

# Control devices

## FLOW, PRESSURE, AND ON/OFF

This section includes stainless needle valves, our combination on/off needle valves, high pressure prime/purge and on/off valves, and VICI pressure regulators and flow controllers.

Because cast parts can introduce porosity and contamination, every VICI control device is assembled from components which are precision-machined from bar stock. This assures that every item has the same high quality workmanship, with careful assembly and testing to rigid standards.

### On/off and prime/purge valves

Valco high pressure on/off or prime/purge valves feature quality engineering, precision machining, and extremely low internal volume (< 2 µl), making them the ideal choice in the most demanding liquid or supercritical fluid chromatography or extraction systems.\* The on/off function is self-explanatory; in prime/purge models, mobile phase flows around the needle when the valve is closed, relieving the back pressure from the column. When the valve opens, mobile phase vents to waste to prime the pump. Standard models provide leak-tight operation up to 10,000 psi (690 bar) at 100°C, with high temperature versions rated up to 6,000 psi/300°C. A 1/16" fitting model with a larger bore and a 1/8" fitting model are available for high flow applications.

The valve needle is made from a special high strength alloy which is resistant even to the buffer salts which might accidentally precipitate inside the valve. Seals are fluorocarbon, with valve bodies machined from HPLC grade stainless steel, ensuring long lifetime in even the most demanding situations.

The on/off and prime/purge valves are available in manual or air/CO<sub>2</sub> actuated versions. The automated valves require a single three-way solenoid: application of 50 psi opens the valve; venting the air allows the spring to return the valve to the closed position.

*\*Not suitable for use with gases.*



#### ULTRA-HIGH PRESSURE 40K ON/OFF AND PRIME/PURGE VALVES

40,000 psi valves . . . . p 85



#### MORE INFORMATION

3-way solenoid . . . . p 198



**On/off valves**

for liquids

**SPECS**

Temp Pressure

**Standard temperature / high pressure**

1/16" 100°C 10,000 psi liq

**High temperature / medium pressure**

1/16" 300°C 6,000 psi liq

1/8" 300°C 2,000 psi liq

**Standard temperature/ high pressure**

Manual Air actuated  
with 1" knob with 1" standoff

Fitting size	Bore	Prod No	Prod No
1/16"	0.50 mm	SFVO	ASFVO
	0.75 mm	SFVOL	ASFVOL

**High temperature/ medium pressure**

Manual Manual Air actuated Air actuated  
with 2" knob with 4" knob with 2" standoff with 4" standoff

Fitting size	Bore	Prod No	Prod No	Prod No	Prod No
1/16"	0.50 mm	SFVOHT	SFVOHT4	ASFVOHT	ASFVOHT4
	0.75 mm	SFVOLHT	SFVOLHT4	ASFVOLHT	ASFVOLHT4
1/8"	1.50 mm	-	-	ASFVO2HT	ASFVO2HT4

**Prime/purge valves**

for liquids

**SPECS**

Temp Pressure

**Standard temperature / high pressure**

1/16" 100°C 10,000 psi liq

**High temperature / medium pressure**

1/16" 300°C 6,000 psi liq

1/8" 300°C 2,000 psi liq

**Standard temperature/ high pressure**

Manual Air actuated  
with 1" knob with 1" standoff

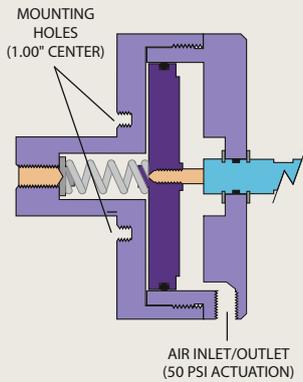
Fitting size	Bore	Prod No	Prod No
1/16"	0.50 mm	SFV	ASFV
	0.75 mm	SFVL	ASFVL

**High temperature/ medium pressure**

Manual Manual Air actuated Air actuated  
with 2" knob with 4" knob with 2" standoff with 4" standoff

