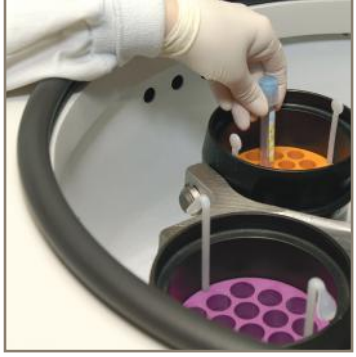

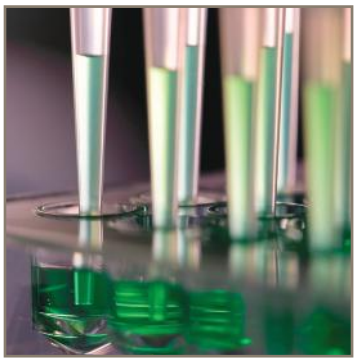

aerospace
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fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Miniature Electronic Pressure Controllers

Precision Fluidics

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When you partner with the global leader in motion and control technologies, expect to move your business and the world forward. From miniature solenoid valves to highly integrated automation systems, our innovations are critical to life-saving medical devices and scientific instruments used for drug discovery and pathogen detection. Not to mention, critical to decreasing time to market and lowering your overall cost of ownership. So partner with Parker, and get ready to move, well, anything.

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Table of Contents

OEM-EP Miniature Pressure Controller
Pressure Controllers

Measuring just 26mm x 27mm x 60mm, the OEM-EP (Electronic Pressure Control Unit) is the smallest electronic pressure controller available on the market, configured specifically for the analytical instrumentation and life science OEM markets.

The OEM-EP can be configured to control pressure or flow and can replace manual regulators, flow controllers, and needle valves, providing integral closed loop proportional control for sensitive instrumentation applications. This product uses Parker's patented VSO® proportional valve, as well as the proven circuitry of its successful larger products.

Features

- Silent operation
- High accuracy
- "Set and Forget" closed loop control
- Low power consumption
- Long life
- Analog control

Physical Properties

Valve Technology:
Thermally compensated proportional valve
Media:
Non-corrosive gases
Operating Environment:
0 to 50°C (32 to 131°F)
Storage Temperature:
-40 to 65°C (-40 to 131°F)
Length: 1.02 in (26 mm)
Width: 1.06 in (27 mm)
Height: 2.36 in (60 mm)
Porting: 10-32 female ports

Electrical

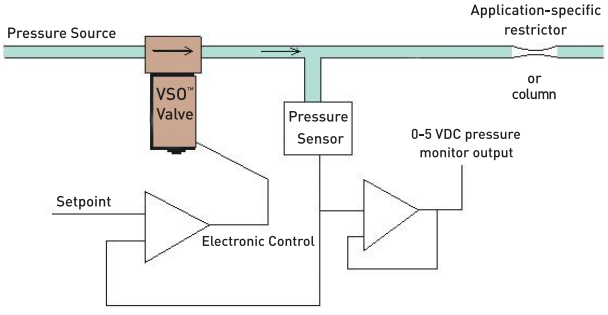
Main Power:
24 VDC ± 10%
Input Control Signal:
0-5 VDC standard
Monitor Output Voltage:
0-5 volts
Current Requirement:
<400 mA
Electrical Connector:
6 pin miniature interface cable included

Performance Characteristics

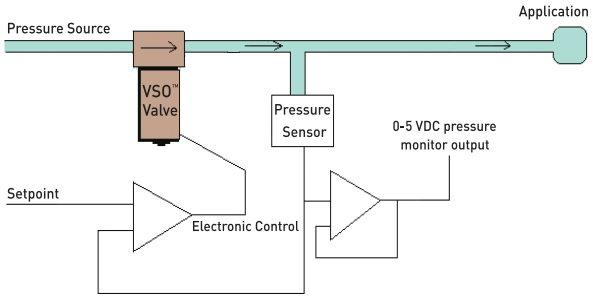
Pressure Ranges:
0-2 psig 0-15 psig 0-50 psig 0-100 psig
Pressure Accuracy:
± 0.2% FS typical* ± 1.5% FS max
Response:
<15 msec *(Response time to target pressure is output volume dependent)*
Linearity:
< ±1.5% FS
*Contact factory for details.

Configurations

Custom configurations are available. Contact factory for details.



