

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.

GAS FLOW CONTROLLERS

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 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.

➔ MORE INFO

Gas flow controllers
Model 100.... page 195
Model 202.....196
Model 300.....197

Model 100 gas flow controller

UPSTREAM-REFERENCED – FIXED SPAN

SPECIFICATIONS

Preset max flow rates

150 mL/min to
10 liters/min
(N₂ at 40 psi).

Maximum inlet pressure
200 psi

Maximum temperature
100°C

Standard fittings

- 1/8" external tube fittings (EAOR22)

Other fittings are available. Contact the factory for further information.

The Model 100 is available in a variety of preset maximum flow rates, from 150 mL/min to 10 liters/min (N₂ at 40 psi). Any flow controller in this series can be ordered with a 10-turn Spectrol digital dial (3 or 4 digits) to

provide a visual indication of the flow setting.

All flow rates listed below are based on N₂ at 40 psi inlet pressure. Maximum inlet pressure is 200 psi.

	Aluminum body Viton diaphragm	Aluminum body SS diaphragm	SS body Viton diaphragm	SS body SS diaphragm
Flow rate/min	Prod No	Prod No	Prod No	Prod No
With standard control knob				
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
With Spectrol 3-digit dial				
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
With Spectrol 4-digit dial				
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

STANDARD
CONTROL KNOB

SPECTROL 3-DIGIT DIAL
(4-DIGIT DIAL SIMILAR)

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 on page 196. Order separately.

Model 202

The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing are included.

For 1/8" OD tubing, order PZA22 on page 38.

Gas flow controllers

CONTROL DEVICES

Model 202 gas flow controller

UPSTREAM-REFERENCED – ADJUSTABLE SPAN

The Model 202 provides a unique span adjustment permitting it to be used for a variety of flow ranges. The span valve can adjust the flow range from a minimum flow as small as 5.0 mL/min up to a maximum flow of 1.6 L/min. After the span is adjusted, the control stem has a full 10 turns of resolution between the minimum and maximum flow rates.

When the flow controller is equipped with a Spectrol digital dial, settings are reproducible to better than 1%. All flow rates listed below are based on N₂ at 40 psi inlet pressure. Maximum inlet pressure is 200 psi.

SPECIFICATIONS

- Flow range**
Infinitely adjustable
Min: 5 mL/min
Max: 1.6 L/min
(N₂ at 40 psi)
- Maximum inlet pressure**
200 psi gas
- 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 below)

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

SPECTROL 3-DIGIT DIAL
(4-DIGIT DIAL SIMILAR)

STANDARD
CONTROL KNOB

ADAPTERS USED FOR VALCO AND CONDYNE CONTROL DEVICES

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

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 are included. For 1/8" OD tubing, order PZA22 on page 38.

Model 300 gas flow controller

DOWNSTREAM-REFERENCED – FIXED SPAN

SPECIFICATIONS

Maximum flow rate

1.6 L/min
with ambient
downstream pressure

Maximum inlet pressure

200 psi gas

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, as long as the downstream pressure remains constant.

	Aluminum body Viton diaphragm	Aluminum body SS diaphragm	SS body Viton diaphragm	SS body SS diaphragm
Flow rate/min	Prod No	Prod No	Prod No	Prod No
With standard control knob				
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
With Spectrol 3-digit dial				
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
With Spectrol 4-digit dial				
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
With screwdriver adjustable operator				
0 - 750 mL	FC31AV1			

? 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.

➔ SEE VIDEO OF MODEL 300

Watch a VICI YouTube video demonstrating the principle of a downstream-referenced flow controller.

STANDARD
CONTROL KNOB

SPECTROL 3-DIGIT DIAL
(4-DIGIT DIAL SIMILAR)

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 ($< 2 \mu\text{l}$), 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 (standard temp) or polyimide (high temp), 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/CO₂ actuated versions. Automated valves require a single 3-way solenoid. (see page 180) Applying 50 psi opens the valve; venting the air allows the spring to return the valve to the closed position.

