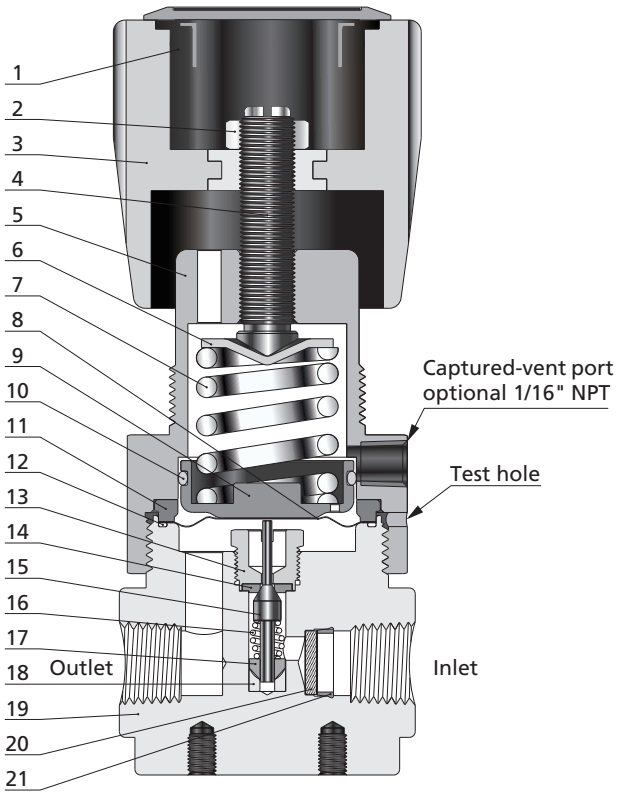
Regulators General Introduction

A pressure reducing regulator is positioned where the high pressure of a medium needs to be reduced and maintained to a lower and stable level. By turning the adjustment handle, the tension of range spring would be changed so as to control the outlet pressure of the regulator.

Diaphragm Regulators



Item	Component	Material/Specification
1	Hole Plug	ABS
2	Nut	Brass
3	Knob Handle	ABS
4	Range Screw	304 SS/ASTM A479 or Brass
5	Bonnet	304 SS/ASTM A479 or Brass
6	Spring Button	304 SS/ASTM A276
7	Range Spring	Alloy
8	Diaphragm	Hastelloy
9	Spring Plate	Aluminium alloy
10	O-ring	Buna-N
11	Gland	304 SS/ASTM A479
12	Seal Ring	PTFE/ASTM D1710
13	Seat Retainer	316L SS/ASTM A276
14	Seat	PCTFE/ASTM D1430
15	Lift Poppet	N10276/ASTM B574
16	Poppet Spring	Alloy X-750
17	Poppet Damper	PTFE/ASTM D1710
18	Friction Sleeve	316L SS/ASTM A479
19	Body	316L SS/ASTM A479 or 316 SS/ASTM A479 or Brass
20	Filter	316L SS
21	Retaining Ring	PTFE/ASTM D1710

Features

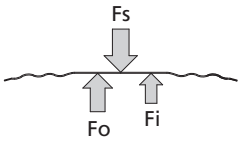
- ◎ Metal diaphragm pressure sensing mechanism ensures excellent sensitivity and set point pressure stability. Piston sensing mechanism (shown on the next page) capable of withstanding higher pressures
- ◎ The valve stem is designed with fine threads, allowing for precise adjustment of outlet pressure with low torque
- ◎ Poppet damper keeps the poppet positioned accurately and reduces vibration
- ◎ The regulator seat is easily damaged by contaminants in the system. 40 μm filter is installed at the inlet to protect the regulator. FLR-3, FLR-5, and HPL-06 series are not fitted with filter, if there are particles in the media, a filter should be installed upstream
- ◎ FCR-1S, FLR-3, and FLR-5 series diaphragm regulators are fitted with a captured-vent port through which the media can be discharged to a designated location in the event of an accidental rupture of the regulator diaphragm