PRESSURE CONTROL: ALTERNATE CONFIGURATION

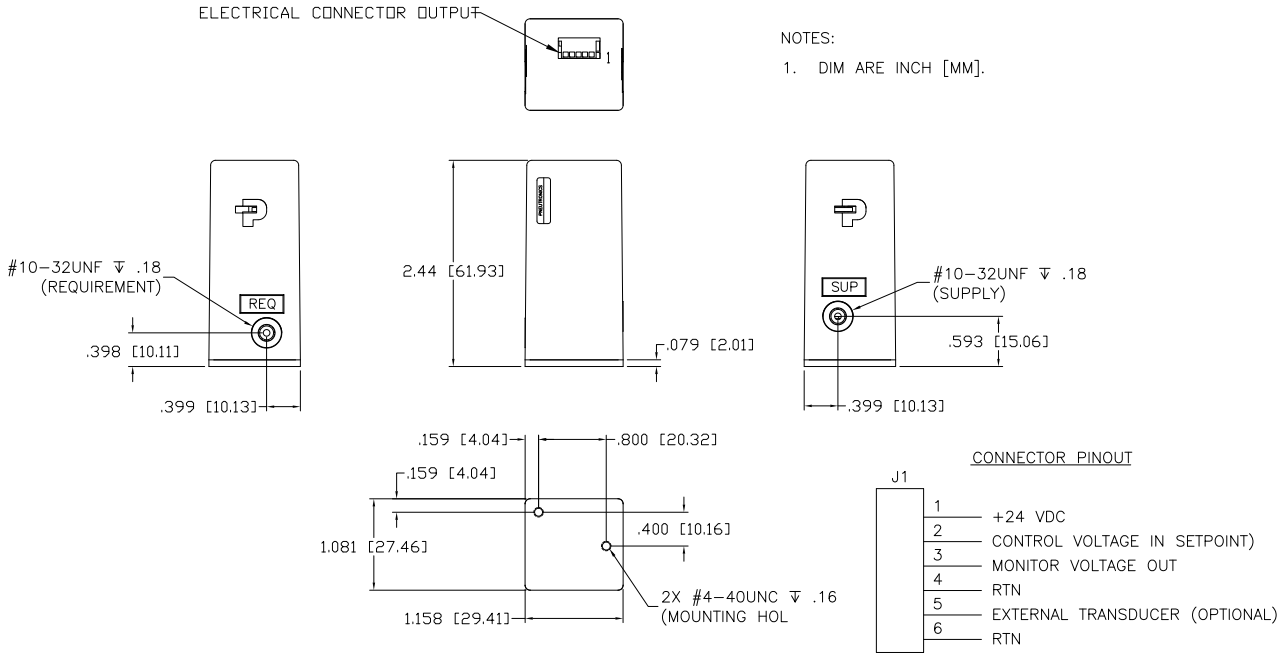


PRESSURE CONTROL: STANDARD CONFIGURATION

Parker

OEM-EP Pressure Controllers

Dimensions



Ordering Information

	part number					
	990-005101-002	990-005101-015	990-005101-100	990-005103-002	990-005103-015	990-005103-100
Family	OEM-EP	OEM-EP	OEM-EP	OEM-EP	OEM-EP	OEM-EP
Configuration [1]	Standard	Standard	Standard	Standard	Standard	Standard
Effective orifice	0.01	0.01	0.01	0.03	0.03	0.03
Power	24 vdc	24 vdc	24 vdc	24 vdc	24 vdc	24 vdc
Control Voltage [2]	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc
Pressure range	0 - 2 psig	0 - 15 psig	0 - 100 psig	0 - 2 psig	0 - 15 psig	0 - 100 psig

	part number		
	990-005123-015	990-005123-050	990-005123-100
Family	OEM-EP	OEM-EP	OEM-EP
Configuration [1]	Alternate	Alternate	Alternate
Effective orifice	0.03	0.03	0.03
Power	24 vdc	24 vdc	24 vdc
Control Voltage [2]	0-5 vdc	0-5 vdc	0-5 vdc
Pressure range	0 - 15 psig	0 - 50 psig	0 - 100 psig

[1] Standard Configurations have a slight constant bleed to atmosphere to accurately control pressure and are typically used to pressurize closed volumes of inert gasses.
Alternate Configuration are typically selected for gas flow applications and do not have an internal bleed.

[2] Control starts at approximately 10% of full scale control voltage and pressure rating allowing for positive shuttoff.
Pressure control may not be possible below 10% of full scale rating.

ORDER ONLINE

NOTE: Please consult Parker Precision Fluidics for other considerations. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002247-001 and Drawing #890-003182-001.

For more information call 1 .800.525.2857 or email ppfinfo@parker.com
Visit www.parker.com/precisionfluidics

VSO-GC Flow Control Module
Pressure Controllers

The VSO-GC, Electronic Pressure Control (EPC) Unit, converts a variable electrical control signal into a variable pneumatic output. By providing integral closed loop control, it replaces manual regulators, costly multiple function control valves, and needle valves. This product uses Parker Hannifin's patented VSOTM proportional valve and offers application-specific integrated pneumatic pressure control for Gas Chromatography (GC) applications.

Typical applications include:

- Column Head Pressure Control
- Split Flow Control
- Carrier Gas Flow Control

Features

- Silent operation
- Long life
- High accuracy
- Unparalleled resolution
- GC-specific proportional valve
- Internal closed loop control
- Pressure signal output
- Analog control

Physical Properties

Valve Technology:
Thermally compensated proportional valve
Media:
Non-corrosive gases
Operating Environment:
0 to 50°C (32 to 122°F)
Storage Temperature:
-40 to 65°C (-40 to 149°F)
Length:
2.25 in (57.15 mm)
Width:
2.25 in (57.15 mm)
Height:
1.25 in (31.75 mm)
Porting:
10-32 female ports

Electrical

Power:
24 VDC ± 10%
Input Control Signal:
0-5 VDC standard 4-20 mA available
Monitor Output Voltage:
0-5 volts
Current Requirement:
<400 mA max
Electrical Connector:
RJ-45

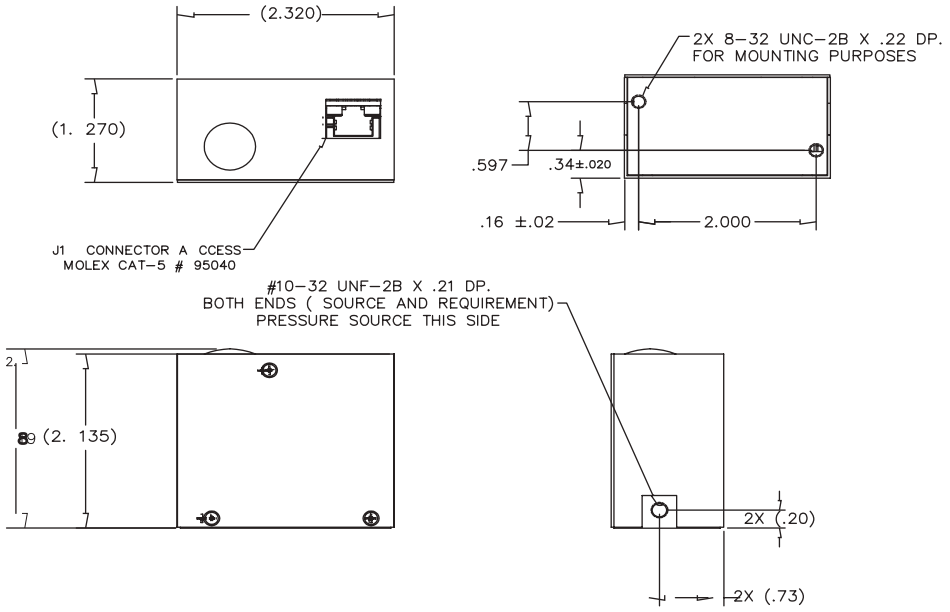
Performance Characteristics

Pressure Ranges:	
0-15 psig	0-2 psig
0-50 psig	0-100 psig
Pressure Accuracy:	
± 0.2% FS typical* ± 1.5% FS max	
Response:	
<15 msec *(Response time to target pressure is output volume dependent)*	
Linearity:	
< ±1.5% FS	

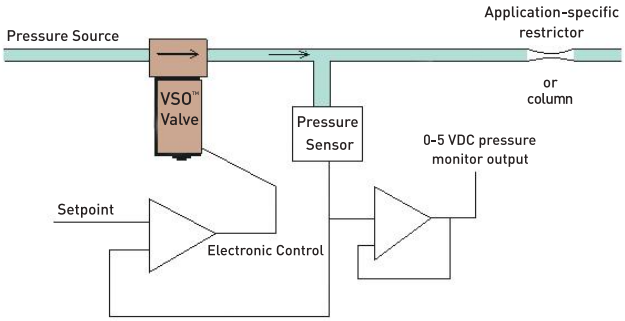
*Contact factory for details.

