First Sensor

VSO®- MI – thermally compensated proportional valve

The VSO®- MI is a miniature proportional valve specifically designed for medical device manufacturers and incorporates thermal compensation to provide precise flow control and stability over a wide operating temperature range. The valve is oxygen service clean and has been evaluated by registered laboratories to guidelines established within the ISO 10993-1:2009 matrix and USP regulatory standards for bio-compatibility. Together with integrated filtration and manifold seals, low power consumption and its light weight design, the VSO®- MI helps reduce the time and cost of system integration and compliance.

Features

- 2-way NC
- Thermally compensated to maintain precision flow and accuracy
- Evaluated to established guidelines within the ISO 10993-1:2009 matrix and USP regulatory standards for bio-compatibility
- Integrated filters to protect the valve from damaging upstream and downstream particulates
- Cleaned for oxygen service use
- Life cycle rating of 25 million

Certificates

- RoHS

Media compatibility

Air, carbon dioxide, nitrogen, oxygen and helium

Applications

- Ventilators
- Oxygen concentrators
- Oxygen conservers
- Anesthesia delivery & monitors
- Pressure & flow control
- Blood pressure monitoring

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Product specifications

Parameter	
Operating temperature	**32 ... 140 °F (0 ... 60 °C)**
Storage temperature	**-40 ... 158 °F (-40 ... 70 °C)**
Weight	**1.23 oz (34.9 g)**
Internal volume	**0.031 in^3 (0.508 cm^3)**

Wetted materials

Parameter	
Valve body	**Polybutylene terephthalate (PBT)**
Stem base	**430 FR stainless steel and brass C3600 HT**
All others	**FKM, 430 FR stainless steel, 300 series stainless steel, brass C3600 HT**

Filtration

Integrated 40 micron filters (inlet and outlet ports)

Performance characteristics

Part no.	Pressure (1)	Vacuum	Orifice size / nominal Cv	Leak rate (tested with nitrogen)	Response	Power	Hysteresis
TI2P100...	**0 to 100 psi**	**0 to 27 in Hg (0 to 686 mm Hg)**	**0.051 in (1.30 mm) / 0.025**	**< 0.2 sccm internal, over rated pressure range < 0.016 sccm external, @ 150 psig**	**10 ms typical**	**1 W typical, 2 W max.**	**7 % of full scale current typical 15 % of full scale current max.**
TI2P150...	**0 to 150 psi**		**0.031 in (0.79 mm) / 0.010**				

Specification notes
(1) Maximum inlet pressure for all valves is 150 psi.

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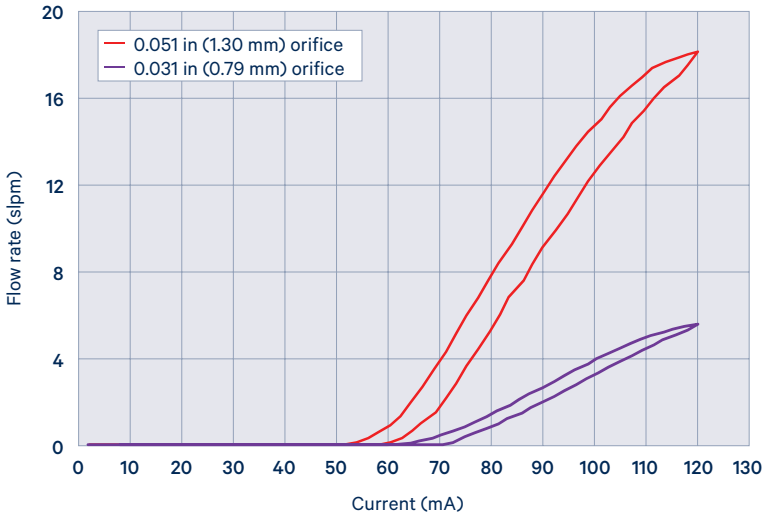
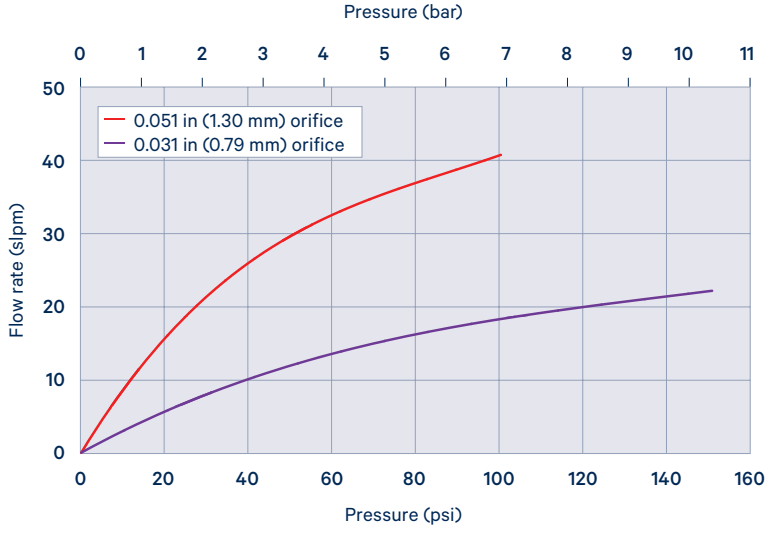
Typical flow curve