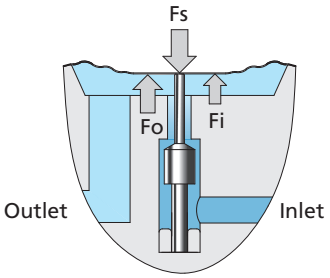
Principle for Pressure Reducing

When the regulator is in operation, the inlet pressure (Fi) plus the out pressure (Fo) should be equal to the downward force on the diaphragm by the compressed spring (Fs), namely Fi+Fo=Fs to reach an equilibrium.

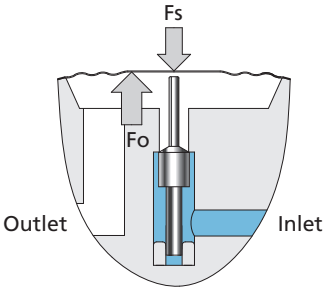
When the outlet pressure (Fo) is lower than the set pressure, the poppet would be pushed away from the seat by the excess downward force, allowing more high pressure gas to enter the chamber so as to increase the outlet pressure.

As soon as the outlet pressure (Fo) exceeds the set pressure, the excess upstream force shall lift the poppet back to the seat to limit high pressure gas entering, so as to reduce the outlet pressure.





Fs > Fo+Fi

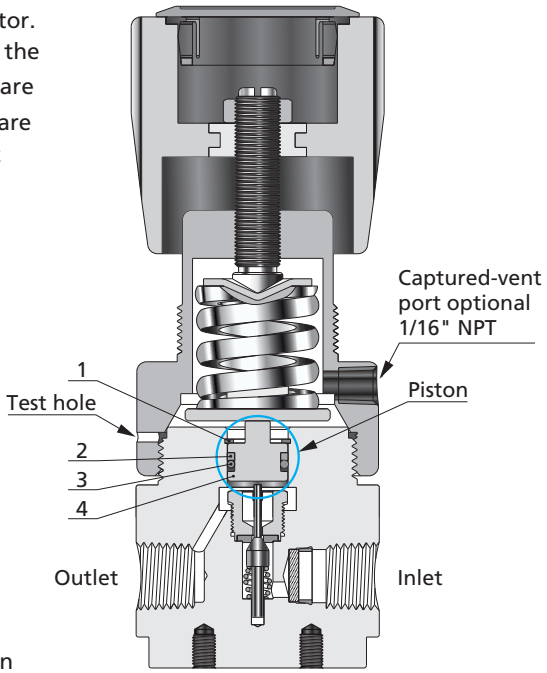


Fs < Fo+Fi
(In this figure, inlet pressure doesn't act on diaphragm)

Piston Regulators

A piston regulator has the same working principle as a diaphragm regulator. The key distinction is that the diaphragm is changed to a piston to satisfy the needs for high pressure applications. Piston sensing mechanisms typically are used to regulate higher pressures than a diaphragm can withstand. They are also more resistant to damage caused by pressure spikes and have a short stroke to maximize cycle life.

Item	Component	Material/Specification
1	Circlips for Bores	Stainless Steel
2	Retaining Ring	PTFE/ASTM D1710
3	O-ring	FKM or FFKM
4	Piston	316L SS/ASTM A479