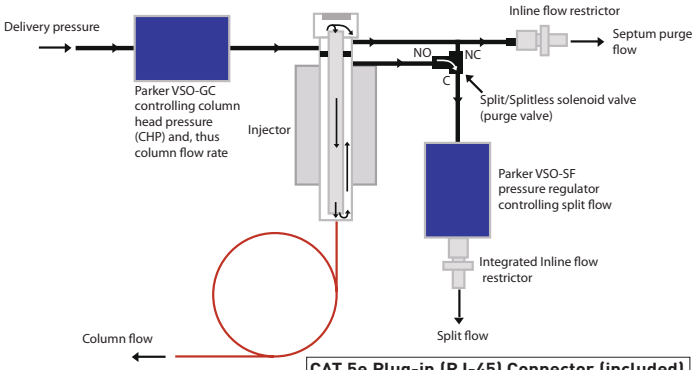
VSO-GC Pressure Controllers

Dimensions



Configuration





VSO-GC Block Diagram Representation

CAT 5e Plug-in (RJ-45) Connector (included)	
Signal	**RJ-45 Pin # Color**
Main Power, 24 VDC	**1** White w/ Orange
Input Control Signal, 0-5 VDC	**2** Solid Orange
Monitor Signal Output, 0-5 VDC	**3** White w/ Green
System Ground	**4** Solid Blue

Ordering Information

Part Number	990-005020-002	990-005021-015	990-005021-050	990-005021-100	990-005023-015	990-005023-050	990-005023-100
Family	VSO-GC	VSO-GC	VSO-GC	VSO-GC	VSO-GC	VSO-GC	VSO-GC
Effective Orifice	0.003	0.01	0.01	0.01	0.03	0.03	0.03
Power	24 vdc	24 vdc	24 vdc	24 vdc	24 vdc	24 vdc	24 vdc
Control Voltage	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc
Pressure Range	0-2 psig	0-15 psig	0-50 psig	0-100 psig	0-15 psig	0-50 psig	0-100 psig
Buy Online	N	N	N	N	N	N	N

Control starts at approximately 10% of full scale control voltage and pressure rating allowing for positive shutoff.
Pressure control may not be possible below 10% of full scale rating.

NOTE: Please consult Parker Precision Fluidics for other considerations. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002202-002 and Drawing #890-003146-002.

VSO-EP Miniature Pressure Controller

Pressure Controllers

The VSO-EP™ Electronic Pressure Control Unit converts a variable electrical control signal into a variable pneumatic output. Used to control critical pressure, the VSO-EP replaces manual regulators, needle valves, flow controllers, and bleed orifices, providing integral closed loop proportional control. This product uses Pneutronics' patented VSO® proportional valve and offers significant improvements over dual valve controllers. VSO-EP is used for carrier gas flow control, microfluidic flow control, vacuum pump control, and for aspirate/dispense applications.

Features

- Offers silent operation
- Ensures high accuracy and unparalleled resolution
- Tested for long life
- Offers internal closed loop control and external pressure sensor capability*
- OEM application-specific configurations available
- Analog control

*Accessories Required

Physical Properties

Valve Technology:
Thermally compensated proportional valve
Media:
Non-corrosive gases
Operating Environment:
0 to 55°C (32 to 131°F)
Storage Temperature:
-40 to 65°C (-40 to 131°F)
Length:
2.25 in (57.15 mm)
Width:
2.25 in (57.15 mm)
Height:
1.25 in (31.75 mm)
Porting:
10-32 female ports

Electrical

Power:
24 VDC + 10% 12, 15 available
Input Control Signal:
0-5 VDC standard 4-20 mA available
Monitor Output Voltage:
0-5 volts
Current Requirement:
<400 mA
Electrical Connector:
RJ-45

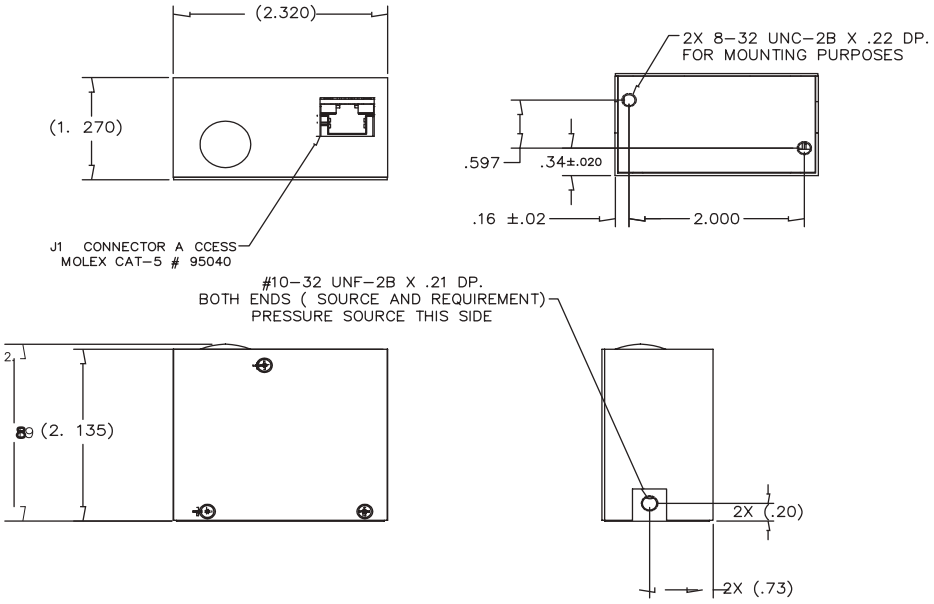
*Contact factory for details.

Performance Characteristics

Pressure Ranges:
0-7 psig 0-15 psig 0-30 psig 0-50 psig 0-100 psig
Pressure Accuracy:
± 0.2% FS typical* ± 1.5% FS max
Response:
<15 msec *(Response time to target pressure is output volume dependent)*
Linearity:
≤ +1.5% FS

VSO-EP Pressure Controllers

Dimensions



CAT 5e Plug-in (RJ-45) Connector (included)	
Signal	**RJ-45 Pin # Color**
Main Power, 24 VDC	**1** White w/ Orange
Input Control Signal, 0-5 VDC	**2** Solid Orange
Monitor Signal Output, 0-5 VDC	**3** White w/ Green
System Ground	**4** Solid Blue

