
Storage Temperature:	-40 to 158°F (-40 to 70°C)
Length:	1.785 in (45.3 mm)
Width:	0.625 in (15.88 mm)
Height:	0.67 in (17.0 mm)
Porting:	1/4" Barbs, Manifold Mount
Weight:	2.2 oz (62.9 grams)

Physical Properties

Internal Volume:	0.031 in ³ (0.508 cm ³)
Filtration:	43 micron
Flow Direction:	Inlet Port Port 2 Outlet Port Port 1
Oxygen and Analytically Clean:	Standard

Electrical

Power:	3.0 Watts maximum
Voltage:	See Table 2
Electrical Termination:	18 in Wire Leads

Wetted Materials

Body:	360 HO2 Brass
Stem Base:	430 FR Stainless Steel and Brass 360 HT
All Others:	FKM; 430 FR Stainless Steel; 300 Series Stainless Steel

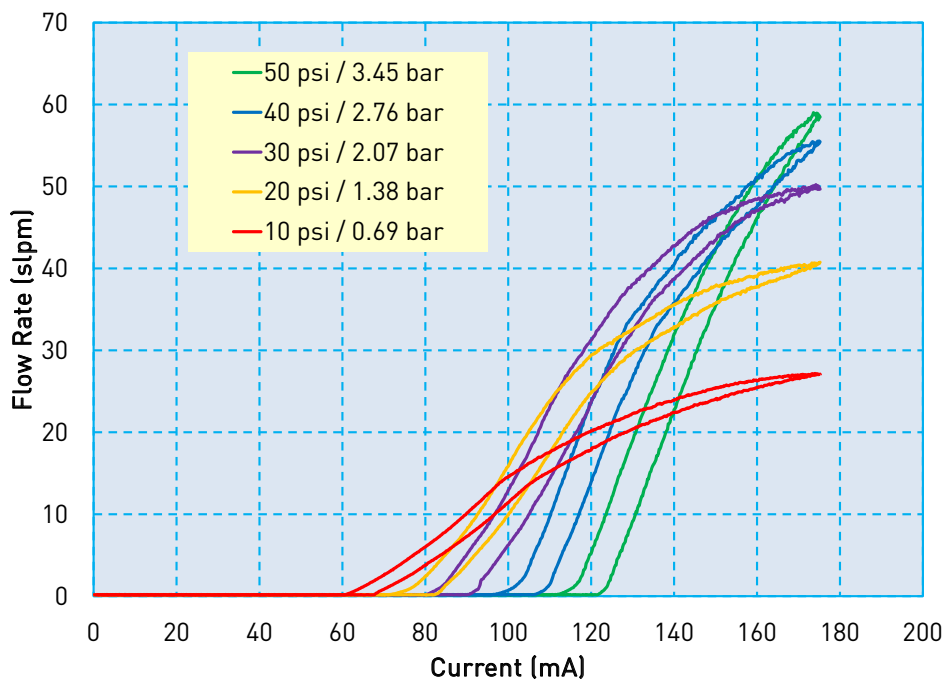
Performance Characteristics

Leak Rate:	The leakage shall not exceed the following values: Internal 0.5 SCCM of N ₂ External 0.016 SCCM of N ₂
Pressure:	0 to 50 psi (3.45 bar) See Table 1
Vacuum:	0-27 in Hg (0-686 mm Hg)
Orifice Size:	0.070" (1.8 mm) effective
Hysteresis:	7% of full scale current (Typical) 15% of full scale current (Max)

