



Type FVB

Pressure Reducing Regulator Manual

Type FVB Pressure Reducing Regulator

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WARNING

Failure to follow these instructions or properly install and maintain this equipment could result in an explosion, fire, and/or chemical contamination causing property damage and personal injury or death.

Jeon Regulators must be installed, operated and maintained in accordance with federal, state, and local codes, rules and regulations, and Emerson Process Management Asia Pacific Pte Ltd, Regulator Technologies (Regulator Technologies) instructions.

Installation, operation, and maintenance procedures performed by unqualified personnel may result in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Use qualified personnel when installing, operating and maintaining Type FVB Regulator.

Type FVB Pressure Reducing Regulator

1. Introduction

Type FVB pressure reducing regulator is a spring-loaded direct-operated gas regulator which is designed for low and medium pressure gas distribution networks. It regulates and stabilizes gas pressure for residential and industrial applications.

2. Features and Benefits

- **Modular structure design** – The actuator and balance port assembly can be assembled in the body from the top. This allows the regulator to be maintained easily in-line.
- **Simple pressure setting** – User friendly.
- **Integral overpressure shut-off (OPSO), overpressure and underpressure shut-off (OPSO/UPS0)** – Incorporate precautionary measures and thus safe to use.
- **Easy installation and maintenance** – Reduce set-up time and downtime.

3. Specifications

Maximum Inlet Pressure:	0.02 to 0.4 MPa / 0.2 to 4 bar / 2.90 to 58 psig
Outlet Pressure Range:	1.5 to 50 kPa / 15 to 500 mbar / 6-Inches w.c. to 4.3 psig See Table 1
Accuracy Class:	Up to AC5
Lockup Pressure Class:	Up to SG10
Slam-Shut Pressure Class:	Up to AG5
Temperature Capability:	-10 to 60°C / 14 to 140°F
Body Size:	DN 50 / 2 inches
End Connection:	CL125 FF, PN 16 RF

Materials of Construction

- Body and flanges:** Cast iron
- Cover:** Cast steel
- Diaphragm:** Nitrile (NBR)
- Disk:** Stainless steel and Fluorocarbon (FKM)
- Orifice:** Stainless steel
- Control Spring:** Zinc-plated steel

Option

- Without Slam Shut Device

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4. Principle of Operation

The outlet pressure of the regulator is set through the Main Actuator Spring. When gas consumption at downstream increases, the outlet pressure, P_2 tends to drop. This pressure drop is sensed below the main diaphragm, causing the main diaphragm to move down, as a result of the acting Main Actuator Spring. This also causes the balance of the Lever, the Push Rod, the Stem and the Balance Port Spring to change. The Main Actuator Spring overcomes the pressure beneath the diaphragm and pushes the diaphragm downward allowing the lever to move counterclockwise. The balance port spring will then push the push rod and the stem towards the lever causing the valve disk, which is connected through the stem, to move away from the orifice and creates an opening. This will allow the gas to flow downstream keeping the outlet pressure constant.

When the amount of gas increases at the downstream of the regulator, the operating process will be in the reverse until the regulator achieves lockup.

The shut-off pressure of the slam-shut device, Type JVQ, is set through the Overpressure Adjusting Spring and the Underpressure Adjusting Spring. When outlet pressure, P_2 of the regulator exceeds (or is lower than) the set pressure of the slam-shut, the slam-shut diaphragm moves upwards (or downwards) triggering the tripping mechanism of the slam-shut stem and allows the disk valve to move left rapidly and close the orifice.