Ordering Information

part number					
Part Number	990-005001-015	990-005001-050	990-005001-100	990-005003-015	990-005010-100
Family	VSO-EP	VSO-EP	VSO-EP	VSO-EP	VSO-EP
Configuration[1]	Standard	Standard	Standard	Standard	Alternate
Effective Orifice	0.01	0.01	0.01	0.03	0.003
Power	24 VDC	24 VDC	24 VDC	24 VDC	24 VDC
Control Voltage[2]	0-5 VDC	0-5 VDC	0-5 VDC	0-5 VDC	0-5 VDC
Pressure Range	0-15 psig	0-50 psig	0-100 psig	0-15 psig	0-100 psig
Buy Online	Y	Y	Y	Y	Y

part number						
Part Number	990-005003-050	990-005003-100	990-005011-015	990-005011-050	990-005011-100	990-00501-030
Family	VSO-EP	VSO-EP	VSO-EP	VSO-EP	VSO-EP	VSO-EP
Configuration[1]	Standard	Standard	Alternate	Alternate	Alternate	Alternate
Effective Orifice	0.03	0.03	0.01	0.01	0.001	0.03
Power	24 VDC	24 VDC	24 VDC	24 VDC	24 VDC	24 VDC
Control Voltage[2]	0-5 VDC	0-5 VDC	0-5 VDC	0-5 VDC	0-5 VDC	0-5 VDC
Pressure Range	0-50 psig	0-100 psig	0-15 psig	0-50 psig	0-100 psig	0-30 psig
Buy Online	Y	Y	Y	Y	Y	Y

[1] Standard Configurations have a slight constant bleed to atmosphere to accurately control pressure and are typically used to pressurize closed volumes of inert gasses. Alternate Configuration are typically selected for gas flow applications and do not have an internal bleed.

[2] Control starts at approximately 10% of full scale control voltage and pressure rating allowing for positive shuttoff. Pressure control may not be possible below 10% of full scale rating.

ORDER ONLINE

NOTE: Please consult Parker Precision Fluidics for other considerations. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002202-001 and Drawing #890-003146-001.

VSO-EV Vacuum Control Module
Pressure Controllers

The VSO-EV™ is a pressure controller specifically configured and optimized for vacuum pressure control. The VSO-EV converts a variable electrical control signal into a closed-loop, tightly regulated pneumatic output. Often used for aspirating liquid samples, as well as for pipetting and dispensing nano-liter volumes, the VSO-EV offers users an internal sensor to close the control loop around critical system parameters. This EVC is well suited for high precision automated laboratory instruments, meeting the most stringent separation and detection requirements.

Features

- Low weight and low power consumption
- Ensures high accuracy and unparalleled resolution
- Tested for long life
- Offers internal closed loop control and external pressure sensor capability*
- OEM application-specific configurations available
- Analog control

*Accessories Required

Physical Properties

Valve Technology:
Thermally compensated proportional valve
Media:
Non-corrosive gases
Operating Environment:
0 to 55°C (32 to 131°F)
Storage Temperature:
-40 to 65°C (-40 to 131°F)
Length:
2.25 in (57.15 mm)
Width:
2.25 in (57.15 mm)
Height:
1.25 in (31.75 mm)
Porting:
10-32 female ports

Electrical

Power:
24 VDC ± 10%
Input Control Signal:
0-5 VDC standard 4-20 mA available
Monitor Output Voltage:
0-5 volts
Current Requirement:
<400 mA
Electrical Connector:
RJ-45

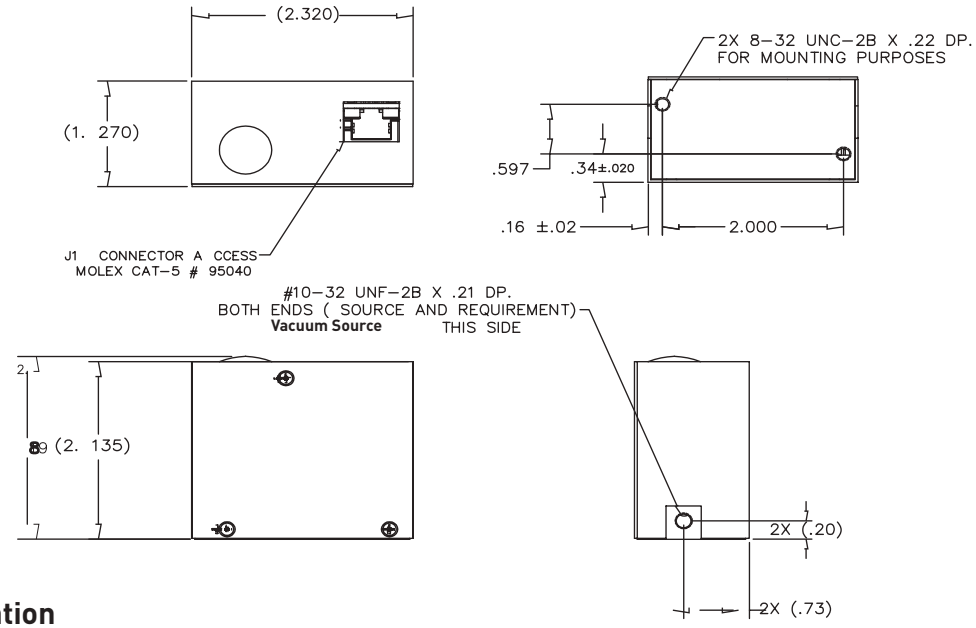
*Contact factory for details.

Performance Characteristics

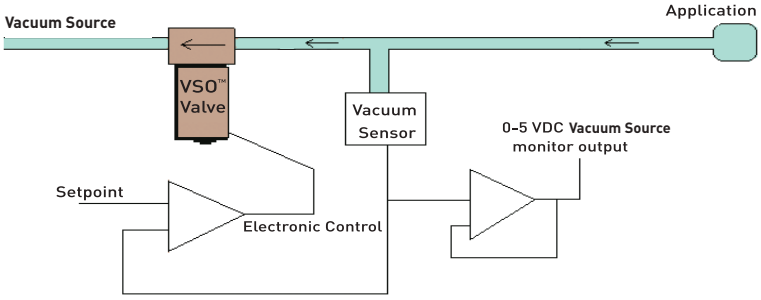
Vacuum Ranges:
0-150 mBar 0-345 mBar Custom units available
Pressure Accuracy:
± 0.2% FS typical* ± 1.5% FS max
Response:
<15 msec *(Response time to target pressure is output volume dependent)*
Linearity:
< ±1.0% FS

VSO-EV Vacuum Controllers

Dimensions



Configuration



VACUUM CONTROL: STANDARD CONFIGURATION

Custom configurations are available. Contact factory for details.

Ordering Information

Part Number	990-005203-005	990-005201-002
Family	VSO-EV	VSO-EV
Effective Orifice	0.003	0.01
Power	22 vdc	23 vdc
Control Voltage	0-5 vdc	0-5 vdc
Vacuum Range	0-345 mBar	0-150 mBar
Buy Online	y	N

ORDER ONLINE

CAT 5e Plug-in (RJ-45) Connector (included)	
Signal	**RJ-45 Pin # Color**
Main Power, 24 VDC	**1** White w/ Orange
Input Control Signal, 0-5 VDC	**2** Solid Orange
Monitor Signal Output, 0-5 VDC	**3** White w/ Green
System Ground	**4** Solid Blue

NOTE: Please consult Parker Precision Fluidics for other considerations. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002219-001 and Drawing #890-003146-001.