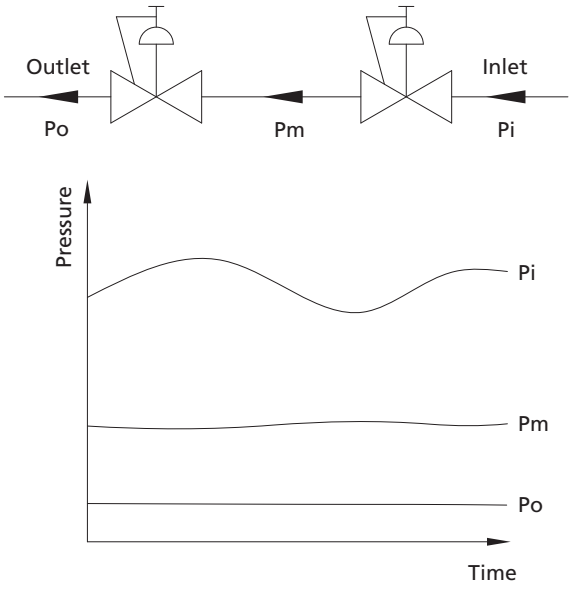
Features

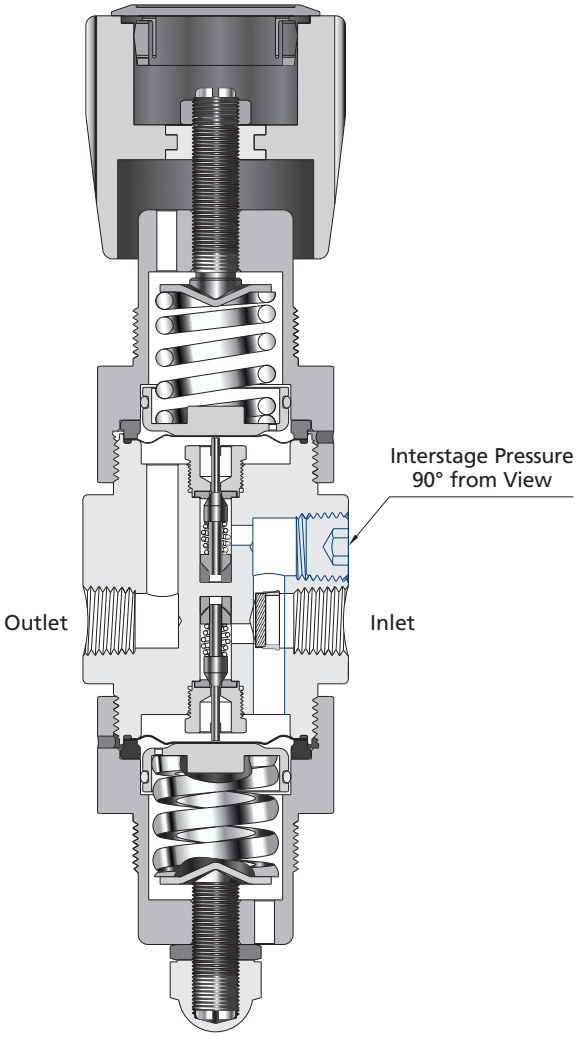
- The piston sensing mechanism can withstand higher pressures, so piston regulators have a larger outlet pressure control range
- FCR-2 and FLR-2 series piston regulators are fitted with a captured-vent port, through which the media can be discharged to a designated location in the event of accidental failure of the piston seal of the regulators
- Piston regulators, except for FRB-1 series, are available with optional self-venting to allow excessive outlet pressure to be discharged

Dual-Stage Diaphragm Regulators

When the inlet pressure (Pi) decreases, the outlet pressure (Po) shall increase. Even though the increase may not be significant, the dual-stage regulator would be a better option when more stable pressure is required, and the upstream pressure fluctuates violently.

The function of a dual-stage regulator is similar to that of two single-stage regulators in series. The 1st-stage regulator reduces the inlet pressure to an intermediate level for the 2nd-stage regulator to adjust to a constant output, which at the most extent ensures the stability of the outlet pressure.

