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LabSmith uProcess™ System

Microfluidic Automation

- Automated fluid delivery and routing
- Innovative software for coordinated control
- Constant-pressure or constant-rate flow
- Fast, simple automation construction



LabSmith's uProcess™ system provides hardware and software that simplifies construction and control of microfluidic systems. uProcess™ devices include AV series automated selector valves, SPS01 programmable syringe pumps, uPS pressure sensors, and prototyping bread-boards.

Coordinated, Automated Fluid Control

uProcess devices connect to CapTite™ microfluidic interconnect products to make it easy to build and revise micro- and nano-fluidic circuits. CapTite™ fittings have zero dead-volume and compatible, quick-to-assemble fluid interfaces, taking the hassle out of fluid routing.

SPS01 Programmable Syringe Pumps can be configured for total fluid volumes of 5 to 100 µl, with step sizes as low as 8 nl. The compact pump design (100 mm long x 25 mm wide) is ideal for applications striving to minimize tubing length or overall footprint. Syringes are available for connection either to 360 µm capillary or 1/16" tubing.

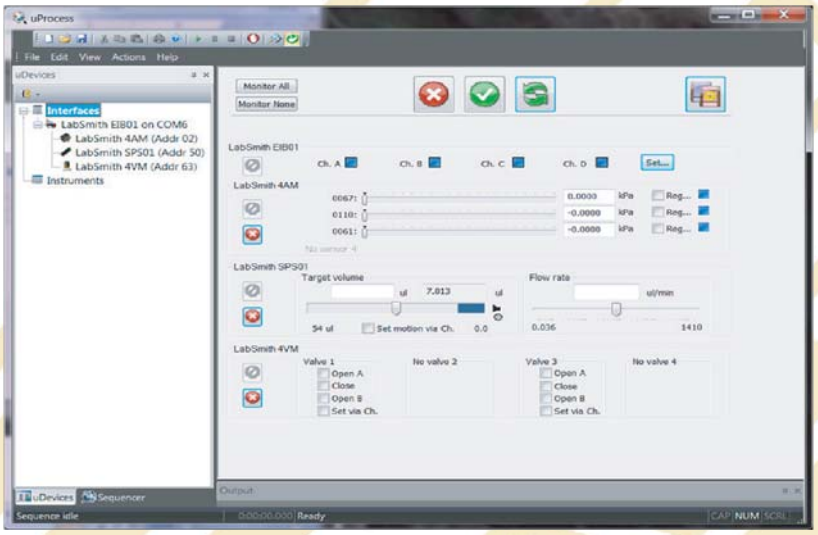
AV Series Automated Selector Valves switch3 or 4 ports between 2 positions, with zero dead-volumes and low swept volumes. The valves are available for 360 µm, 1/32", or 1/16" tubing.

uPS Pressure Sensors are ideal for monitoring and controlling pressure in microfluidic circuits. The 13-mm-diameter sensors sensors can be threaded into any CapTite™ port, allowing easy integration into a microfluidic circuit via microfluidic chips, tees, or reservoirs to minimize dead-volume and size.

Programmable Automated Operation

uProcess™ Software provides a user-friendly interface for monitoring, configuring, and controlling uProcess™ devices via a laptop or PC. Automated sequences are easily programmed into uProcess for multistep, coordinated control of devices.

The uPS pressure sensors can be used in combination with the syringe pumps and valves to create constant-pressure or constant-rate flow applications.



uProcess™ software provides a simple interface to control uProcess™ devices and create automated processes.

LabSmith AV Series Automated Valves

- Small footprint
- High pressure
- Low (nl) swept volume
- Easy integration with other uProcess devices