VSO-HP High Performance Pressure Controller

Pressure Controllers

Used in analytical and OEM instrument applications, the VSO-HP delivers integral closed loop proportional control with the highest level of accuracy and stability.

With an extra internal dump valve, the VSO-HP offers rapid depressurization, which results in a fast response time and has an optional external sensor for expertly controlling pressure in required applications.

The VSO-HP can be configured to control pressure or flow, replacing manual regulators, flow controllers, and needle valves. This product uses Parker's patented VSO® proportional valve and offers precise motion control with Parker pneumatic cylinders, such as the Series SRX.

Typical applications include:

- Gas over liquid flow control
- Microfluidic flow control
- Hydro-dynamic focusing
- Liquid dispensing

Features

- Stable pressure control with minimal thermal drift
- Rapid depressurization
- High accuracy; high repeatability
- Low power consumption
- Optional 5 VDC supply output
- Configurable for pressure control or flow control
- External pressure sensor capability
- Silent operation; long life
- Analog control

Physical Properties

Valve Technology:
Thermally compensated proportional valve, digital dump valve
Media:
Non-corrosive gases
Operating Environment:
0 to 50°C (32 to 131°F)
Storage Temperature:
-40 to 65°C (-40 to 131°F)
Length:
1.52 in (39 mm)
Width:
1.66 in (42 mm)
Height:
2.79 in (71 mm)
Porting:
10-32 female ports

Electrical

Power:
24 VDC + 10%
Input Control Signal:
0-5 VDC standard
Monitor Output Voltage:
0-5 volts
Current Requirement:
<400 mA
Electrical Connector:
6 pin miniature interface cable included

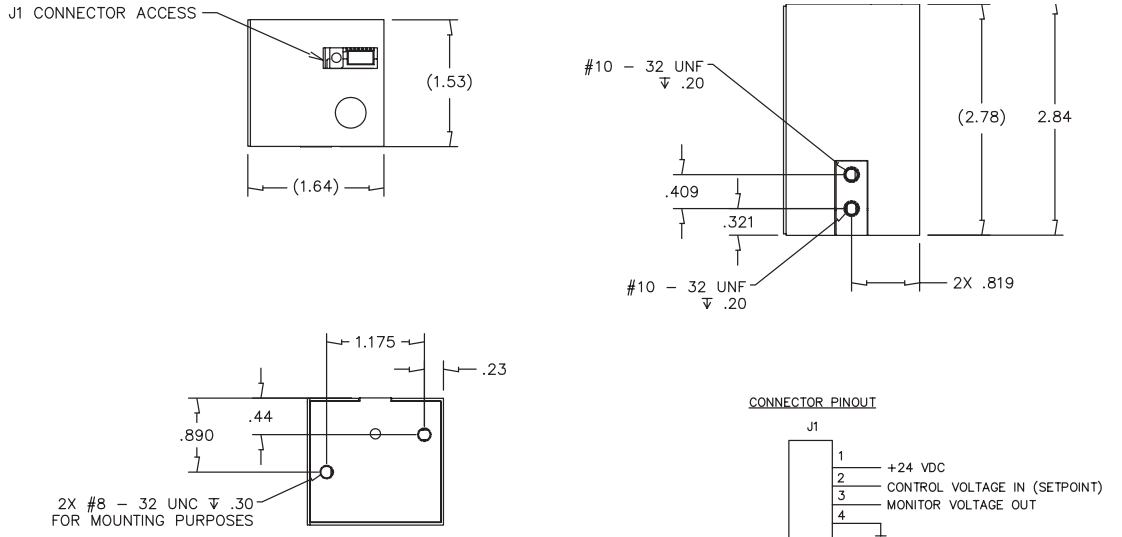
*Contact factory for details.

Performance Characteristics

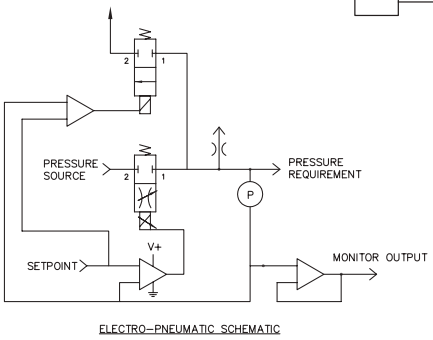
Pressure Ranges:	
0-5 psig	0-7 psig
0-15 psig	0-100 psig
Pressure Accuracy:	
± 0.2% FS typical*	
± 1.5% FS max	
Response:	
<15 msec *(Response time to target pressure is output volume dependent)*	
Linearity:	
< ±1.5% FS	

VSO-HP Pressure Controllers

Dimensions



Configuration



ELECTRO–PNEUMATIC SCHEMATIC

Custom configurations are available. Contact factory for details.

Ordering Information

CONNECTOR PINOUT
J1

part number

	990-005303-005	990-005303-015	990-005303-100	990-005311-007	990-005311-015	990-005311-100
Family	VSO-HP	VSO-HP	VSO-HP	VSO-HP	VSO-HP	VSO-HP
Configuration [1]	Standard	Standard	Standard	Alternate	Alternate	Alternate
Effective Orifice	0.03	0.03	0.03	0.01	0.01	0.01
Relief Valve Orifice	0.03	0.03	0.03	0.03	0.03	0.03
Power	24 vdc	24 vdc	24 vdc	24 vdc	24 vdc	24 vdc
Control Voltage [2]	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc	0-5 vdc
Pressure Range	0 - 5 psig	0 - 15 psig	0 - 100 psig	0 - 7 psig	0 - 15 psig	0 - 100 psig
Buy Online	N	Y	Y	N	N	N

[1] Standard Configurations have a slight constant bleed to atmosphere to accurately control pressure and are typically used to pressurize closed volumes of inert gasses. Alternate Configuration are typically selected for gas flow applications and do not have an internal bleed.

[2] Control starts at approximately 10% of full scale control voltage and pressure rating allowing for positive shuttoff. Pressure control may not be possible below 10% of full scale rating.

ORDER ONLINE

NOTE: Please consult Parker Precision Fluidics for other considerations. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002250-001 and Drawing #890-003186-001.

For more information call 1 .800.525.2857 or email ppfinfo@parker.com
Visit www.parker.com/precisionfluidics

VSO-LP Long Performance Pressure Controller

Pressure Controllers

The VSO-LP series provides single channel "I to P" control for industrial applications requiring long life and high accuracy. This voltage sensitive module promotes consistent, accurate flow while offering rapid depressurization. It incorporates an onboard sensing transducer and a VSO® patented proportional valve, plus a long life digital valve.