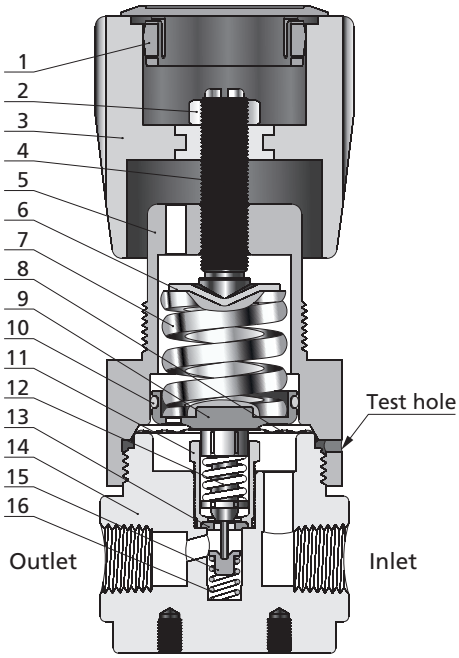




Back Pressure Regulators General Introduction

Back pressure regulators control inlet pressure by balancing an adjustable spring force against the force of the inlet pressure. The spring force is adjusted by turning the handle/stem, which sets the desired inlet pressure.

Back Pressure Diaphragm Regulators



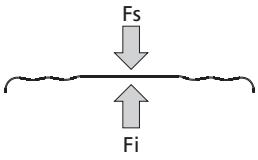
Item	Component	Material/Specification
1	Hole Plug	ABS
2	Nut	C36000/ASTM B16
3	Knob Handle	ABS
4	Range Screw	304 SS/ASTM A479 or Brass
5	Bonnet	304 SS/ASTM A479 or Brass
6	Spring Button	304 SS/ASTM A240
7	Range Spring	Alloy
8	Diaphragm	316L SS
9	Spring Plate	Aluminium alloy
10	O-ring	NBR
11	Seat Retainer	316L SS/ASTM A479
12	Lift Poppet	316L SS/ASTM A479
13	Seat	PCTFE/ASTM D1430
14	Body	316L SS/ASTM A479 or 316 SS/ASTM A479 or Brass
15	Friction Sleeve	316L SS/ASTM A479
16	Poppet Spring	316L SS/ASTM A313

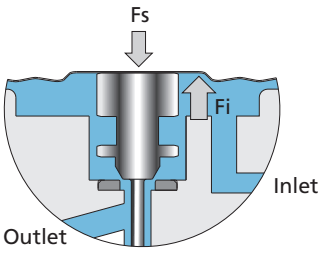
Features

◎ Metal diaphragm pressure sensing mechanism to ensure excellent sensitivity and stable set point pressures
◎ Stem designed with fine-pitch threads to enable precise spring adjustment with low torque
◎ Metal-to-metal diaphragm seal minimizes the potential for leakage

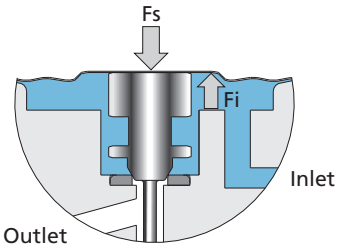
Working Principle

When the force (Fs) acting on the diaphragm by the range spring is less than the force (Fi) acting on the diaphragm by the inlet pressure, the lift poppet and the seat seal are separated, where the channel opens. When the force (Fs) acting on the diaphragm by the range spring is greater than the force (Fi) acting on the diaphragm by the inlet pressure, the lift poppet and the seat seal fit, where the channel closes.