Figure 1: Type FVB Operational Schematic

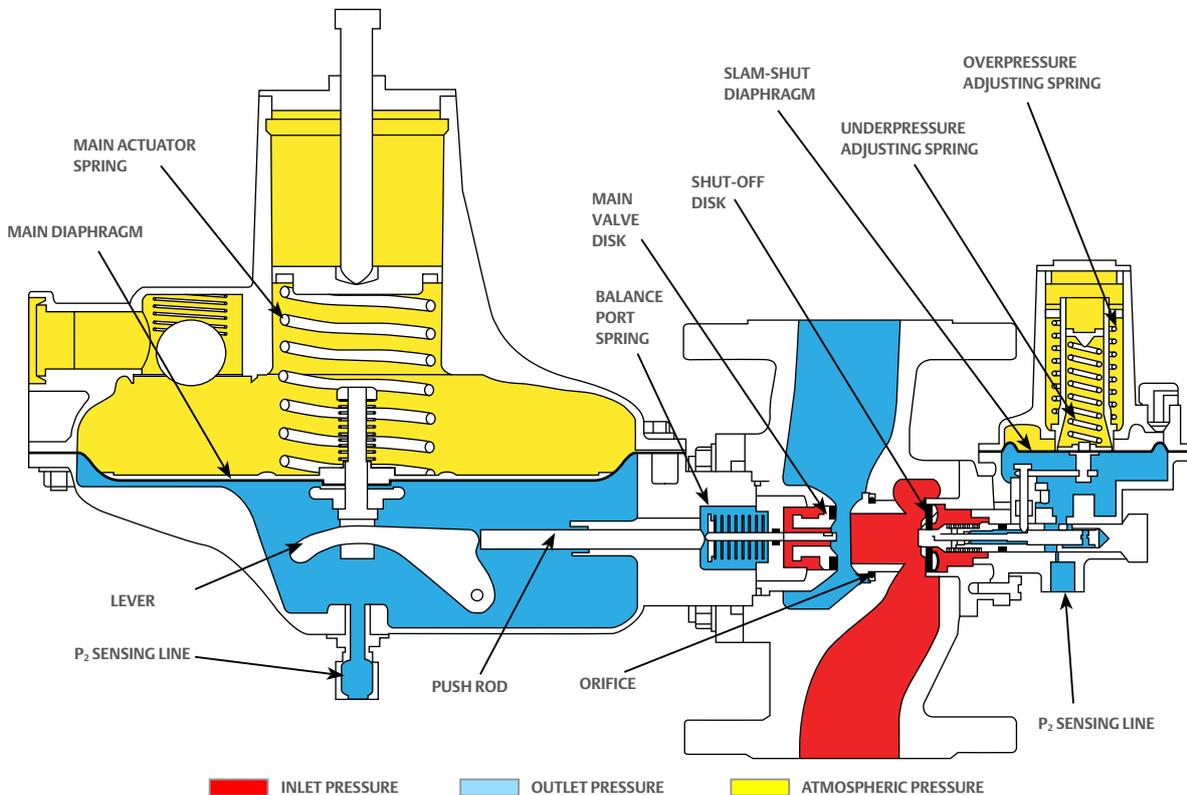


Table 1: Type FVB Flow Capacities

Outlet Pressure		FLOW CAPACITIES IN Sm ³ /h / SCFH OF 0.6 SPECIFIC GRAVITY NATURAL GAS											
mbar	psig	Inlet Pressure, bar / psig											
		0.2 / 2.90		0.50 / 7.25		1.00 / 14.5		2.0 / 29.0		3.0 / 43.5		4.0 / 58	
15	0.22	105	3708	180	6356	255	9005						
24	0.35	160	5650	250	8828								
30	0.44	150	5297	250	8828								
50	0.72	135	4767	250	8828								
100	1.45	120	4237	230	8122								
150	2.18			215	7592								
200	2.90			200	7062	300	10,594	400	14,125	500	17,657	600	21,188
250	3.63			125	7062								
300	4.35		----	125	4414								
350	5.08			100	3531								
400	5.80												
500	7.25												

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5. Dimensions and Weight

PRODUCT DESCRIPTION	APPROXIMATE WEIGHT
FVB with slam-shut valve	21 kg
FVB without slam-shut valve	16.5 kg