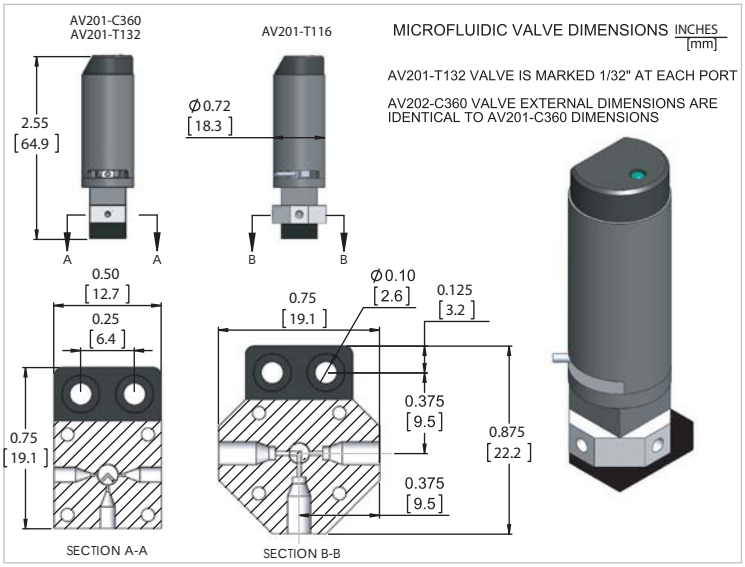
Big performance in a small size

LabSmith's uProcess™ automated valves deliver programmable fluid routing in a fraction of the footprint required for most valves. With nanoliter swept volumes and operation pressures up to 5 kpsi, the AV series valves are ideal for most microfluidic routing applications.

The AV201 three port, two position valve uses an "L" pattern flow routing (see top figures at right). Valve models are available for use with 360 µm, 1/32" or 1/16" tubing.

The AV202 four port, two-position valves use a dual cut stem to route the fluid simultaneously between two sets of adjacent ports (see bottom figures at right). This design allows for simultaneous operation of two syringe pumps, one in fill mode and one in dispense, for the uninterrupted delivery of solution during low flow rate, long term experiments.

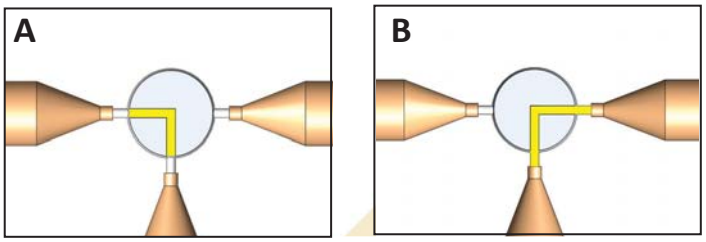
All valve models feature zero dead volume connections, rapid flow response time, low carryover, <0.5 second switching, inert wetted materials, and zero "hold" power.



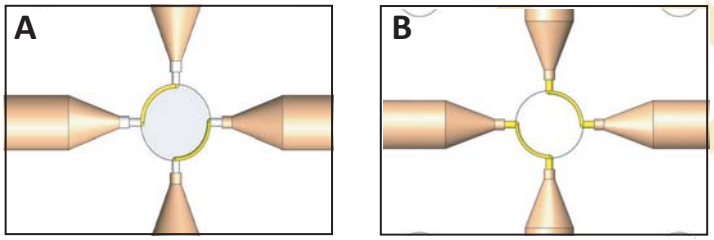
Easy Integration with uProcess system

uProcess™ software is used to control the automated valves along with the SPS01 syringe pumps and uPS pressure sensors for complete experiment automation.

A 4VM valve manifold is required to control the automated valves (one 4VM can control up to 4 valves). An Electronic Interface Board (EIB) is also required; a single EIB can simultaneously operate up to 10 uProcess™ devices or over 100 devices sequentially.



Fluid flow through **AV201 valve** when valve is switched between ositions A and B. Yellow indicates swept volume (A) and valve volume (B)

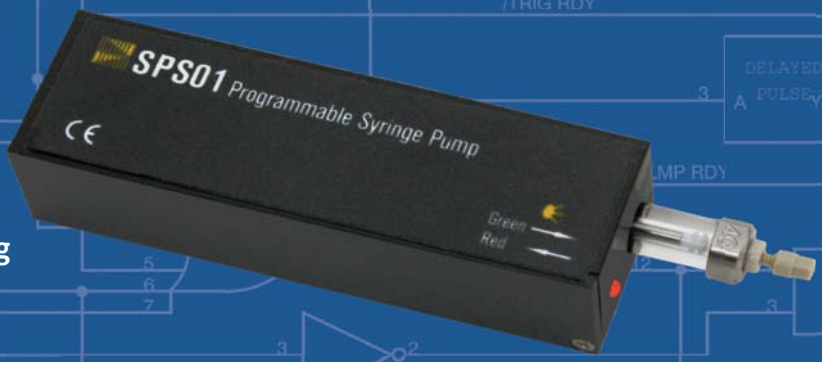


Fluid flow through **AV202 valve** when valve is switched between positions A and B.