Typical air flow with 13.5 VDC coil @ 25 psid (1.7 bar)



Pressure vs flow curves @ 20 °C



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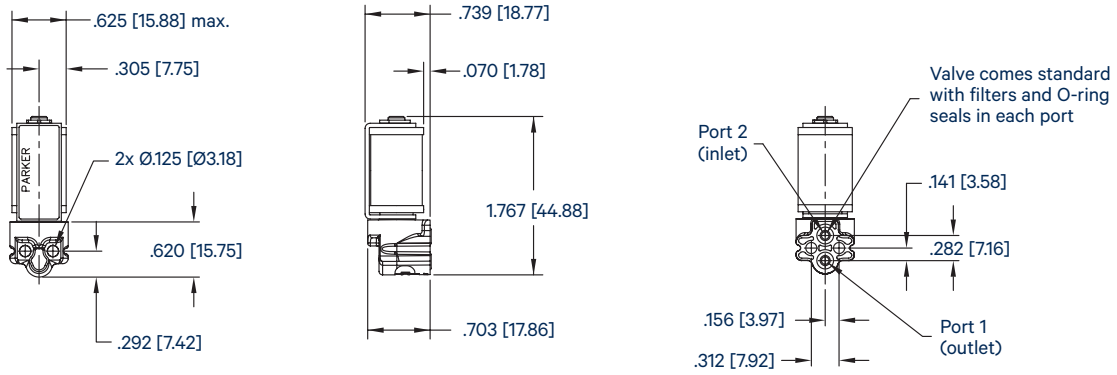
Dimensional drawing



dimensions in inch [mm]