Figure 2: Type FVB Regulator with Slam Shut Valve Dimensional Drawing

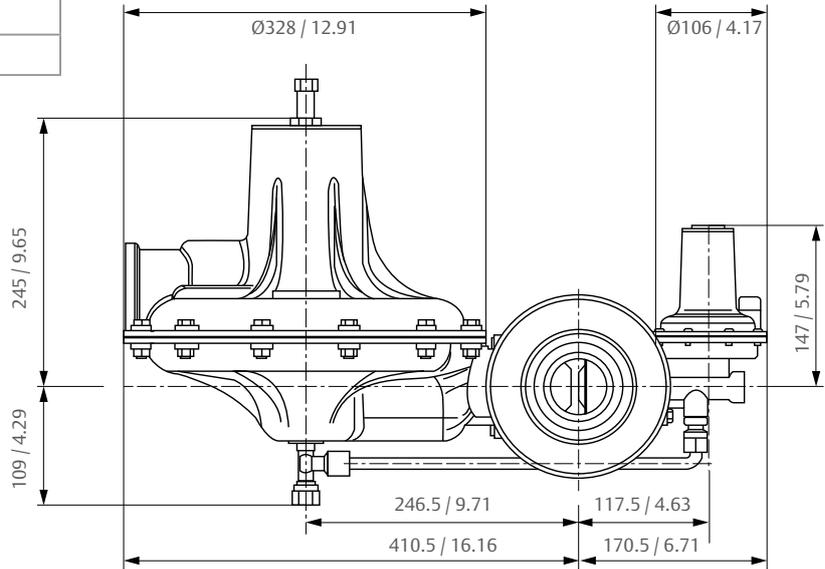
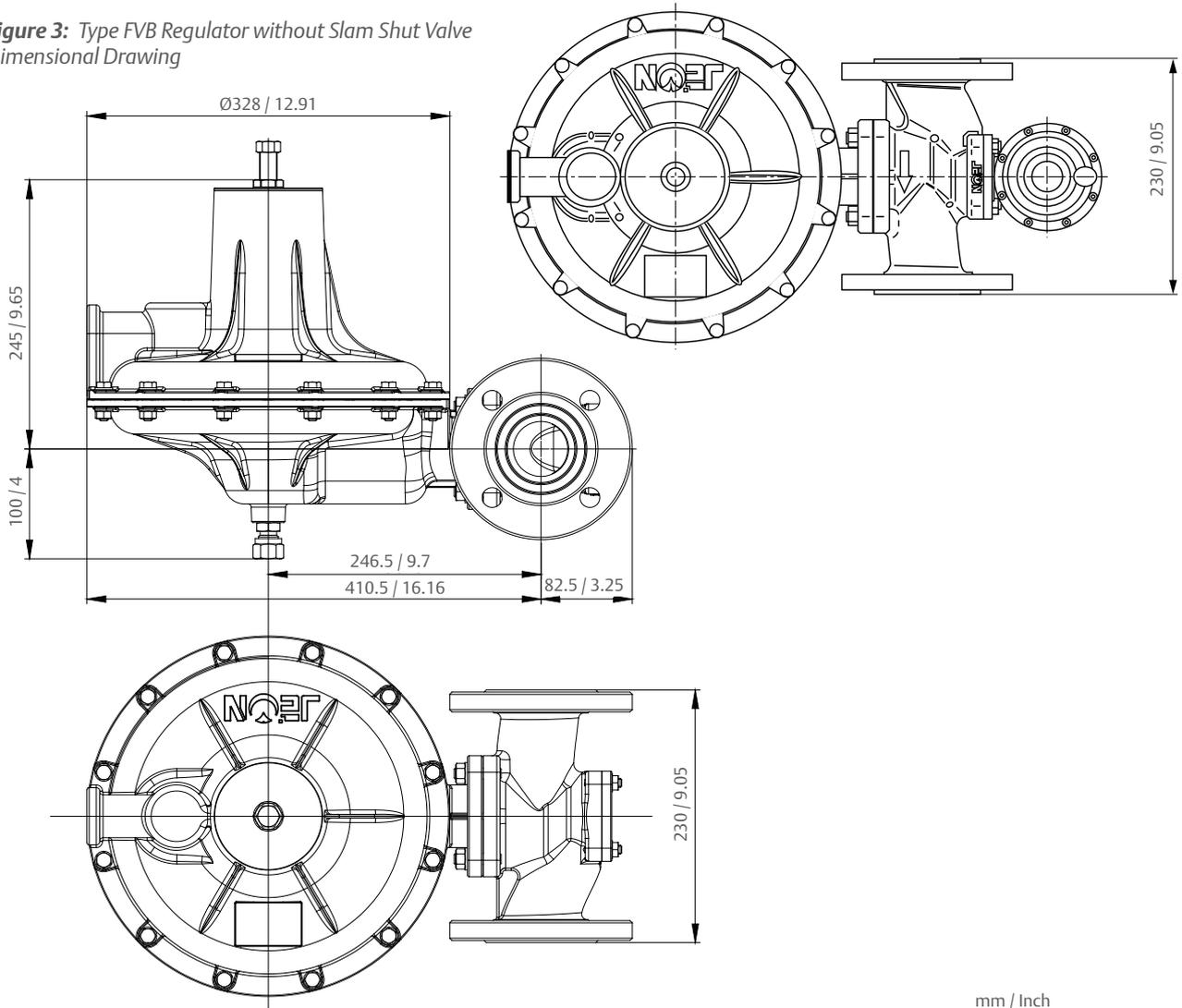