VALVE	THROUGH HOLE DIAMETER	SWEPT VOLUME	VALVE VOLUME
AV201-C360	0.01" [250 µm]	130 nl	170 nl
AV201-T132	0.01" [250 µm]	130 nl	170 nl
AV201-T116	0.02" [510 µm]	520 nl	1.1 µl
AV202-C360	0.01" [250 µm]	90 nl	130 nl

LabSmith SPS01 Syringe Pumps

- Automated fluid delivery
- Innovative software for coordinated control
- Zero dead-volume direct connection to tubing
- Low flow rates - as low as 50 nl/min



Reliable Delivery, Remarkable Size

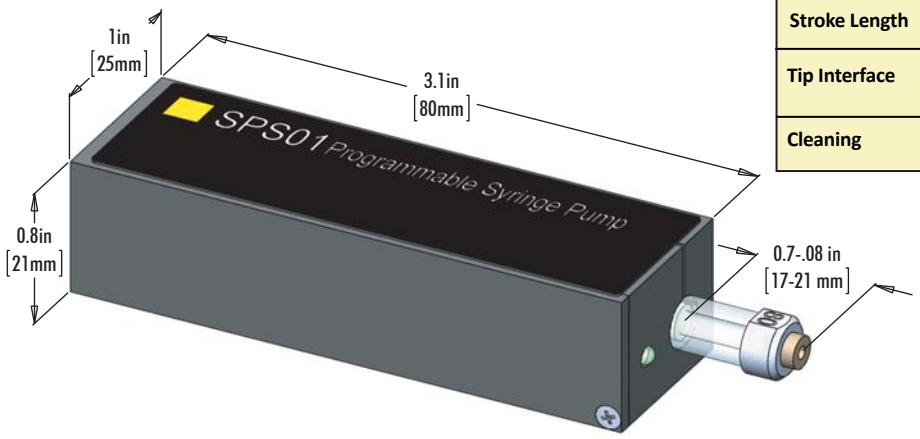
Only 100 mm long, the SPS01 syringe pump uses a fraction of the space and power of other syringe pumps. The SPS01 delivers volumes from 5 to 100 µl, with step sizes as low as 8 nl.

Low Dead Volume, Easy Cleaning

The SPS01's unique syringe glass design directly connects to 360 µm OD capillary and 1/16" OD tubing via a LabSmith CapTite™ connector for very low dead volumes. The pump body allows syringes to be easily removed and replaced, so a pump can be configured with a wide range of syringe volumes. All wetted surfaces are easily removed for sterilization and autoclaving.

Coordinated Fluid Delivery

LabSmith SPS01 syringe pumps are fully programmable for coordinated fluid delivery and sequencing. An Electronic Interface Board (EIB) is required for operation; a single EIB can simultaneously control up to 10 uDevices (valves and syringe pumps), or can control many more sequentially. Included uProcess™ software makes it easy to create programs to operate syringes and valves.