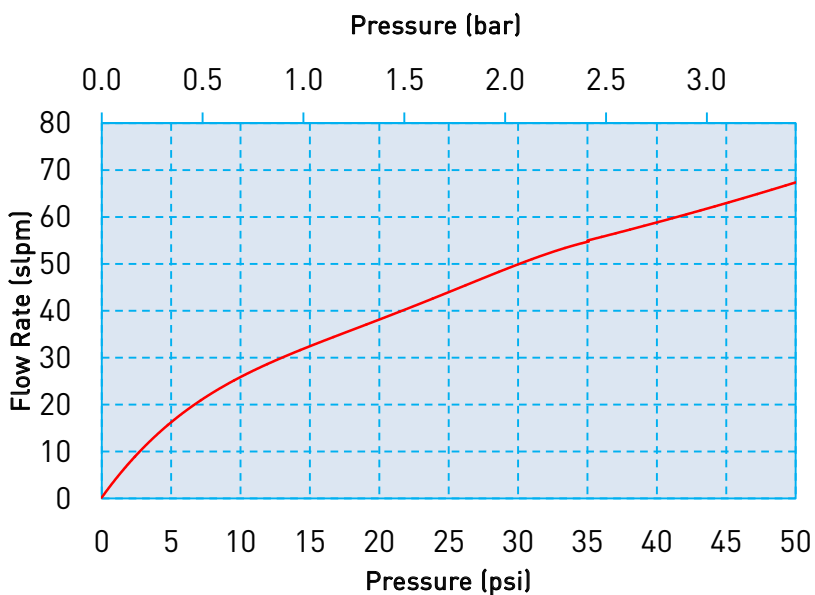
HF PRO Miniature High Flow Proportional Valve

Typical Flow Curve

Typical Air Flow with 12 VDC Coil @ 68 Ohm



HF Pro - 0.070" (1.8 mm) Orifice Pressure vs Flow Curve



Pressure and Flow Capabilities

Table 1

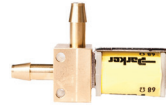
Orifice Diameter	Maximum Operating Inlet Pressure	Maximum Operating Pressure Differential
0.070 in (1.8 mm)	150 psig (10.34 bar)	50 psid (3.45 bar)

