

# Self-Priming Micro Pumps



## Inert solenoid operated self-priming fixed displacement diaphragm pumps

- High accuracy dispense settings from 8 $\mu$ l to 250 $\mu$ l
- Low power consumption / minimal heat generation
- Low internal volume
- Positive shut off
- High cycle life - up to 20 million dispense cycles
- Choice of inert wetted materials

## Broad range of dispense settings and flow rates

The diaphragm pumps are factory set for discrete outputs ranging from 8 $\mu$ l to 250 $\mu$ l. The pumps can be cycled at up to 2.0 Hz for the smallest version and 1.6 Hz for the largest version. Flow rates reach up to 25 ml / minute. Depending on the dispense setting, very high accuracy can be achieved with deviations from set-point of less than 1%. For optimal accuracy, the pumps should be used for the transfer of fluids between un-pressurized containers.

## Self-priming

At startup, the pump is able to draw air. The suction created by the larger pumps is sufficient to pull liquids from an un-pressurized container located up to 1.3 meters (4' 3") beneath the pump. Once the pump is primed, it is able to generate around 5 psi (0.3 bar) pressure, equating to 3.5 meters (11' 6") of water.

## Wide assortment of inert wetted materials available

The pumps provide a non-metallic, inert fluid path for the dispensing of high purity or aggressive fluids. The standard pump body is made of PPS (polyphenylsulfide). Other materials available for the pump body include PTFE, PEEK™ and Delrin®. The elastomers that can be used for the diaphragms and check valves include PTFE, EPDM, and Viton®.

## High reliability

The pumps are designed for continuous duty. They are guaranteed for up to 20 million actuations, corresponding to nearly 3,000 hours of continuous use at a 2 Hz cycle rate.

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# Specifications

## Pump series & weight

The self-priming pumps are offered in four pump series, distinguished by the solenoid shell sizes:

Valve Series	Shell Diameter	Weight
090SP	0.75 inches	2 oz. (60 g)
120SP	1.00 inches	5 oz. (140 g)
130SP	1.00 inches	6 oz. (170 g)
150SP	1.50 inches	16 oz. (450 g)

## Electrical

Valve Series	Voltage	Power @ 70°F (21°C)	Current @ 70°F (21°C)	Effective continuous power at max cycle rate
090SP	12 Vdc	2.6 Watts	0.22 amps	0.8 Watts
090SP	24 Vdc	2.6 Watts	0.11 amps	0.8 Watts
120SP	12 Vdc	4.0 Watts	0.32 amps	1.2 Watts
120SP	24 Vdc	4.0 Watts	0.16 amps	1.2 Watts
130SP	12 Vdc	4.0 Watts	0.32 amps	1.2 Watts
130SP	24 Vdc	4.0 Watts	0.16 amps	1.2 Watts
150SP	12 Vdc	8.0 Watts	0.66 amps	3.2 Watts
150SP	24 Vdc	8.0 Watts	0.33 amps	3.2 Watts

## Lead Wires

All lead wires are Teflon<sup>®</sup> coated. Different lengths of lead wires and terminal connectors can be provided. Please consult Bio-Chem Valve and Omnifit concerning non-standard lead wire lengths and the addition of terminal connectors.

Valve Series	Lead wire length	Wire thickness
090SP	15 in. / 38cm	26 gauge
120SP	15 in. / 38cm	26 gauge
130SP	15 in. / 38cm	26 gauge
150SP	15 in. / 38cm	22 gauge

# Specifications (contd.)

## Pressure limits

To attain optimal dispense accuracy, pressure on both the inlet and the outlet side of the pump must be kept between  $\pm 0.5$  psi (0.035 bar) and 0 psi (equating to a head of  $\pm 12$  in / 30 cm of water).

During the pump's up-stroke, suction is created on the inlet. Positive pressure is generated at the outlet during the down-stroke. When the pump is not actuated, it will shut off flow as long as the pressure on the inlet does not exceed the maximum holding pressure. To ensure correct operation, pressure on the inlet side should never exceed 2 psi even when the pump is in the closed position. The check valves in the pump prevent fluid from flowing against the intended flow direction.

Valve Series	Inlet suction (priming w/air)	Inlet suction (after priming)	Outlet pressure
090SP	1 psi / 0.07 bar	3 psi / 0.20 bar	3 psi / 0.20 bar
120SP	2 psi / 0.15 bar	5 psi / 0.35 bar	5 psi / 0.35 bar
130SP	2 psi / 0.15 bar	5 psi / 0.35 bar	5 psi / 0.35 bar
150SP	2 psi / 0.15 bar	5 psi / 0.35 bar	5 psi / 0.35 bar

## Cycle rates

To operate the solenoid micro pumps, first place the rated voltage over the pump's coil (causing the intake stroke) and then turn the voltage off again (causing the output stroke). To achieve the optimal dispense accuracy, the pump must remain in the on and in the off position for a minimum amount of time. To operate the pumps at less than the maximum cycle rate, the on-time should remain unchanged and the off-time should be lengthened appropriately.