Fs < Fi

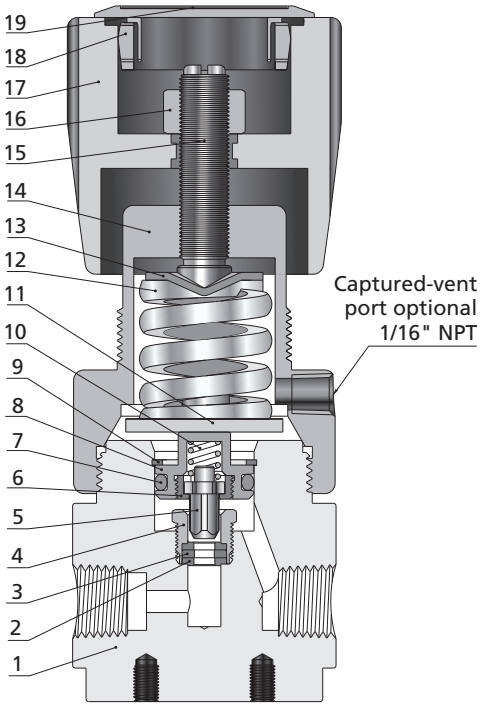


Fs > Fi

Back Pressure Piston Regulators

A piston regulator has the same working principle as a diaphragm regulator. The key distinction is that the diaphragm is changed to a piston to satisfy the needs for high pressure applications. Piston sensing mechanisms typically are used to regulate higher pressures than a diaphragm can withstand. They are also more resistant to damage caused by pressure spikes and have a short stroke to maximize cycle life.

Item	Component	Material/Specification
1	Body	316L SS/ASTM A479 or Brass
2	Seat	PCTFE/ASTM D1430
3	Seat Gasket	316L SS/ASTM A479
4	Seat Retainer	316L SS/ASTM A479
5	Lift Poppet	316L SS/ASTM A479
6	Piston Nut	316L SS/ASTM A479
7	O-ring	NBR or FKM or FFKM
8	Piston	316L SS/ASTM A479
9	Circlips for Bores	304 SS/GB 893.126
10	Poppet Spring	316L SS
11	Spring Plate	Brass
12	Range Spring	Alloy
13	Spring Button	304 SS/ASTM A479
14	Bonnet	304 SS/ASTM A479 or Brass
15	Range Screw	Brass
16	Nut	Brass
17	Knob Handle	ABS
18	Hole Plug	ABS
19	Label	PVC



Features

◎ Piston sensing mechanism can withstand higher pressures, so piston back pressure regulators have a larger inlet pressure adjustment range

◎ Stem designed with fine-pitch threads enables precise spring adjustment with low torque

◎ BPR-2 series piston back pressure regulators are equipped with capture-venting holes. When the piston seal of the back pressure regulator fails accidentally, the media can be released to a designated location through the capture-venting holes

Series of Products

Cylinder Pressure Regulators

Cylinder pressure regulators are typically used to reduce the high pressure in cylinders to a desired lower pressure.

Line Pressure Regulators

Line pressure regulators are typically used to reduce the high pressure in pipelines to a desired lower pressure.

Pressure Control Panels

The pressure control panels consist of a cylinder pressure regulator (FCR-1 or FCR-2 series) and a three-way diaphragm valve with cut-off, pressure reducing and vent functions. They are typically installed in gas storage areas to depressurize high pressure media from cylinders or tanks to a desired lower pressure.

Changeover Systems

The changeover system switches between the two gas sources and selects one of them to supply gas to ensure the continuity of gas consumption.

There are manual changeover system and automatic changeover system.

Manual changeover system, when a gas source is exhausted, you need to manually switch to another gas supply.

Automatic changeover system, when a gas source is exhausted, the system automatically switches to another gas supply.