HF PRO Miniature Proportional Valve Pneumatic Interface

**HF PRO
Manifold Mount**

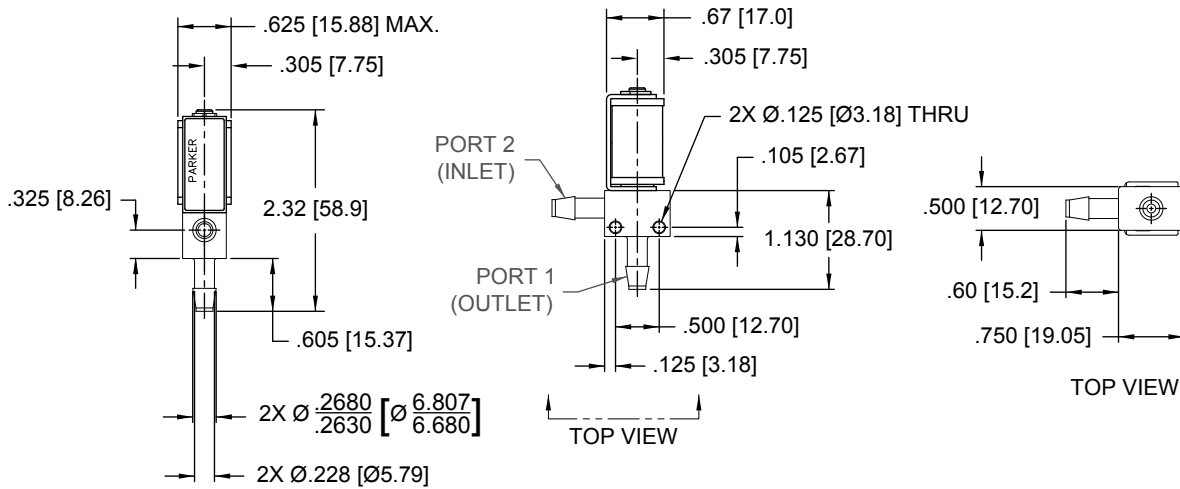


**HF PRO
Barbed**

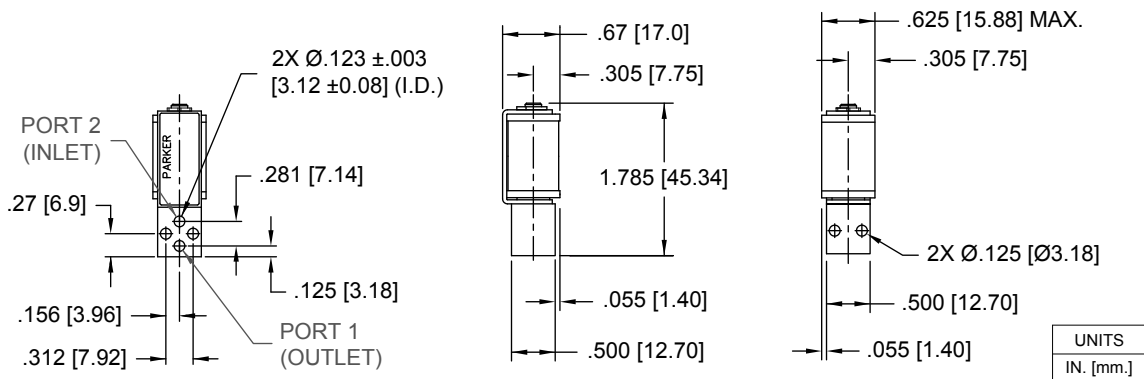


Mechanical Integration Dimensions

HF PRO Barb Mount Basic Valve Dimensions

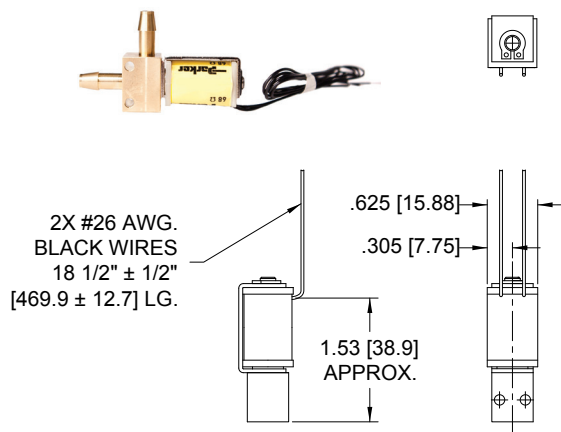


HF PRO Manifold Mount Basic Valve Dimensions



HF PRO Miniature Proportional Valve Electrical Interface

Coil Type: 18" Wire Lead



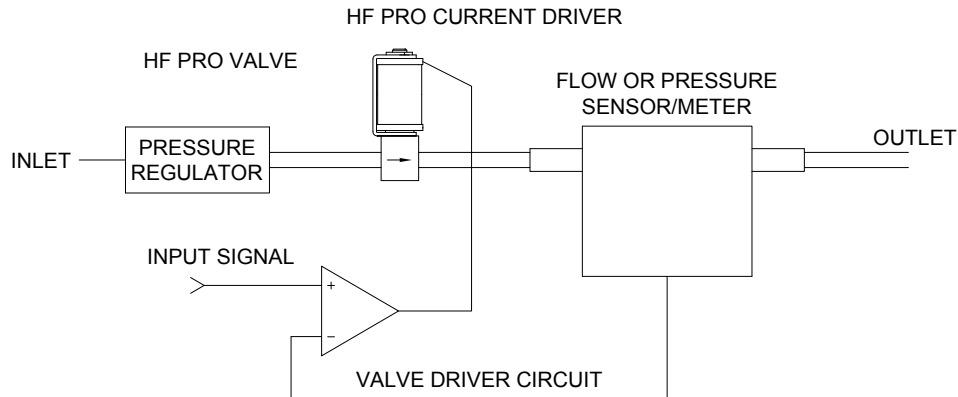
Electrical Requirements

Table 2

Minimum Available Voltage (VDC)	Nominal Coil Resistance @ 20°C (Ohms)	Input Current for Full Flow (mA)
5	11.9	435
12	68	175
24	274	87