Valve Series	Minimum on time	Minimum off time	Maximum cycle rate
090SP	150 msec	350 msec	2.0 Hz
120SP	150 msec	350 msec	2.0 Hz
130SP	150 msec	350 msec	2.0 Hz
150SP	200 msec	400 msec	1.6 Hz

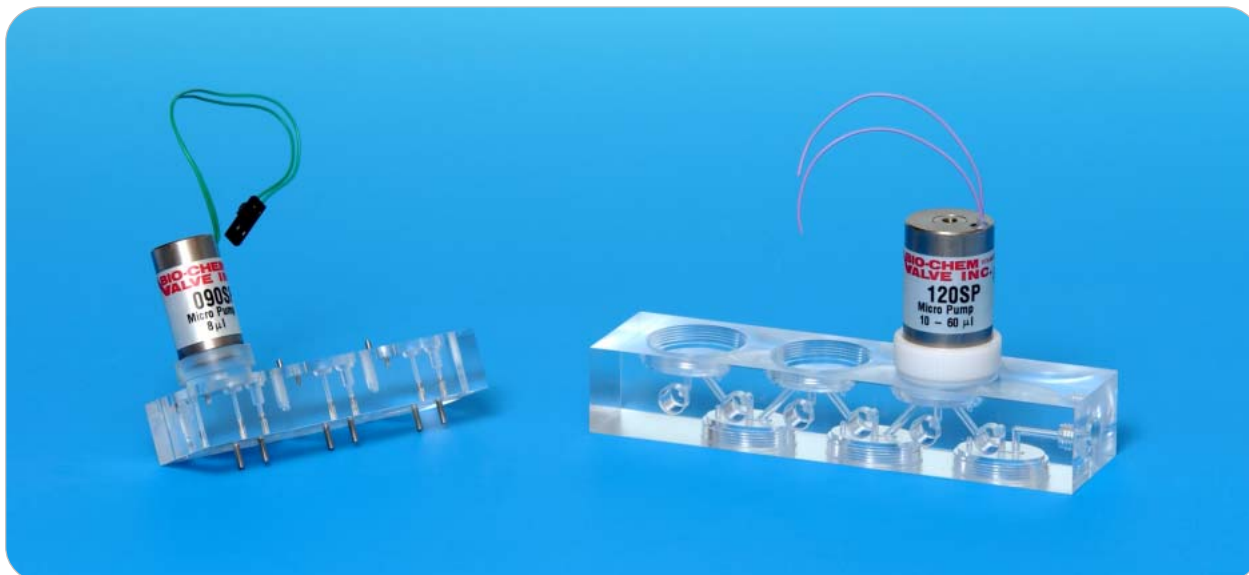
## Dispense volume accuracy

Valve Series		Minimum setting	Maximum setting	Max flow rate
090SP	Dispense volume:	8 $\mu$ l	8 $\mu$ l	1.0 ml / min
	Set-point accuracy:	+/- 25%	+/- 25%	
	Repeatability:	+/- 5%	+/- 5%	
120SP	Dispense volume:	10 $\mu$ l	60 $\mu$ l	7.2 ml / min
	Set-point accuracy:	+/- 4%	+/- 2%	
	Repeatability:	+/- 3%	+/- 1%	
130SP & 120SP w/PTFE dia.	Dispense volume:	10 $\mu$ l	50 $\mu$ l	6.0 ml / min
	Set-point accuracy:	+/- 5%	+/- 5%	
	Repeatability:	+/- 3%	+/- 1%	
150SP	Dispense volume:	100 $\mu$ l	250 $\mu$ l	25 ml / min
	Set-point accuracy:	+/- 5%	+/- 3%	
	Repeatability:	+/- 1%	+/- 0.5%	

# Specifications (contd.)

## Manifold mounted pumps

The Bio-Chem Valve diaphragm pumps can be mounted directly on manifolds. Many configurations are possible to meet the specific needs of the application. Please consult with Bio-Chem Valve regarding manifold mounted pump designs.



## Ports and tubing

To achieve an optimal dispense accuracy, the tubing should conform to the recommended inner diameters stated below and friction losses should be kept to a minimum.

For more information regarding 1/4"-28 fittings and tubing sets, please consult the Omni-Lok™ Fitting System and Fitting Systems specification sheets.