On/off valves

STANDARD TEMPERATURE – HIGH PRESSURE

Fitting size	Bore	Manual with 1" knob	Air actuated with 1" standoff
		Prod No	Prod No
1/16"	0.50 mm	SFVO	ASFVO
	0.75 mm	SFVOL	ASFVOL

SPECIFICATIONS

10,000 psi liq
100°C max
Fittings: 1/16"

On/off valves

HIGH TEMPERATURE – MEDIUM PRESSURE

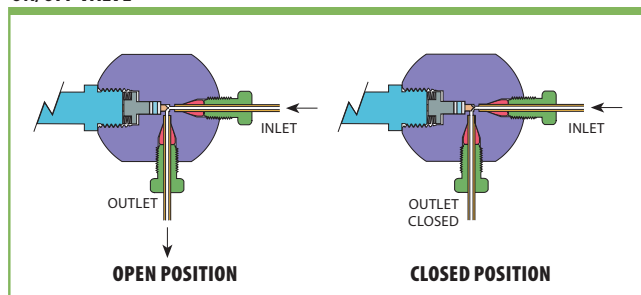
Fitting size	Bore	Manual with 2" knob	Manual with 4" knob	Air actuated with 2" standoff	Air actuated with 4" standoff
		Prod No	Prod No	Prod No	Prod No
1/16"	0.50 mm	SFVOHT	SFVOHT4	ASFVOHT	ASFVOHT4
	0.75 mm	SFVOLHT	SFVOLHT4	ASFVOLHT	ASFVOLHT4
1/8"	1.50 mm	–	–	ASFVO2HT	ASFVO2HT4

SPECIFICATIONS

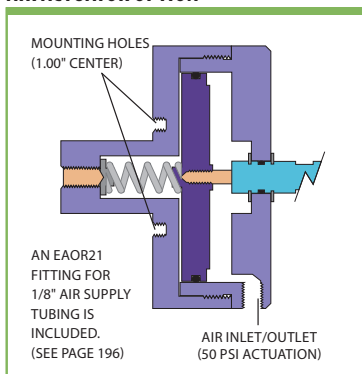
6,000 psi liq
300°C max
Fittings: 1/16"
2,000 psi liq
300°C max
Fittings: 1/8"

*For liquids. Not suitable for use with gases.

ON/OFF VALVE



AIR ACTUATOR OPTION



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

40,000 psi valves . . . p 65

→ SEE ALSO

3-way solenoid . page 180

Prime/purge valves

STANDARD TEMPERATURE – HIGH PRESSURE

SPECIFICATIONS		Manual with 1" knob	Air actuated with 1" standoff
10,000 psi liq			
100°C max			
Fittings: 1/16"			
Fitting size	Bore	Prod No	Prod No
1/16"	0.50 mm	SFV	ASFV
	0.75 mm	SFVL	ASFVL

Prime/purge valves

HIGH TEMPERATURE – MEDIUM PRESSURE

SPECIFICATIONS		Manual with 2" knob	Manual with 4" knob	Air actuated with 2" standoff	Air actuated with 4" standoff
6,000 psi liq					
300°C max					
Fittings: 1/16"					
2,000 psi liq					
300°C max					
Fittings: 1/8"					
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

For liquids. Not suitable for use with gases.