HF PRO Miniature Proportional Valve Installation and Use

Typical Valve Set-up



Valve Electrical Control

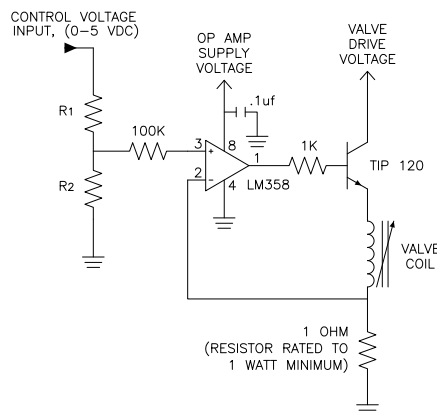
Basic Control:

The HF 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 between 5-12kHz. Optimum frequency will be application dependent.

Suggested HF PRO Current Driver Schematic



This simple current driver circuit draws only 1 mA at the input control (0-5VDC) and provides control for any HF PRO 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 (1mA)
LM358-Based Current Driver**

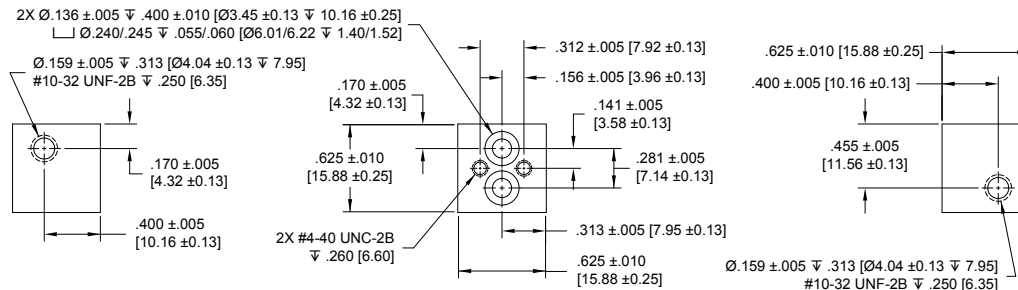
Voltage Supplied to Valve Coil (Reference)	Valve Drive Voltage (VDC)	Nominal Coil Resistance @ 20°C (Ohms)	Input Current for Full Flow (mA)	R1 (Ohms)	R2 (Ohms)
5	7	11.9	435	1000	95.3
12	14	68	175	2260	33.6
24	26	274	87	4990	18.2

HF PRO Miniature High Flow Proportional Valve

Installation and Use

Manifold & O-Ring Dimensions & Design

Not shipped with valves.



Ordering Information

Sample Part ID	HFPRO	7	V	A	F	8	O
Description	Series	Model Number: Maximum Operating Pressure / Orifice Size	Elastomer/ Body Material	Coil Voltage*	Electrical Interface	Pneumatic Interface	Cleaning
Options		7: 50 psi / 0.070" (1.78 mm)	V: FKM / Brass	A: 5 VDC D: 12 VDC F: 24 VDC *Maximum voltage for continuous full flow, ambient temperature 55°C	F: Wire Leads, 18" (45.7 cm)	1: Manifold Mount 8: 1/4" (6 mm) Barbs	O: Oxygen Service

Accessories	
190-007024-002: O-ring, FKM, 0.114" ID x 0.070" Thick*	*Not supplied with the valve. Used as a seal between the valve body and manifold.
191-000115-010: Screw 4-40 x 5/8" Pan Head**	**Not supplied with the valve. Used to mount the valve to a manifold.



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 (or go to www.parker.com/precisionfluidics/hfpro) to configure your HF PRO Non-Thermally Compensated Proportional Valve. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002243-001 and HF PRO Barbed Drawing #890-003192-001 and HF PRO Manifold Mount Drawing #890-003191-001.

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