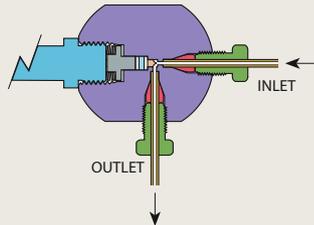
Fitting size	Bore	Prod No	Prod No	Prod No	Prod No
1/16"	0.50 mm	SFVHT	SFVHT4	ASFVHT	ASFVHT4
	0.75 mm	SFVLHT	SFVLHT4	ASFVLHT	ASFVLHT4
1/8"	1.50 mm	-	-	ASFV2HT	ASFV2HT4

**Air actuator option**

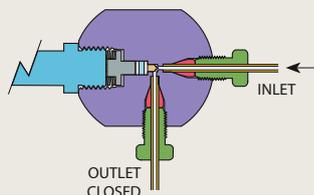


AN EAOR21 FITTING FOR 1/8" AIR SUPPLY TUBING IS INCLUDED. (SEE PAGE 216)

**On/off valve**

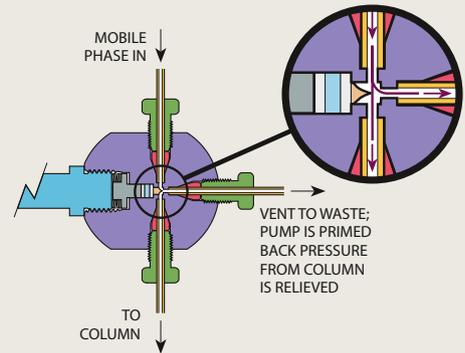


**OPEN POSITION**

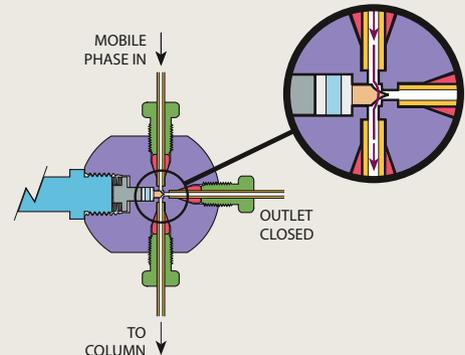


**CLOSED POSITION**

**Prime/purge valve**



**OPEN POSITION**



**CLOSED POSITION**

## Combo valves

### CONTROL DEVICES

A new generation needle and shut-off valve combines flow control and positive shut-off without damage to the needle. Since the flow setting is not changed by turning the valve on and off, the valve is ideal for providing hydrogen and air to an FID. It can also be used to supply make-up or combustion gas in a wide variety of applications.

Flow is set using the screwdriver adjustment in the center of the on/off knob.

The valve body materials are

anodized aluminum or stainless steel, with Viton® O-ring seals. Maximum temperature is 100°C, and maximum inlet pressure is 100 psig. The valve can be panel-mounted in an 11/16" or 3/4" hole, using hardware supplied, and all are supplied with Valco 1/16" ZDV fittings. Other configurations are available in OEM quantity upon request.

The standard knob is silver-colored and .62" long. Colored knobs for gas identification are available separately, in two lengths.

### Combo valves

**Maximum flow  
@ 40 psi He or N<sub>2</sub>**

10 ml/min  
50 ml/min  
150 ml/min  
  
250 ml/min  
500 ml/min

**Aluminum  
body**  
*Prod No*

CNV1A10S1  
CNV1A50S1  
CNV1A150S1  
  
CNV1A250S1  
CNV1A500S1

**Stainless  
body**  
*Prod No*

CNV1S10S1  
CNV1S50S1  
CNV1S150S1  
  
CNV1S250S1  
CNV1S500S1

#### SPECS

Inlet pressure:  
100 psi  
Maximum  
temperature:  
100°C

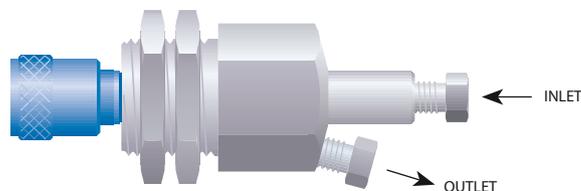
**Optional colored knobs Standard  
(.62")**  
*Prod No*