Figure 3: Type FVB Regulator without Slam Shut Valve Dimensional Drawing



mm / Inch

Type FVB Pressure Reducing Regulator

⚠ WARNING

Overpressuring a regulator or associated equipment may cause leakage, part damage, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas. Do not install a regulator where service conditions can exceed the specifications listed on the Specifications section and of any applicable local, state or federal codes and regulations.

Additionally, physical damage to the regulator may result in personal injury or property damage due to escaping of accumulated fluid. To avoid such injury and damage, install the regulator in a safe location.

6. Installation

The pressure in the pipeline should be checked to make sure that the system pressure is within the pressure range stated on the regulator nameplate and the flow direction of the pipeline should match the arrow stamped on the regulator. After installation, use soap solution as gas detector to run a leak test to ensure that all connections are well sealed.

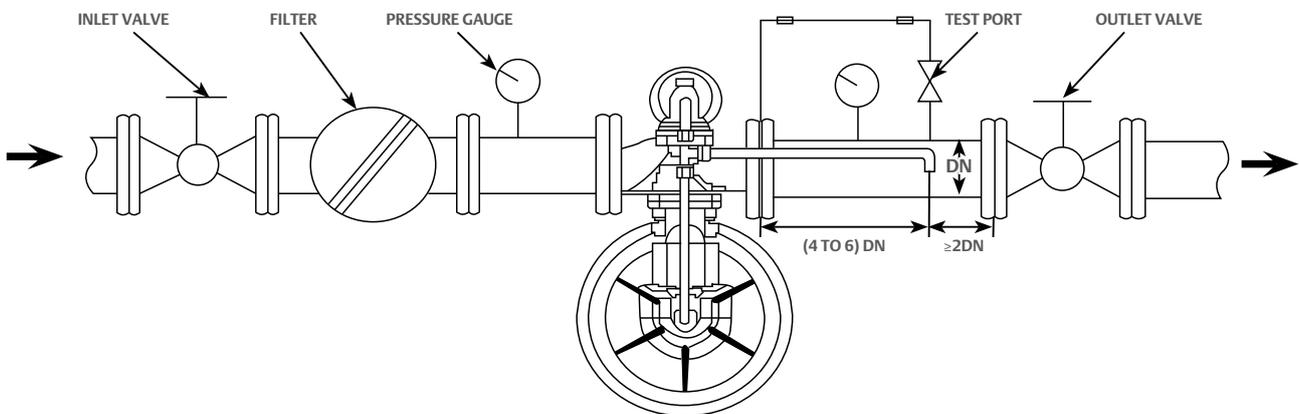
If a quick-open (or close) equipment is installed after the regulator, reserve some volume between them to avoid significant pressure drop due to rapid flow changes. Install the regulator horizontally with a filter at the inlet of the regulator. Provide a sufficient length of sensing line, approximately 4 to 6 times of the diameter of the pipe (DN) at the outlet of the regulator as shown in Figure 3. This is to allow the stable feedback signals from the slam-shut device.