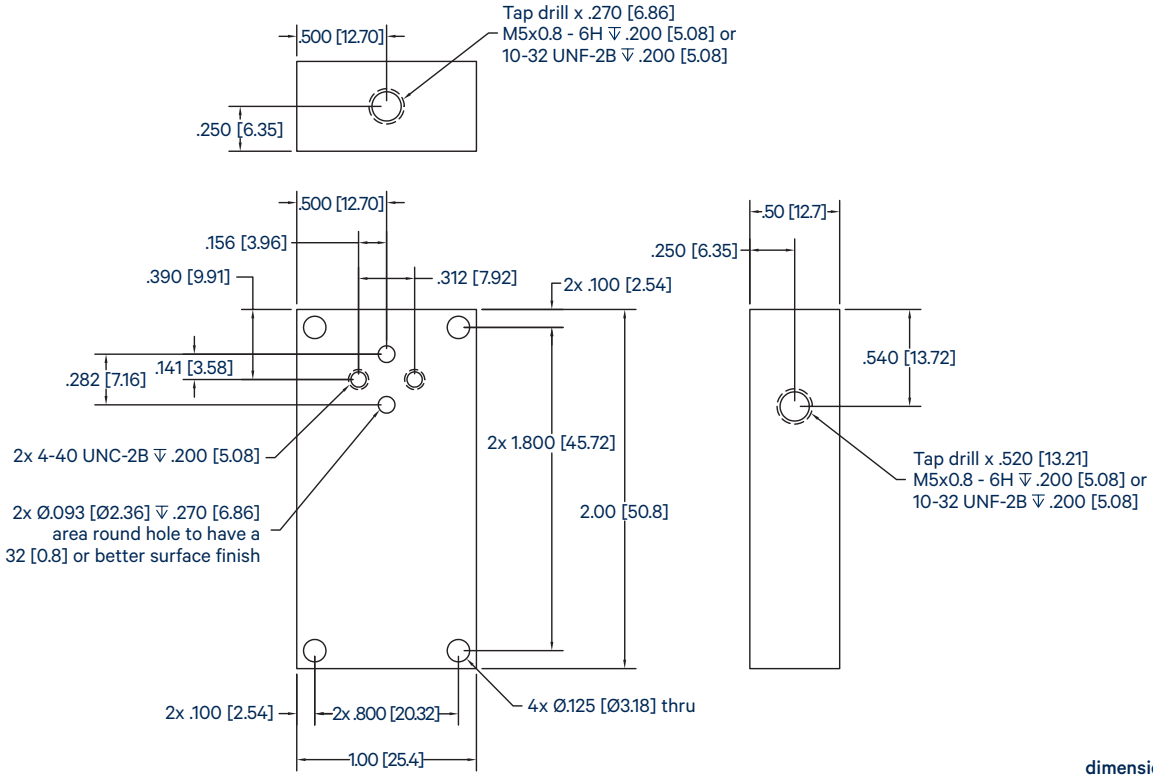
Mounting Requirements

Mounting screw sizes (2)	Mounting Screw Torque
4-40 x 3/4"	**45 oz-in**
M3 x 20 mm	**0.32 N.m.**

Note

(2) Pan head machine screw. Mounting screws are not provided with the valve. See Accessories.

Manifold mount diagram



dimensions in inch [mm]

First Sensor

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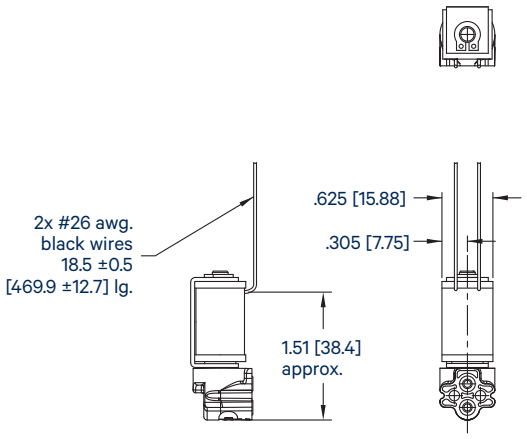
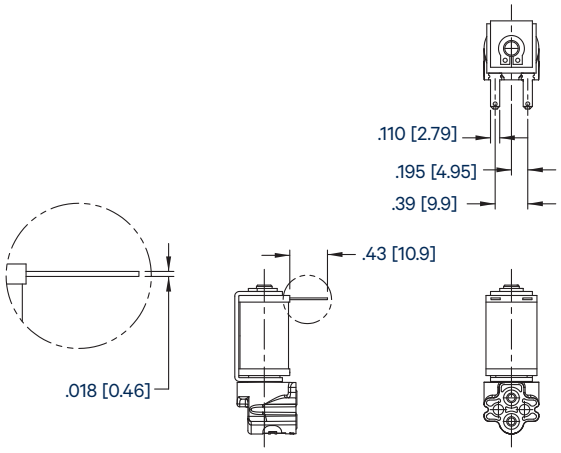
Electrical interface