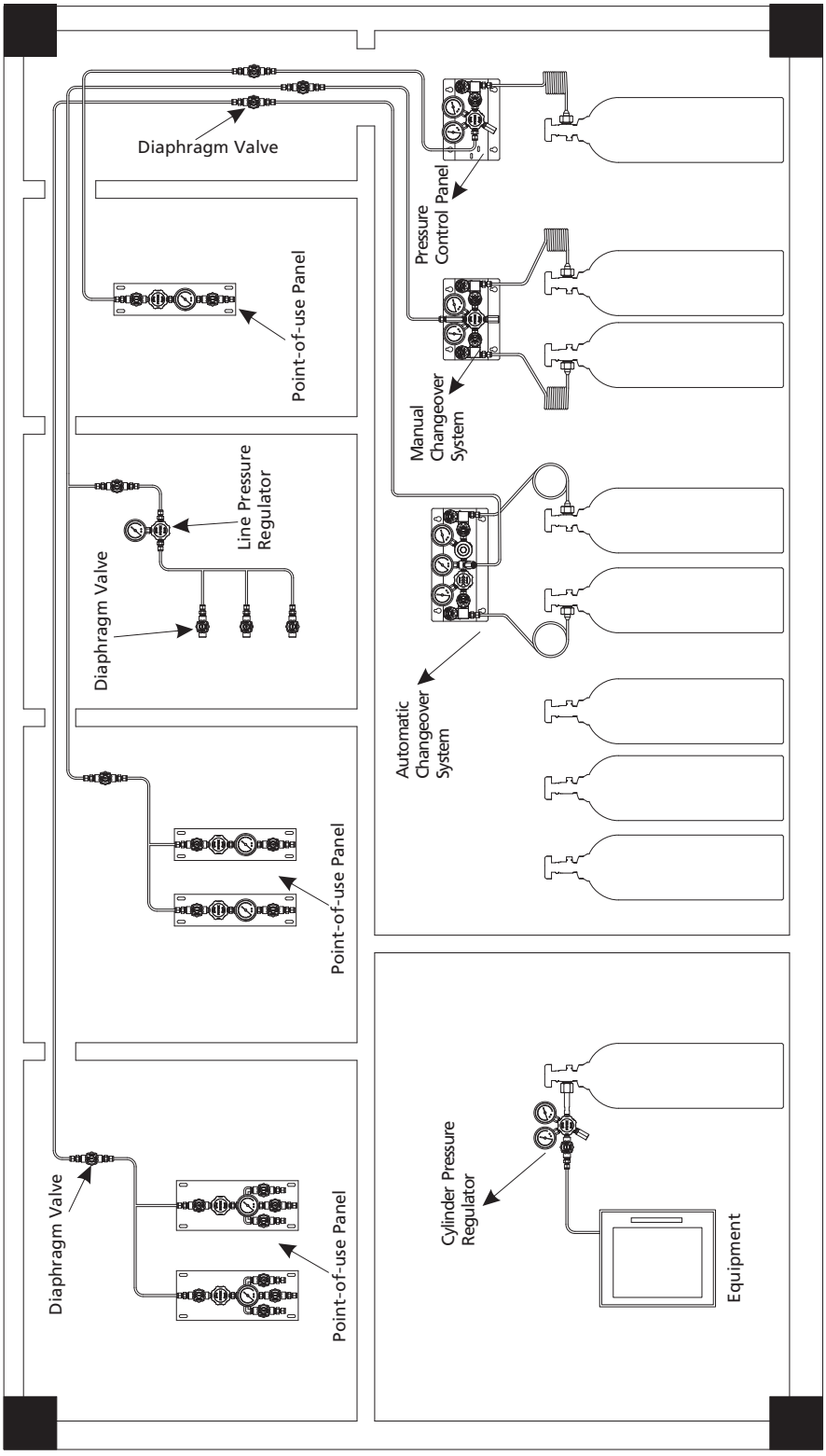
Point-of-Use Panels

The point-of-use panels consist of a line pressure regulator (FCR-1 series or FCR-1S series) and a diaphragm valve with cut-off and pressure reducing functions. They are typically installed in a gas point to precisely adjust the system to a desired pressure.

Back Pressure Regulators

Back pressure regulators are used to control system back pressure and are typically used in analytical and metering systems.

Products Practical Application



Pressure Regulator Selection Guide

Select diaphragm regulators when the outlet pressure < 500 psig.
Select piston regulators when the outlet pressure ⩾ 500 psig.
Dual-stage diaphragm regulators are recommended when the inlet pressure fluctuates frequently but no outlet pressure variation is desired.