Pump Series	Standard ports	Recommended inlet tubing size	Recommended outlet tubing size
090SP	1/4"-28 flat bottom	≥ 1/32" I.D.	≥ 1/32" I.D.
120SP	1/4"-28 flat bottom	≥ 1/32" I.D.	≥ 1/32" I.D.
130SP	1/4"-28 flat bottom	≥ 1/32" I.D.	≥ 1/32" I.D.
150SP	5/16"-24 flat bottom	≥ 1/8" I.D.	≥ 1/8" I.D.

## Internal volume

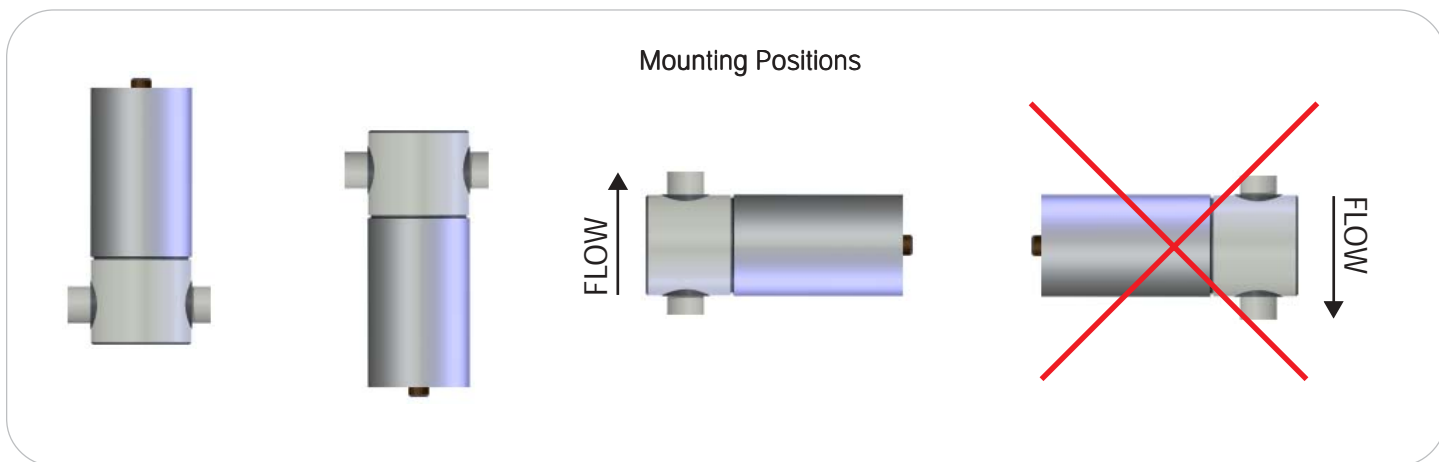
Pump Series	Internal volume
090SP	130 µl
120SP	105 µl
130SP	105 µl
150SP	710 µl

# Specifications (contd.)

## Mounting

For mounting clips, rings and flanges, please see the Mounting Accessories and Options specification sheet. Two mounting holes in the body permit bottom mounting in the 120SP series pumps. Please see the dimensional diagrams on the following pages for further information.

The pumps should be installed with the solenoid portion of the pump pointing upwards, downwards, or in a horizontal position with the outlet on top. The horizontal position with the outlet on the bottom could affect the output accuracy.



## Adjustable pumps

In cases where the dispense volume for the application is unknown, Bio-Chem Valve offers an adjustable pump designed to be used as an R&D tool by the instrument design engineer to help determine the optimal dispense setting. By turning the shell on the pump, the engineer can compensate for the instrument's friction losses or pressure imbalances. Once the correct pump setting and dispense volume have been determined, the engineer can provide the dispense volume to the factory. This information will be used to manufacture a factory-set (non-adjustable) pump specific to the application.



Pump Series	Dispense range
090SP - adjustable	8 $\mu$ l to 12 $\mu$ l
120SP - adjustable	10 $\mu$ l to 60 $\mu$ l
150SP - adjustable	100 $\mu$ l to 250 $\mu$ l

Aside from the adjustability of these pumps, all other specifications are identical with those stated in this product data sheet for the same pump series.

For part numbers of the adjustable pump versions, please contact Bio-Chem Valve and Omnifit.