Features

- Output pressure control
- Rapid depressurization
- High accuracy; high repeatability
- Low power consumption
- On-board pressure sensing transducer
- Silent operation; long life
- Analog control

Physical Properties

Valve Technology:
Thermally compensated proportional valve, bleed valve
Media:
Non-corrosive gases
Operating Environment:
0 to 50°C (32 to 122°F)
Storage Temperature:
-40 to 65°C (-40 to 149°F)
Length:
1.52 in (39 mm)
Width:
1.66 in (42 mm)
Height:
2.79 in (71 mm)
Porting:
10-32 female ports

Electrical

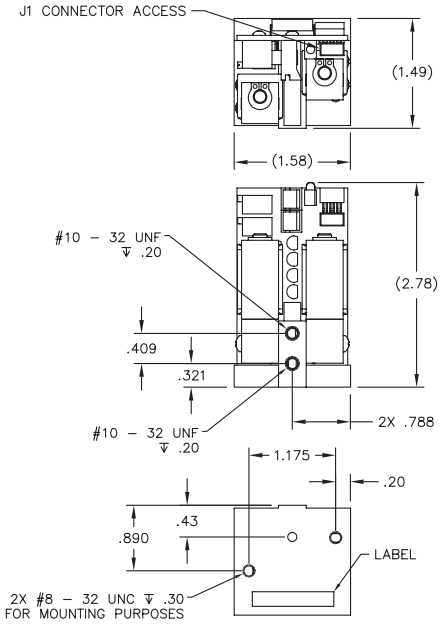
Power:
24 VDC + 10%
Input Control Signal:
0-5 VDC standard 4-20 mA available
Monitor Output Voltage:
0-5 volts
Current Requirement:
<250 mA
Electrical Connector:
6 pin miniature interface cable included

Performance Characteristics

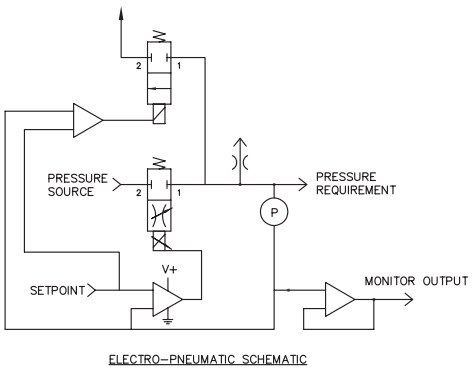
Pressure Ranges:
0-15 psig 0-100 psig
Pressure Accuracy:
± 1.5% FS max
Response:
<15 msec *(Response time to target pressure is output volume dependent)*
Linearity:
< ±1.5% FS

VSO-LP Pressure Controllers

Dimensions

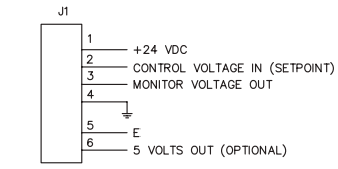


Configuration



ELECTRO–PNEUMATIC SCHEMATIC

CONNECTOR PINOUT



Custom configurations are available.
Contact factory for details.

Ordering Information

part number

	990-005403-015	990-005403-100
Family	**VSO-LP**	**VSO-LP**
Configuration [1]	Standard	Standard
Effective Orifice	0.03	0.03
Releif Valve Orifice	0.03	0.03
Power	24 vdc	24 vdc
Control Voltage [2]	0-5 vdc	0-5 vdc
Pressure Range	0 - 15 psig	0 - 100 psig
Buy Online	Y	Y

ORDER ONLINE

NOTE: Please consult Parker Precision Fluidics for other considerations. For more detailed information, visit us on the Web, or call and refer to Performance Spec. #790-002272-001 and Drawing #890-003186-002

For more information call 1 .800.525.2857 or email ppfinfo@parker.com
Visit www.parker.com/precisionfluidics

VSO-BT Benchtop Controller
Pressure Controllers

The VSO-BT Electronic Benchtop pressure controller combines the closed loop performance features of OEM-grade electronic pressure controllers into a form factor suitable for laboratory and prototype development work. Used in microfluidic and life science research, this unit replaces manual regulators, sensors, gauges, and tubing assemblies while providing considerably better pressure accuracy and eliminating pressure drift and fluctuation.

Typical applications include:

- Liquid Piloting
- Microfluidics
- Cytometry Research
- Oocyte Chambers

Features

- Simple adjustment of closed-loop pressure set points via front panel knob
- Electrical inputs for high resolution set points
- Set and display pressure in your choice of units
- Optional I/O hook-ups allow high resolution and/or remote operation
- Quick disconnect fittings for easy pneumatic connection

Physical Properties

Media:
Air and non-corrosive gasses
Operating Environment:
0 to 55°C (32 to 131°F)
Storage Temperature:
-40 to 55°C (-40 to 131°F)
Dimensions (W x L x H):
5.08 x 5.25 x 2.25 in (129 x 133 x 57 mm)
Weight:
2 lbs (907 grams)

Electrical

Input Power:
100 - 240 VAC* (50-60 Hz) *power supply and 6ft. cord included
I / O:
0–5 VDC analog input for high resolution (0.001 psi) pressure set points 0–5 VDC monitor output signal allows high resolution (0.001 psi)

LED Display

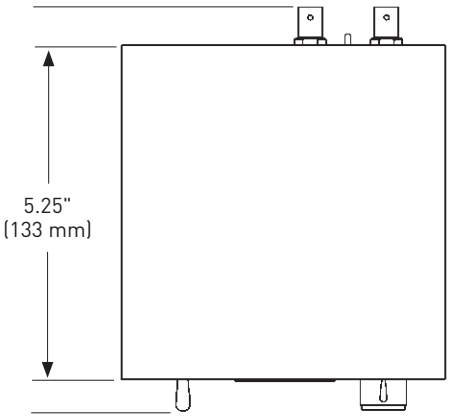
3 digit visual (0.375" height) with choice of pressure units *(see ordering information)*
Refresh rate
0.1 sec

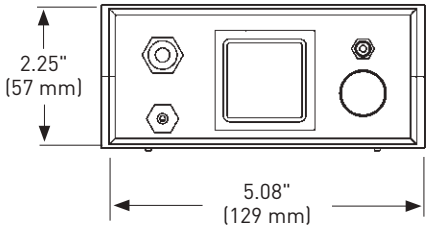
Performance Characteristics

Pneumatic
Includes 2 pcs of Parker Presto-Loc quick disconnect fittings for ¼" urethane tubing
Recommended Pressure Source:
120% rated pressure
Accessories (*not included*)
Burst proof air-over-liquid piloting chamber