It is recommended to regulate the outlet gas velocity at no more than 30 m/s / 98.4 ft/s. Use soap solution or gas detector to run a leak test to ensure that all connections are well sealed.

Note:

The actuator used in Type FVB regulator has to be installed vertically facing down or horizontal. Do not install the actuator facing up vertically.

Figure 4: Type FVB Regulator Installation Diagram



Type FVB Pressure Reducing Regulator

7. Operation

1. Startup

1. Make sure that the dry gas filter and the isolation valve are properly installed at the inlet pipe of Type FVB regulator.
2. Ensure that the slam-shut valve is open.
3. Keep the outlet isolation valve slightly open.
4. Slowly open the inlet isolation valve.
5. Keep in this position until the flow stabilizes.
6. Fully open the inlet and outlet isolation valve. The loading pressure can regulate the outlet pressure by moving the disk to or away from the orifice.

2. Outlet Pressure Setup

The regulator control spring is factory set at a set point specified in the order. If no set point is specified, the control spring is set at approximately the midpoint of the spring range, so an initial adjustment may be required to give the desired result. If adjustment of the outlet pressure is required, slightly open the outlet isolation valve, and slowly open the inlet isolation valve. Manually turn the adjusting screw on the pilot to achieve the required outlet pressure. Turning the adjusting screw clockwise will increase outlet pressure setting while turning counterclockwise reduces the outlet pressure setting.

Table 2: Type FVB Regulator Outlet Pressure Ranges

END CONNECTIONS STYLES	MAIN ACTUATOR PRESSURE RANGE		MAIN ACTUATOR	MAIN ACTUATOR SPRING PRESSURE RANGE		MAIN ACTUATOR SPRING	COLOR
	mbar	psig		mbar	psig		
CL125 or PN 16	15 to 50	0.22 to 0.72	JJJB7BX001	15 to 23	0.22 to 0.33	JJJB7CXT01	Red
				22 to 32	0.32 to 0.46	JJJB7CXT02	Yellow
				31 to 57	0.45 to 0.83	JJJB7CXT03	Blue
	50 to 300	0.73 to 4.35	JJJB7BX002	56 to 115	0.81 to 1.66	JJJB7CXT04	Green
				110 to 195	1.60 to 2.82	JJJB7CXT05	Black
				190 to 300	2.76 to 4.35	JJJB7CXT06	White
	300 to 500	4.35 to 7.25	JJJB7BX014	250 to 360	3.63 to 5.22	JJJB7CXT05	Black
				350 to 500	5.08 to 7.25	JJJB7CXT06	White

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3. Pressure Setting of Type JVQ Slam-Shut Device

Users shall adjust pressure setting of the slam-shut correspondingly when outlet pressure setting is changed. Slam-shut device pressure is set to ensure the safety of the equipment downstream. It is recommended that slam-shut pressure setting be 1.30 to 1.45 times of outlet pressure. If adjustment of slam-shut pressure is required, unscrew the cover and slowly rotate the adjusting screw. Turning the adjusting screw clockwise increases pressure setting while turning counterclockwise reduces the pressure setting of Type JVQ slam-shut device.

Do not directly start the operation of the slam-shut valve if the inlet and outlet valves of the regulator are completely open or without prior balance. The company will assume no liability for any consequences caused by improper operation.