AIR ACTUATED
WITH 2"
STANDOFF

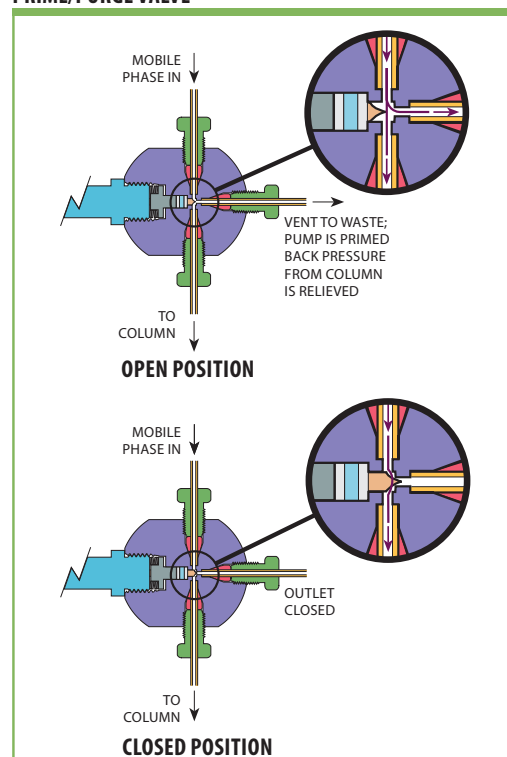
MANUAL WITH
2" KNOB

AIR ACTUATED
WITH 4" STANDOFF

ON/OFF AND PRIME/PURGE VALVES

Types of actuation

PRIME/PURGE VALVE



Combo valves

CONTROL DEVICES

COMBO VALVES

These needle and shut-off valves provide 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, they are ideal for providing hydrogen and air to an FID, or for supplying make-up or combustion gas in a wide variety of applications.

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

Valve bodies are anodized aluminum or stainless steel, with Viton® O-ring seals. Maximum temperature is

100°C, with maximum inlet pressure of 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 or rate flow identification are available in blue, green, red, or black, .62" or 1.25" long. Knob length and color must be specified at time of order, as these cannot be changed after assembly.

Combo valves

1/16" VALCO ZDV FITTINGS

Maximum flow @ 40 psi He or N₂

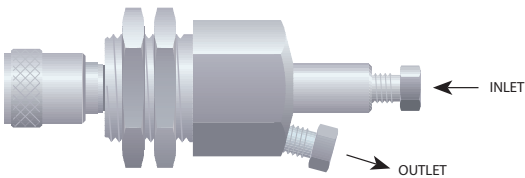
	Aluminum body	Stainless body
	Prod No	Prod No
10 ml/min	CNV1A10S1	CNV1S10S1
50 ml/min	CNV1A50S1	CNV1S50S1
150 ml/min	CNV1A150S1	CNV1S150S1
250 ml/min	CNV1A250S1	CNV1S250S1
500 ml/min	CNV1A500S1	CNV1S500S1

SPECIFICATIONS

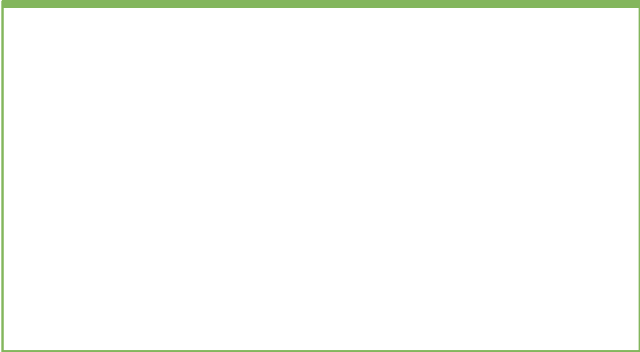
Inlet pressure
100 psi gas

Maximum temperature
100°C

Standard knob is silver-colored and .62" long. Contact the factory for combo valves with a knob in blue, green, red, or black. Knobs are available in .62" and 1.25" lengths.



COMBO VALVES WITH OPTIONAL COLORED KNOBS



CONDYNE COMBO VALVES

Very similar in function to the design on the facing page, these are refined versions of the hex-bodied combo valves originally made by Condyne.

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, with standard colors listed in the table below. Non-standard knob colors can be specified when ordering; however, knobs cannot be changed after initial assembly.

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

1/16" OR 1/8" VALCO ZDV FITTINGS

SPECIFICATIONS

Maximum inlet pressure
100 psi gas
Maximum temperature
100°C

Maximum flow @ 40 psi He or N₂

	<i>Knob color</i>	1/16" Valco fittings	1/8" Valco fittings
		<i>Prod No</i>	<i>Prod No</i>
10 ml/min	Green	CVA10GS1	CVA10GS2
50 ml/min	Red	CVA50RS1	CVA50RS2
150 ml/min	Blue	CVA150US1	CVA150US2
500 ml/min	Black	CVA500BS1	CVA500BS2
1 liter/min	Yellow	CVA1KYS1	CVA1KYS2

Micrometering valves

CONTROL DEVICES

MICROMETERING VALVES

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.