Green  
Red  
Blue  
  
Silver  
Black

CNVEKG  
CNVEKR  
CNVEKU  
  
CNVEKS  
CNVEKB

**Long  
(1.25")**  
*Prod No*

CNVEKLG  
CNVEKLR  
CNVEKLU  
  
CNVEKLS  
CNVEKLB



Very similar in function to the more recent design on the opposite page, these are the original, hex-bodied combo valves made by the Condyne division of VICI Metronics for nearly 30 years. Condyne products have been transferred to the Valco Houston location, where a number of improvements have been made.

Standard construction features an anodized aluminum body with Viton® O-ring seals. Maximum inlet pressure is 100 psi, with a maximum

temperature of 100°C. The valve can be panel mounted through an 11/16" or 3/4" diameter hole. Valco 1/16" fittings are standard, but 1/8" fittings are also available. Nuts and ferrules are included.

Typically, the knob color is used as an indicator of the rated flow, but the standard knob can be changed if desired. A longer version of the knob is also available, as is a nickel-plated all brass valve (in OEM quantities). Consult the factory regarding these options.

**Condyne combo valves**

SPECS	Maximum flow @ 40psi He or N2	Knob color	1/16"	1/8"
			Valco fittings Prod No	Valco fittings Prod No
Maximum inlet pressure: 100 psi	10 ml/min	Green	CVA10GS1	CVA10GS2
Maximum temperature: 100°C	50 ml/min	Red	CVA50RS1	CVA50RS2
	150 ml/min	Blue	CVA150US1	CVA150US2
	500 ml/min	Black	CVA500BS1	CVA500BS2
	1 liter/min	Yellow	CVA1KYS1	CVA1KYS2



# Gas flow controllers

## CONTROL DEVICES

Flow controllers provide a stable flow rate under varying pressure. VICI flow controllers are precision machined from aluminum or stainless bar stock to eliminate the contamination often found in die cast parts. Positive flow

shut-off is provided by an integral Viton-sealed adjustment valve.

With all our flow controllers, the inlet pressure must exceed the outlet pressure by a minimum of 10 psi.

### WHICH KIND OF CONTROLLER?

An **upstream-referenced** controller maintains the flow rate as long as the upstream (inlet) pressure is held constant.

A **downstream-referenced** controller maintains a constant flow under constant downstream (outlet) pressure.

### Model 100 gas flow controller

### Fixed span upstream-referenced flow controller

The Model 100 is available in a variety of preset maximum flow rates, from 150 mL/min to 10 liters/min (N<sub>2</sub> at 40 psi). Any flow controller in this series can be ordered with a 10-turn Spectrol digital dial (3 or 4 digits), to permit a visual indication of the flow setting.

All flow rates listed below are based on N<sub>2</sub> at 40 psi inlet pressure. Maximum inlet pressure is 200 psi.



### SPECS

#### Preset max flow rates:

150 mL/min to 10 liters/min (N<sub>2</sub> at 40 psi).

#### Maximum inlet pressure:

200 psi

#### Maximum temperature:

100°C

#### Standard fittings:

■ 1/8" external tube fittings (EAOR22)

Other fittings are available. (See below.) Contact the factory for further information.