VSO-BT Pressure Controllers

Dimensions





Electrical Connections

FRONT

BACK

Ordering Information

MODEL	VSO-BT-015	VSO-BT-050	VSO-BT-100
Pressure Range (psig)	0-14.7	0-50	0-100
Actual Resolution from monitor signal (psi)	0.001	0.001	0.001
Display Resolution (psi)	0.1	0.1	1
Display Resolution (bar)	0.001	0.01	0.01
Display Resolution (kPa)	0.1	1	1
Display Resolution (Kgf/cm^3)	0.001	0.01	0.01
Repeatability of Pressure Control	0.2%FS	0.2%FS	0.2%FS

ORDER ONLINE

NOTE: Please consult Parker Precision Fluidics for other considerations. For more detailed information, visit us on the Web, or call and refer to Performance Spec #790-002202-004 and Drawing #890-003213-001

For more information call 1 .800.525.2857 or email ppfinfo@parker.com
Visit www.parker.com/precisionfluidics

PARKER-HANNIFIN CORP., PRECISION FLUIDICS TERMS AND CONDITIONS OF SALE, ORDER POLICIES & PRODUCT WARRANTY INFORMATION

1. APPLICABLE LAW: This order shall be only subject to the terms and conditions set forth herein, notwithstanding any terms and conditions that may be contained in any order acknowledgement or other form of Buyer. Such terms and conditions of Buyer shall not bind the Seller unless accepted by it in writing whether or not they materially alter this order. This order shall be governed in all respects by the laws of the State of New Hampshire.

2. TAXES: Prices do not include Federal, State or local taxes, including without limitation, which taxes may at Seller's discretion be added to sales price or may be billed separately and which taxes will, in any event, be paid by Buyer unless Buyer provides Seller with a proper tax exemption certificate.

3. TERMS OF PAYMENT: Unless otherwise stated on Seller's invoices, terms of payment shall be Net 30 days from date of invoice. If at any time Seller in its sole discretion determines an alternative payment arrangement would be prudent, Seller may require Letter of Credit, Cash on Delivery, advance or other acceptable means of payment. If requirements of Seller are not met, Seller may cancel the order or any part thereof and receive reasonable cancellation fees.

4. DELIVERY: Seller shall not be liable for any delays in or failure of delivery due to acts of God or public authority, labor disturbances, accidents, fires, floods, extreme weather conditions, failure of any delays by carriers, shortages of material, delays of a supplier or any other cause beyond Seller's control. In no event shall the Seller be liable for consequential or special damages arising out of a delay in or failure of delivery. Buyer's requested delivery date or schedule shall be approximate and subject to Seller's acceptance.

5. TERMINATION OF CONTRACT: Orders accepted by the Seller may be cancelled by Buyer only with the consent of Seller and upon payment of reasonable cancellation charges, determined by Seller in its sole discretion. Seller shall have the right without penalty or payment to cancel any order accepted or to refuse or delay the shipment thereof if (1) Buyer fails to make promptly any payment due, or to meet any other reasonable requirements established by Seller, (2) Buyer's act or omission to act delays Seller's performance, or (3) Buyer's credit becomes impaired, in the Seller's sole judgement. In such event, Seller shall be entitled to receive reimbursement for reasonable and proper cancellation charges.

6. CHANGES IN SPECIFICATIONS OR DESIGN: If Buyer requests changes in specifications or designs relating to any goods, delivery schedules shall be revised if necessary, and an equitable adjustment upward or downward shall be made in price if warranted.

7. FREIGHT: Carriers will be selected by the Seller unless the Buyer instructs otherwise in writing. All shipments will be F. O. B. Seller's plant. Standard freight charges for equipment repaired under warranty will be paid by Parker Precision Fluidics. Buyers request for alternatives means will be charged additional freight as required.

8. CONSEQUENTIAL DAMAGES: In no event shall Seller be liable for consequential or special damages arising out of delay in or failure of delivery, defects in material, or workmanship or arising out of a breach by Seller of any other term or obligation of the Seller under this contract.

9. GOVERNMENT COobNTRACTS: If the products to be furnished under this contract are to be used in the performance of a United States Government Contract or sub-contract, the government contract number, priority rating and a statement to that effect shall appear on the Buyer's purchase order. If the Buyer's purchase order includes all of said information and if said order is accepted in writing by an authorized officer of Seller with knowledge of said information, then those clauses of the applicable government procurement regulations which are mandatorily required by Federal Statute or regulation to be included in this contract shall be incorporated herein by reference; in all other events said clauses shall not be incorporated herein by reference.

10. PROPRIETARY INFORMATION: Buyer represents that is has adopted reasonable procedures to protect proprietary information as defined hereafter including binding agreements with employees and consultants to prevent unauthorized publication, disclosure, or use of such information during or after the term of their employment by or services for Buyer. Buyer shall not use proprietary information except as expressly permitted hereunder, shall not disclose proprietary information of Seller to any third party and shall not transmit any documents or copies thereof containing proprietary information to any third party except as may be authorized in writing by Seller.

11. PATENT INDEMNITY: Seller shall have no liability for patent infringement unless the goods furnished hereunder, in an of themselves, constitute the infringement. If they do, and Seller is notified of the class of infringement within ten days after such claim is received by the Buyer and is permitted to settle or defend such claim, Seller will indemnify the Buyer against reasonable expense of defending suit and against any judgement or settlement to which Seller agrees. However, such indemnity will be limited to an amount not exceeding the price paid by Buyer to Seller for the infringing goods. If an injunction is issued against the further use of the goods, Seller will have the option of either procuring for the Buyer the right to use the goods, replacing them with non-infringing goods, modify them so that they become non-infringing, or refunding the purchase price. The foregoing constitutes Seller's entire warranty and liability as to patents. If the goods furnished hereunder are in accordance with a design furnished by the Buyer, the Buyer will defend and hold harmless Seller from all cost, expenses and judgements on accounts of any claim of infringement of any patent.

12. WARRANTIES: A. Equipment: Seller warrants that all equipment manufactured by it shall be free from defects in material or workmanship under normal use for a period of one (1) year from date of shipment to Buyer and upon examination of Seller determines to its satisfaction that such equipment is defective in material or workmanship and such defect was not caused by accident, misuse, neglect, alteration, improper adjustment, improper repair, improper application, or improper testing. Seller shall at its option repair or replace the equipment, shipment to Buyer prepaid. Seller does not recommend it's products for use in life support systems.

B. The foregoing are in lieu of all representations, warranties and covenants, express or implied, with respect to the products and any defects therein of any nature whatever, including without limitation, warranties of merchantability and fitness for a particular purpose. Seller's sole and exclusive liability, and Buyer's sole and exclusive remedy, for any nonconformity or defect in the products in tort (including negligence), contract, or otherwise, shall be as set forth in Section 12A.