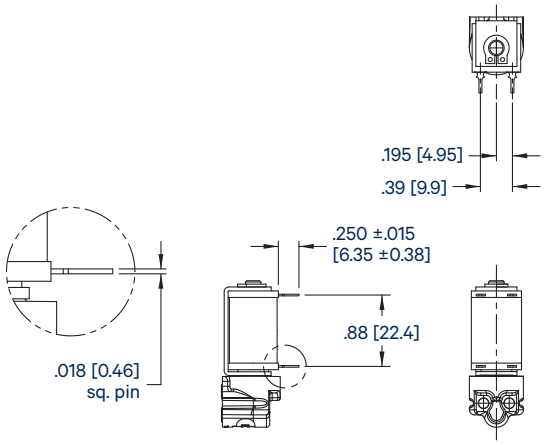
Wire leads
(for terminal block connection)

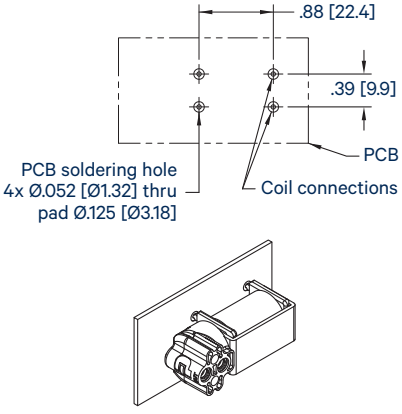


Quick connect spade
(for female spade terminal connection)



4 PC pins
(for PCB solder mount connection)





dimensions in inch [mm]

Electrical requirements

Max. supply voltage (VDC)	Control current at max. flow (mA)	Nominal coil resistance @ 20°C (ohms)
5.5	**304**	**11**
13.5	**125**	**68**
29	**66**	**274**

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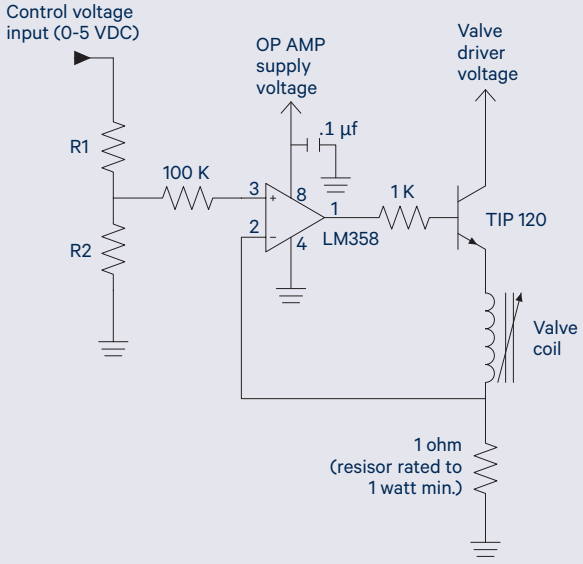
Installation and use

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.

Suggested current driver schematic



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

The table below describes the recommended R1 and R2 resistor values based upon the full shut-off current.

Selectable resistor values for a low current (1 mA) LM358- based current driver

Min. voltage (VDC)	Valve drive voltage (VDC)	Nominal coil resistance @ 20°C (ohms)	Input current for full flow (mA)	R1 (ohms)	R2 (ohms)
5.5	**7.5**	**11**	**304**	**5100**	**330**
13.5	**15.5**	**68**	**125**	**4420**	**113**
29	**31**	**274**	**66**	**4990**	**66.5**

Ordering information

Part	Ways	Pressure / Function / Orifice		Elastomer	Voltage		Electrical	
TI	**2** [2-way]	**P100C051**	100 psi, NC, 0.051 in (1.30 mm)	**V** [FKM]	**05**	5.5 VDC	**F**	Wire leads, 18 in (45.7 cm)
		P150C031	150 psi, NC, 0.031 in (0.79 mm)		**13**	13.5 VDC	**Q**	Quick connect, spade
					29	29 VDC	**P**	PC board mount, 4 pins

Accessories		
190-007059-001	Manifold O-ring (FKM), 0.114" ID x 0.039" thick	**supplied with each valve**
191-000115-012	Screw, pan head, 4-40 x 3/4", stainless steel	**not supplied with the valve, 2 required for each valve**