Flow rate /min	Aluminum body Viton diaphragm Prod No	Aluminum body SS diaphragm Prod No	SS body Viton diaphragm Prod No	SS body SS diaphragm Prod No
<b>With standard control knob</b>				
0 - 150 mL	FC10AV1K	FC10AS1K	FC10SV1K	FC10SS1K
0 - 250 mL	FC10AV2K	FC10AS2K	FC10SV2K	FC10SS2K
0 - 850 mL	FC10AV3K	FC10AS3K	FC10SV3K	FC10SS3K
0 - 1.2 L	FC10AV4K	FC10AS4K	FC10SV4K	FC10SS4K
0 - 4.5 L	FC10AV5K	FC10AS5K	FC10SV5K	FC10SS5K
0 - 10.0 L	FC10AV6K	FC10AS6K	FC10SV6K	FC10SS6K
<b>With Spectrol 3-digit dial</b>				
0 - 150 mL	FC10AV1S3	FC10AS1S3	FC10SV1S3	FC10SS1S3
0 - 250 mL	FC10AV2S3	FC10AS2S3	FC10SV2S3	FC10SS2S3
0 - 850 mL	FC10AV3S3	FC10AS3S3	FC10SV3S3	FC10SS3S3
0 - 1.2 L	FC10AV4S3	FC10AS4S3	FC10SV4S3	FC10SS4S3
0 - 4.5 L	FC10AV5S3	FC10AS5S3	FC10SV5S3	FC10SS5S3
0 - 10.0 L	FC10AV6S3	FC10AS6S3	FC10SV6S3	FC10SS6S3
<b>With Spectrol 4-digit dial</b>				
0 - 150 mL	FC10AV1S4	FC10AS1S4	FC10SV1S4	FC10SS1S4
0 - 250 mL	FC10AV2S4	FC10AS2S4	FC10SV2S4	FC10SS2S4
0 - 850 mL	FC10AV3S4	FC10AS3S4	FC10SV3S4	FC10SS3S4
0 - 1.2 L	FC10AV4S4	FC10AS4S4	FC10SV4S4	FC10SS4S4
0 - 4.5 L	FC10AV5S4	FC10AS5S4	FC10SV5S4	FC10SS5S4
0 - 10.0 L	FC10AV6S4	FC10AS6S4	FC10SV6S4	FC10SS6S4

### ADAPTERS USED FOR VALCO AND CONDYNE CONTROL DEVICES

Description			Prod No	Used for
Valco 1/16" internal to	10-32 O-ring seal		ZAOR11	Diaphragm valve On/off valves (optional)
	5/16-24 O-ring seal		ZAOR12	Model 100 controller (optional) Model 300 controller (optional)
Valco 1/8" internal to	5/16-24 O-ring seal		ZAOR22	Model 100 controller (optional) Model 300 controller (optional)
External 1/8" to	10-32 O-ring seal		EAOR21	Air actuated prime/purge and on/off valves
	5/16-24 O-ring seal		EAOR22	Model 100 controller (standard) Model 300 controller (standard)

### ALTERNATE FITTING TYPES

#### Models 100 and 300

The standard is the EAOR22 1/8" external tube fitting. Alternative fitting types are ZAOR22 and ZAOR12, listed at left. Order separately.

#### Model 202

The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing included. To use 1/8" OD tubing, order PZA22 on page 35.

**Model 202 gas flow controller**

*Adjustable span upstream-referenced flow controller*

**SPECS**

**Flow range:**

infinitely adjustable

Min: 5 mL/min

Max: 1.6 L/min  
(N<sub>2</sub> at 40 psi)

**Maximum inlet pressure:**

200 psi

**Maximum temperature:**

100°C

**Standard fittings:**

■ 1/8" NPT female pipe threads

■ Pipe adapters to 1/16" OD tubing are included.

Other fittings are available. (See facing page.)

The Model 202 provides a user-variable span adjustment permitting it to be used for a variety of flow ranges. After the span is adjusted, the flow controller has a full 10 turns of resolution between the minimum and maximum flow rates. When equipped with a Spectrol digital dial, settings are reproducible to better than 1%.



	<b>Aluminum body Viton diaphragm</b> <i>Prod No</i>	<b>Aluminum body SS diaphragm</b> <i>Prod No</i>	<b>SS body Viton diaphragm</b> <i>Prod No</i>	<b>SS body SS diaphragm</b> <i>Prod No</i>
<b>With standard control knob</b>	FC22AV1K	FC22AS1K	FC22SV1K	FC22SS1K
<b>With Spectrol 3-digit dial</b>	FC22AV1S3	FC22AS1S3	FC22SV1S3	FC22SS1S3
<b>With Spectrol 4-digit dial</b>	FC22AV1S4	FC22AS1S4	FC22SV1S4	FC22SS1S4

**Model 300 gas flow controller**

*Fixed span downstream-referenced flow controller*

**SPECS**

**Maximum flow rate:**

1.6 L/min  
with ambient  
downstream pressure

**Maximum inlet pressure:**

200 psi

**Maximum temperature:**

100°C

**Standard fittings:**

■ 1/8" external tube fittings (EAOR22)

Other fittings are available. (See facing page.) Contact the factory for further information.