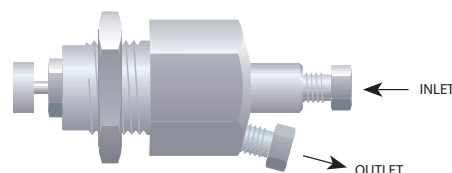
1/16" micrometering valves

WITH VALCO FITTINGS

Seal	Lubrication	Prod No
Standard: 2–225 ml/min @ 15 psig N₂ inlet		
Viton	Lubricated	ZBNV1
	Non-lubricated	ZBNV1-D
Kalrez	Non-lubricated	ZBNV1-KZ
Fine control: 2–175 ml/min @ 15 psig N₂ inlet		
Viton	Lubricated	ZBNV1F
	Non-lubricated	ZBNV1F-D
Kalrez	Non-lubricated	ZBNV1F-KZ
Low flow: 2–90 ml/min @ 40 psig N₂ inlet		
Viton	Lubricated	ZBNV1LF
	Non-lubricated	ZBNV1LF-D
Kalrez	Non-lubricated	ZBNV1LF-KZ

SPECIFICATIONS

Maximum pressure
1000 psi gas
Maximum temperature
Viton 225°C
Kalrez 315°C



1/16" micrometering valves

WITH 1/8" TUBES

Seal	Lubrication	Prod No
Fine control: 2–175 ml/min @ 15 psig N₂ inlet		
Viton	Lubricated	BNV1
	Non-lubricated	BNV1-D
Kalrez	Non-lubricated	BNV1-KZ
Low flow: 2–90 ml/min @ 40 psig N₂ inlet		
Viton	Lubricated	BNV1LF
	Non-lubricated	BNV1LF-D
Kalrez	Non-lubricated	BNV1LF-KZ

SPECIFICATIONS

Maximum pressure
1000 psi gas
Maximum temperature
Viton 225°C
Kalrez 315°C

OPTIONAL

- Dual outlet versions are available in most configurations.
- A cap is available to protect the setting from getting changed by accidental contact. (Product No. ZBNV1-C)

Contact the factory for more information on these options.

PRESSURE REGULATORS

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.

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 0.5 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.

Compact pressure regulators

NO KNOB OR SHUT-OFF FEATURE

SPECIFICATIONS

Maximum inlet pressure

250 psi gas

Maximum temperature

100°C

Wetted materials

- Anodized aluminum
- Stainless steel
- Viton

- Enhanced thermal stability, linearity, and shock resistance
- Compact size (1.125" diameter by 2" long)

Pressure range	1/16" Valco internal fittings	1/8" Valco internal fittings	1/8" external fittings
	Prod No	Prod No	Prod No
0-15 psi	PR51A15Z1	PR51A15Z2	PR51A15E2
0-30 psi	PR51A30Z1	PR51A30Z2	PR51A30E2
0-60 psi	PR51A60Z1	PR51A60Z2	PR51A60E2

Combo pressure regulators

WITH SHUT-OFF FEATURE

SPECIFICATIONS

Maximum inlet pressure

250 psi gas

Maximum temperature

100°C

Wetted materials

- Anodized aluminum
- Stainless steel
- Viton

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 0.5 psi of the setpoint.

Pressure range	1/16" Valco internal fittings	1/8" Valco internal fittings	1/8" external fittings
	Prod No	Prod No	Prod No
0-15 psi	PR50A15Z1	PR50A15Z2	PR50A15E2
0-30 psi	PR50A30Z1	PR50A30Z2	PR50A30E2
0-60 psi	PR50A60Z1	PR50A60Z2	PR50A60E2