Type	Series	Sensing Mechanism	Maximum Inlet Pressure psig	Outlet Pressure Range psig	Flow Rate Cv
Cylinder Pressure Regulators	FCR-1	Diaphragm	4500	0-500	0.06
	FCR-1S	Diaphragm	4500	0-200	0.06
	FCR-2	Piston	6000	0-2500	0.06
	FCR-1D	Dual-stage Diaphragm	4500	0-250	0.05
Line Pressure Regulators	FLR-1	Diaphragm	1500	0-250	0.14
	FLR-2	Piston	4500	0-1000	0.06 0.1 (Vent)
	FLR-3	Diaphragm	3000	0-200	1.0
	FLR-5	Diaphragm	500	0-150	1.8
	FBR-1	Piston	6000	0-1800	0.06
	HPR-10	Piston	10000	10-10000	0.06
	HPL-06	Piston	4500	0-1500	2.0
High Performance High Purity Pressure Regulators	FHR-1	Diaphragm①	3500	0-150	0.06 0.15 (Inlet pressure 600, 1000)
Ultra High Purity Miniature Pressure Regulators	FHR-M	Diaphragm①	145	0-60	0.06
Steam Heated Vaporizing Pressure Regulators	VPR	Diaphragm	3600	0-500	0.06
Pressure Control Panels②	FSR-1	Diaphragm	4500	0-500	0.06
	FSR-2	Piston	4500	0-2500	0.06 0.1 (Vent)
Changeover Systems②	FDR-1	Diaphragm	4500	0-500	0.06
	FDR-2	Piston	4500	0-2500	0.06 0.1 (Vent)
	CEPR	Diaphragm	4500	85-265	0.06
	FDR-1L	Diaphragm	4500	85-265	0.06
	DPPR	Diaphragm	4500	0-150	0.06
	FDR-1T	Diaphragm	4500	0-150	0.06
Point-of-Use Panels②	FPR-1	Diaphragm	1500	0-500	0.14
	FPR-1S	Diaphragm	1500	0-200	0.06
Back Pressure Regulators	BPR-1	Diaphragm	250	0-250	0.3
	BPR-2	Piston	1000	10-1000	0.3
	BPR-3	Piston	10000	5-10000	0.25

Notes:
① Tied Diaphragm.
② Sensing mechanism of pressure control panels, changeover systems and point-of-use panels refers to the sensing mechanism of the pressure regulator.

User's Guide

1. Pressure regulators are sensitive components, so handle them gently and do not bump them.
2. Pressure regulators with bottom mounting or panel mounting type available, when panel mounting is selected, handles of some series products need to be removed for installation. When removing the handle, ensure that the handle and stem positions are not changed, otherwise the outlet pressure range will not be the same as the factory setting.
3. Before the pressure regulators are connected to the piping system, the system must be purged to remove impurities from the system, such as iron filings from tubing cutting or welding slag from tubing welding.
4. If the media contain impurities, a filter must be installed upstream, otherwise the impurities will damage the pressure regulators, which will lead to the failure of the pressure regulating function of the pressure regulators and the continuous increase of downstream pressure. The downstream pressure will continue to rise and damage the downstream pressure gauge or other equipment. FITOK FT series 15 μm filters are recommended.
5. Do not allow any loose thread sealing tape or thread sealant to enter the pressure regulators when it is installed.
6. Figure out the inlet and outlet when installing the pressure regulators.
7. After the pressure regulators are connected to the pipeline, make sure that the pressure regulators are in the closed position by turning the handle before using the pressure regulators. For pressure regulators, turn the handle counterclockwise until it is loosened to the closed position.
8. Check connections for leakage by applying leak detection fluid to all connections, turning the handle clockwise to set the outlet pressure to the desired pressure, and observing the connections for leakage.
9. If the pressure regulators are used for liquid media, the filter element installed at the inlet of the pressure regulators may clog and cause a pressure drop and flow reduction. It is recommended to remove the filter element and install a filter upstream the inlet of the pressure regulators.