The Model 300 flow controller provides a stable flow rate when upstream pressure conditions vary, providing the downstream pressure remains constant.

All flow rates listed below are based on N<sub>2</sub> at 40 psi inlet pressure. Maximum inlet pressure is 200 psi.



	<b>Aluminum body Viton diaphragm</b> <i>Flow rate /min</i> <i>Prod No</i>	<b>Aluminum body SS diaphragm</b> <i>Prod No</i>	<b>SS body Viton diaphragm</b> <i>Prod No</i>	<b>SS body SS diaphragm</b> <i>Prod No</i>
<b>With standard control knob</b>	0 - 200 mL FC30AV1K	FC30AS1K	FC30SV1K	FC30SS1K
	0 - 300 mL FC30AV2K	FC30AS2K	FC30SV2K	FC30SS2K
	0 - 800 mL FC30AV3K	FC30AS3K	FC30SV3K	FC30SS3K
	0 - 1.6 L FC30AV4K	FC30AS4K	FC30SV4K	FC30SS4K
<b>With Spectrol 3-digit dial</b>	0 - 200 mL FC30AV1S3	FC30AS1S3	FC30SV1S3	FC30SS1S3
	0 - 300 mL FC30AV2S3	FC30AS2S3	FC30SV2S3	FC30SS2S3
	0 - 800 mL FC30AV3S3	FC30AS3S3	FC30SV3S3	FC30SS3S3
	0 - 1.6 L FC30AV4S3	FC30AS4S3	FC30SV4S3	FC30SS4S3
<b>With Spectrol 4-digit dial</b>	0 - 200 mL FC30AV1S4	FC30AS1S4	FC30SV1S4	FC30SS1S4
	0 - 300 mL FC30AV2S4	FC30AS2S4	FC30SV2S4	FC30SS2S4
	0 - 800 mL FC30AV3S4	FC30AS3S4	FC30SV3S4	FC30SS3S4
	0 - 1.6 L FC30AV4S4	FC30AS4S4	FC30SV4S4	FC30SS4S4
<b>With screwdriver adjustable operator</b>	0 - 750 mL FC31AV1			

**MORE INFORMATION**

Male pipe adapters  
Internal . . . . . page 35  
External . . . . . 36

# Micrometering valves

## CONTROL DEVICES

Micrometering (needle) valves combine the ease of connection associated with Valco zero dead volume fittings with convenient bulkhead mounting. Very low internal volume and precision design make this valve ideal for use as a gas control valve in chromatographic systems.

The Viton® model is rated at 225°C, while a version with Kalrez™ seals is capable of continuous operation at 315°C. This allows a needle valve to be mounted directly within a heated oven, facilitating control of

flow switching in multidimensional systems while keeping the gases at oven temperature.

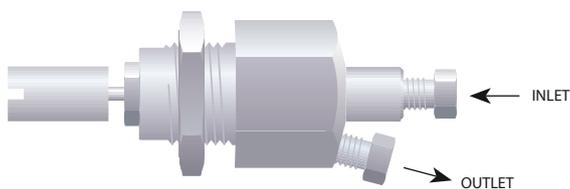
Valves are rated for maximum of 1000 psi gas. They are individually tested on a mass spectrometer leak detector to a helium leak rate specification of  $< 1 \times 10^{-8}$  atm cc/sec.

An unlubricated version with a specially polished seat was designed to be used with our pulsed discharge detectors, and should be used upstream of any ultrapure gas system. There is also a 1/16" tube version.