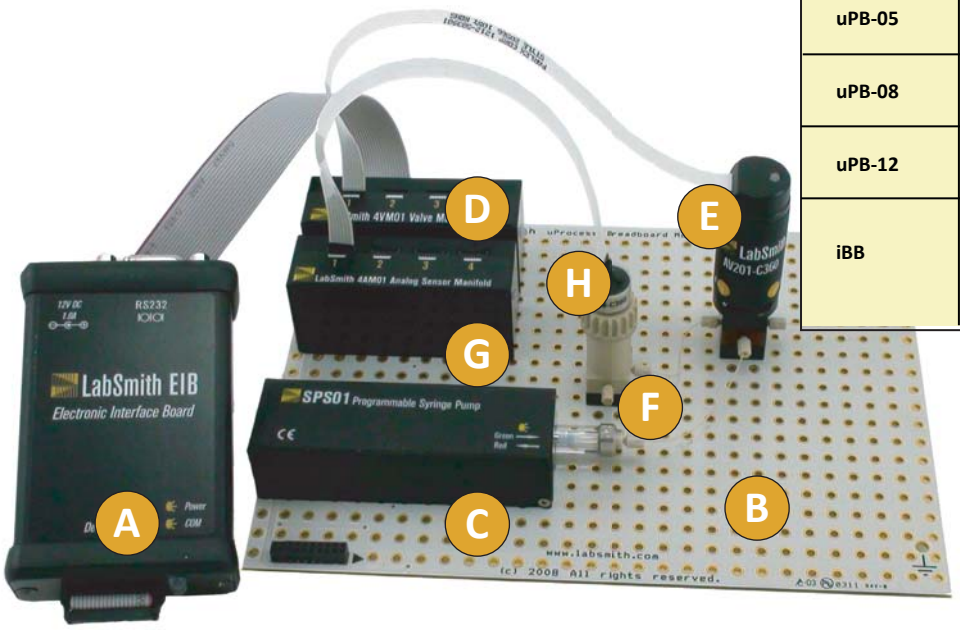
PERFORMANCE					
Model	**Max Volume (µl)**	**Min Flow Rate (µl/min)**	**Max Flow Rate (µl/min)**	**Step Size (µl)**	**Max Pressure (psig)**
- 04	5	0.05	280	0.008	> 500
- 08	10	0.10	560	0.017	> 500
- 20	20	0.20	1100	0.033	> 500
- 40	50	0.50	2800	0.083	300
- 80	100	1.0	5600	0.17	200
Volume Accuracy	~ 1 % (infuse direction)				
Flow Rate Accuracy	~ 1 % (infuse direction)				
Service Temperature Range	50 – 176 °F (10 – 80 °C)				

PHYSICAL	
Dimensions	100 x 25 x 20 mm (3.9 x 1.0 x 0.79") L x W x H
Housing Material	Delrin®
Syringe Material	Glass with PEEK™ tip
Plunger Material	Stainless steel with Teflon® tip
Wet Volumes	5, 10, 20, 50, and 100 µl (interchangable, all volumes supported with the same housing)
Stroke Length	12 mm
Tip Interface	Directly connects to 360 µm OD capillary via CapTite C360-100 one piece fitting; or 1/16" OD tubing for selected
Cleaning	Wetted parts can be chemically sterilized or autoclaved

uProcess™ Hardware

Components of a Typical uProcess™ Setup

- **A** Electronic Interface Board (EIB) is used to control SPS01 syringe pumps, AV201 automated valves, or uPS01 pressure sensors.
- **B** uPB or iBB breadboard (uPB-05 shown) is optional, for simplified component mounting.
- **C** SPS01 Programmable Syringe Pump.
- **D** 4VM01 Valve Manifold controls up to four AV201 or AV202 automated valves.
- **E** AV201 Automated Valve.
- **F** CapTite™ microfluidic routing components complete the fluid circuit. Shown here are a Breadboard Reservoir, one-piece fittings and capillary.
- **G** 4AM01 Analog Manifold controls up to four uPS pressure sensors.
- **H** uPS series pressure sensor can be used to monitor and regulate pressure, allowing syringe pumps to be run in constant pressure or constant flow rate mode.



ELECTRONIC INTERFACE BOARD (EIB)	
Device Interface	Control up to 128 uProcess™ devices (syringes, automated valves and/or sensors)
Interface	RS-232; optional USB adaptor sold separately
Power	12 volt, 1 amp external power supply included
uProcess™ software included	
LabVIEW™ drivers included	
Software Developers' Kit (C, C++) included	

ELECTRONIC MANIFOLDS (REQUIRED FOR VALVE AND SENSOR OPERATION)	
4VM01	Controls up to 4 valves
4AM01	Controls up to 4 pressure sensors

uPROCESS BREADBOARDS (OPTIONAL)	
uProcess breadboards have integrated connectors for uProcess devices and ¼" hole spacing for mounting LabSmith valves and CapTite™ microfluidic connector products	
uPB-05	185 x 132 mm (7.3 x 5.2") breadboard; connections for 5 devices
uPB-08	254 x 229 mm (10 x 9") breadboard; connections for 8 devices
uPB-12	305 x 305 cm (12 x 12") breadboard; connections for 12 devices
iBB	25.5 x 23 cm (10 x 9") breadboard with connections for up to 8 devices; 2.5 x 7.6 cm (1 x 3") cutout for viewing microsystems on LabSmith SVM340 Synchronous Video Microscope

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