Pricing and Lead Time

- Standard Prices and lead times are as indicated on the current published Standard Price List and Discount Schedule.
- Non-standard pricing (other than that contained in the published Price List) must be approved by Parker Precision Fluidics and a formal quotation must be submitted to the customer.
- Quantity discounts for similar product are as noted on the Standard Price List and Discount Schedule.
- All shipments are FCA factory (payable in US dollars).
- The Standard Price List and Discount Schedule are subject to change.
- All price quotations are valid for a period of 90 days.

Payment and Credit Terms

- Payment terms are 1% 10, 25 net 30 as noted below:
  - For invoices dated between the 1st and 15th, payments must be received by the 25th of the month.
  - For invoices dated between the 16th and 31st, payments must be received by the 10th of the following month.
- The above payment terms and discount are available to all customers with established credit. Otherwise, the following special terms exist:
  - COD for non-established domestic customers for orders greater than $1,000.Cash in Advance for non-established foreign customers for orders greater than $1,000.
  - Standard payment terms will be established upon corporate credit approval.
  - Credit card sales will be accepted from customers with established credit.

Order Policies

- A hard copy Purchase Order confirmation must be provided for all orders. This copy may be sent via fax or Internet e-mail provided it is signed by the authorized buyer.
- Minimum order/shipment is $250.00 Net. All sales transactions totaling $2,500 or less will be processed via credit card only.
- Distributor/Contract Mfg. Orders: All distributors and contract manufacturers are required to report end customer information at the time of order. Orders will not be processed by Parker Precision Fluidics until such information is provided.
- Blanket Orders: Orders consisting of multiple releases must be completed within a twelve (12) month (A.R.O.) period unless other terms have been agreed upon prior to acceptance of the order.
- **Blanket Orders are subject to back billing (add billing) as indicated below:**
  - Standard Product: If at the end of the contract period the full quantity has not been released and shipped, the entire order will be re-priced at the applicable discount for quantity shipped.
  - Custom Product: If at the end of the contract period the full quantity has not been released and shipped, a charge will be assessed to cover the cost of any unique material plus an adjustment of discount on the entire order.
- **Order Reschedules:**
  - Standard Product: A 20% reschedule fee will be incurred unless a formal change order is received at least thirty (30) days prior to scheduled shipment.
  - Custom Product: A 20% reschedule fee will be incurred unless a formal change order is received at least sixty (60) days prior to scheduled shipment due to unique component lead time.
- **Order Expedites:**
  - Customers requesting an expedited delivery of two (2) weeks or less of the quoted standard lead time will be subject to a charge equal to 20% of the amount being expedited.
- **Order Cancellations:**
  - Standard Product - A 20% cancellation fee will be incurred unless a formal change order is received at least thirty (30) days prior to scheduled shipment.
  - Custom Product - Cancellations of custom product are subject to a 20% cancellation fee plus the cost of all work in process and the cost of any material unique to that order

Product Returns

- Standard Product: - All returns of standard product are subject to prior approval from Parker Precision Fluidics and will incur a restocking charge of 20%. Credit will be issued based upon original invoice value. No material will be accepted for return without prior authorization from Parker Precision Fluidics. The Return Material Authorization (RMA) number should appear on all packages and accompanying paperwork.
- Custom Product: Return of custom product cannot be accepted.

Warranties

- Parker Precision Fluidics warrants its products against defective materials and workmanship under normal use for a period of one (1) year from the date of shipment to our customer. This warranty does not apply to any product that has been subjected to misuse, accident, improper installation, improper application, or improper operation, nor does it apply to any product that has been repaired or altered by other than an authorized factory representative. There are no warranties that extend beyond those herein specifically given.
- *Miniature Diaphragm Pumps* – Seller warrants to buyer that the products will be free, under normal use and maintenance, from defects in material and workmanship for a period of twelve (12) months from the manufacture date as noted by date code, serial number, or rated hours of operation which ever occurs first, unless otherwise stated.
- *Warranty Repair:* All products will be repaired at the factory, replaced at no charge throughout the warranty period, or a credit will be issued to reconcile the account. The balance of the warranty will remain in effect and no other warranty will be issued.
- Warranty items costing less than $75 will no longer be repaired – credit will be issued upon receipt of item.
- Non-Warranty Repair Charges: Non-warranty repairs are not available. For a fee of $500, a standard analysis which includes visual inspection, determination of cause, and failure analysis report will be performed. Additional charges may be imposed if the use of an outside lab is necessary.
- IOTA One Solenoid Valve Controllers and Picospritzer III Pressure Injection Systems manufactured more than five (5) years prior to the request date will not be accepted for repair. For a fee of $250.00, an evaluation will be performed on non-warranty units less than five (5) years old and a quote will be prepared detailing the cost of all the repairs.

Return Materials Authorizations

- *Hazardous Material:* All products returned must be free of hazardous materials. Return of any product exposed to bio hazardous material will not be accepted.
- You must obtain a Return Material Authorization (RMA) number from Parker Precision Fluidics in order that we may process your returned equipment. Material will not be accepted unless an RMA number is assigned and is clearly marked on all incoming packages and associated paperwork. RMA numbers expire 60 days after date of issue. Items returned without authorization or after 60 days of issuance will be returned to the customer freight collect.
- This policy has been set for our mutual protection in that it greatly reduces the possibility of misplaced returns. Please call our Customer Service Department at 1-800-525-2857 to obtain an RMA number. **Be prepared to provide the following information when calling:**
  - Customer Name, Address & Phone Number
  - Contact Name
  - Ship-To and Bill-To Address
  - Reason for Return & Failure Symptoms if Applicable
  - Part Number, Quantity & Date Code

  Purchase Order Numbers (*Note: A Purchase Order Number is necessary for products returned under warranty. P.O. number to be used as tracking Vehicle only.

  Precision Fluidics Division will contact the customer with date of return shipment.

Shipping: Products that are shipped to the factory for Warranty repair will be shipped at the customer's expense and will be returned to the Customer at no charge via Precision Fluidics Division's standard shipping method. Products that are shipped to the factory on a freight collect basis will not be accepted. Customers may specify preferred method of shipment. Product will then be shipped back to the customer on a freight collect basis.

PARKER-HANNIFIN CORP., PRECISION FLUIDICS DIVISION **8/10/2009**

Standard terms and conditions are supplemented by this policy statement, which each apply to all orders from the division.

WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY, AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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Parker Hannifin Corporation
Precision Fluidics Division
26 Clinton Dr., Unit 103
Hollis, NH 03049
phone 603 595 1500
fax 603 595 8080
www.parker.com/precisionfluidics