### 1/16" micrometering valves

*with Valco fittings*

Seal	Lubrication	Prod No
<b>Standard:</b> 2–225 ml/min@ 15 psig N <sub>2</sub> inlet		
Viton	Lubricated	ZBNV1
Viton	Non-lubricated	ZBNV1-D
Kalrez	Non-lubricated	ZBNV1-KZ
<b>Fine control:</b> 2–175 ml/min@ 15 psig N <sub>2</sub> inlet		
Viton	Lubricated	ZBNV1F
Viton	Non-lubricated	ZBNV1F-D
Kalrez	Non-lubricated	ZBNV1F-KZ
<b>Low flow:</b> 2–90 ml/min@ 40 psig N <sub>2</sub> inlet		
Viton	Lubricated	ZBNV1LF
Viton	Non-lubricated	ZBNV1LF-D
Kalrez	Non-lubricated	ZBNV1LF-KZ



### 1/16" micrometering valves

*with 18" tubes*

Seal	Lubrication	Prod No
<b>Fine control:</b> 2–175 ml/min@ 15 psig N <sub>2</sub> inlet		
Viton	Lubricated	BNV1
Viton	Non-lubricated	BNV1-D
Kalrez	Non-lubricated	BNV1-KZ
<b>Low flow:</b> 2–90 ml/min@ 40 psig N <sub>2</sub> inlet		
Viton	Lubricated	BNV1LF
Viton	Non-lubricated	BNV1LF-D
Kalrez	Non-lubricated	BNV1LF-KZ



VICI regulators are machined from aluminum bar stock and then hard-anodized to provide contamination-free service. They feature a stainless steel diaphragm and Viton®-sealed stainless poppet. The compact size (1.125" diameter by 2" long for regulator, 3" long for combo version) saves panel space and permits installation anywhere that an 11/16" hole can be located. Mounting hardware is supplied.

While the outward appearance is unchanged, a recent redesign has enhanced thermal stability, linearity, and shock resistance.

The VICI combo regulator is a combination regulator and shut-off valve. The pressure is set using the screwdriver adjustment in the center

of the on/off knob. Turning the knob counterclockwise provides positive shutoff, while clockwise rotation restores gas pressure to within 0.05 psi of the setpoint.

Available with outlet pressure ranges of 0-15 psi, 0-30 psi, or 0-60 psi, VICI regulators can be ordered with 1/16" or 1/8" Valco internal fittings or 1/8" external fittings. Other configurations are available in OEM quantities.

Maximum operating temperature is 100°C, and maximum supply pressure is 250 psig. The influence of supply pressure on outlet pressure is less than 0.1 psi per 10 psi change in supply pressure.



**Pressure regulators**

**NEW**

*No knob and shut-off feature*

**SPECS**

**Maximum inlet pressure:**  
250 psi

**Maximum temperature:**  
100°C

- Wetted materials:**
- Anodized aluminum
  - Stainless steel
  - Viton

**Valco internal fittings**  
**1/16"**

*Pressure range:*

0-15 psi  
0-30 psi  
0-60 psi

*Prod No*  
PR51A15Z1  
PR51A30Z1  
PR51A60Z1

**Valco internal fittings**  
**1/8"**

*Prod No*

PR51A15Z2  
PR51A30Z2  
PR51A60Z2

**External fittings**  
**1/8"**

*Prod No*

PR51A15E2  
PR51A30E2  
PR51A60E2



**Combo pressure regulators**

**SPECS**

**Maximum inlet pressure:**  
250 psi

**Maximum temperature:**  
100°C

- Wetted materials:**
- Anodized aluminum
  - Stainless steel
  - Viton

**Valco internal fittings**  
**1/16"**

*Pressure range:*

0-15 psi  
0-30 psi  
0-60 psi

*Prod No*  
PR50A15Z1  
PR50A30Z1  
PR50A60Z1

**Valco internal fittings**  
**1/8"**

*Prod No*

PR50A15Z2  
PR50A30Z2  
PR50A60Z2

**External fittings**  
**1/8"**

*Prod No*

PR50A15E2  
PR50A30E2  
PR50A60E2