# Specifications (contd.)

## Wetted materials

Valve Series	Standard materials	Options
090SP	Body:	PPS
	Diaphragm:	PTFE
	Check valves:	Viton®, Perfluoroelastomer
120SP	Body:	PPS
	Diaphragm:	EPDM
	Check valves:	Viton®, Perfluoroelastomer
130SP	Body:	PTFE
	Diaphragm:	PTFE
	Check valves:	Perfluoroelastomer
150SP	Body:	PPS
	Diaphragm:	EPDM
	Check valves:	EPDM

## Ordering Information

1	Select pump series	090SP, 120SP, 130SP, 150SP
2	Indicate voltage	12 VDC, 24 VDC
3	Indicate dispense setting (µl)	8 (090SP), 10, 20, 30, 40, 50, 60 (120SP), 10, 20, 30, 40, 50 (130SP), 100, 125, 150, 175, 200, 225, 250 (150SP)
4	Indicate body material (See optional materials in chart above.)	1 (PTFE, 130SP only), 4 (PPS), 5 (PEEK), 6 (Delrin®, 120SP only)
5	Indicate diaphragm material (See optional materials in chart above.)	E (EPDM), T (PTFE)
6	Indicate check valve material (See optional materials in chart above.)	E (EPDM), V (Viton®), P (Perfluoroelastomer)

Part Number Example:

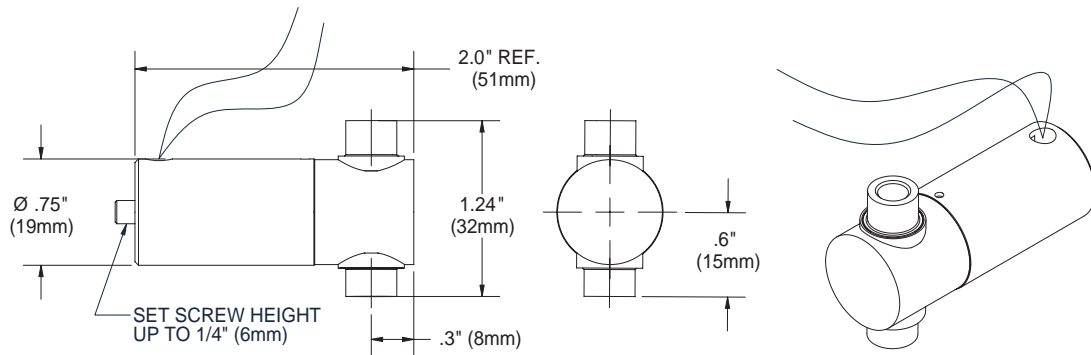
<b>120SP</b>	<b>24</b>	<b>50</b>	<b>-</b>	<b>5</b>	<b>T</b>	<b>P</b>
Pump Series	Voltage	Dispense setting		Body material	Diaphragm material	Check valve material

Please see our other product specification sheets for the following accessories:

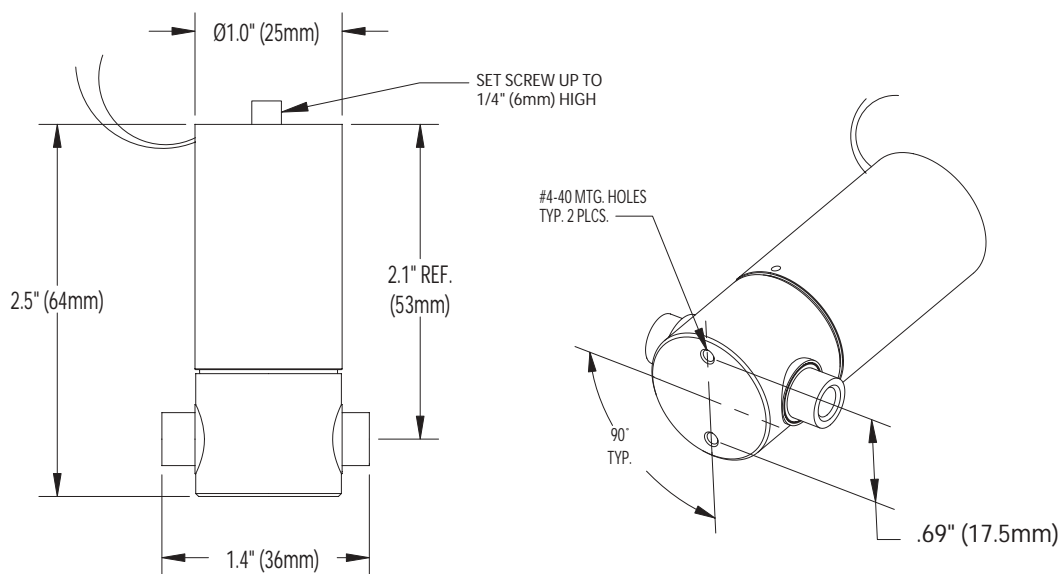
- Omni-Lok™ fittings and tubing sets
- CoolCube™ control module
- Mounting clips

# Installation Drawings

## 090SP



## 120SP



# Installation Drawings (contd.)