Table 3: Slam-Shut Device Set Pressure Ranges

END CONNECTION STYLE	OVERPRESSURE PROTECTION (OPSO)				UNDERPRESSURE PROTECTION (UPSO)			
	Set Pressure Range		Spring Part Number	Spring Color	Set Pressure Range		Spring Part Number	Spring Color
	mbar	psig			mbar	psig		
CL125 or PN 16	20 to 70	0.29 to 1.01	JJJJ50CXT04	Yellow	5 to 30	0.07 to 0.43	JJJJ50CXT10	Yellow
	50 to 220	0.73 to 3.19	JJJJ50CXT05	Blue	20 to 80	0.29 to 1.16	JJJJ50CXT11	Blue
	200 to 450	2.90 to 6.52	JJJJ50CXT06	Black	30 to 120	0.44 to 1.74	JJJJ50CXT12	Black
	400 to 850	5.80 to 12.32	JJJJ50CXT07	Green	80 to 300	1.15 to 4.35	JJJJ50CXT13	Green
	----	----	----	----	200 to 450	2.90 to 6.52	JJJJ50CXT14	Orange

4. Resetting Operation of Type JVQ Slam-Shut Device

1. Slowly open the inlet valve of Type FVB regulator.
2. Completely close the inlet valve of Type FVB regulator and close the outlet valve until there is minor flow. Unscrew the pull rod of Type JVQ slam-shut device from the lower diaphragm seat when pressure at the outlet drops below the set shut-off pressure value.
3. Pull out the pull rod by hand to open the internal bypass valve disk and keep pressure before and after the valve disk balanced. You may expect to hear sound from the flow at this moment. Check for the cause of the problem if abnormal pressure is observed. Otherwise, proceed to the next step.
4. Continue pulling the pull rod even after pressure gets balanced. Release the pull rod only when you ensure that the tripping system will not trigger.
5. Push the push rod into the lower diaphragm seat and tighten it.
6. Slowly open inlet and outlet valves. The shut-off valve may be shut off if it is opened too quickly.

The pull rod must be screwed into the lower diaphragm seat after resetting the slam-shut. Otherwise, it will easily result in unstable shut-off pressure, slow shut-off operation and screw thread damage during tripping.

5. Shutdown

First, slowly close the upstream shut-off valve or Inlet Isolation Valve. Then, close the downstream shut-off valve or Outlet Isolation Valve. If a vent valve is installed, slightly open the vent valve to release the pressure inside the regulator.

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WARNING

Personal injury, equipment damage, or leakage due to escaping fluid may result if seals are not properly lubricated or maintained. Due to normal part wear or damage that may occur from external source, this regulator should be inspected and maintained periodically. The frequency of inspection, maintenance, and replacement of parts depend upon the severity of service conditions or the requirements of local, state and federal rules and regulations.

8. Maintenance

1. General Rule of Maintenance

1. Before maintenance, close the inlet and outlet valves of Type FVB regulator and keep the slam-shut device in "OPEN" position.
2. Disassembly is only allowed when pressure is relieved completely.
3. When re-assembling, be careful not to damage the parts such as orifice and diaphragms.
4. Check the mobility of all movable parts after re-assembly.
5. Set the post-maintenance pressure setting based on Pressure setting methods of the regulator after maintenance and re-assembly.
6. Use soap solution to run a leak test to ensure that all connections are well sealed.

It is recommended that maintenance be carried out by experienced and skilled technician. For more information, please contact your local Sales Office.

Depending on operating conditions, the user can confirm a maintenance cycle for themselves. The following are recommended maintenance frequency cycles.

2. Daily Checks

1. Use soap solution as gas detector to ensure that there is no leakage on the regulator and tubing connections. Clean up any dirt.
2. Observe the outlet pressure to make sure that the desired outlet pressure is stabilized.
3. Ensure the pipeline system is clean and free of foreign materials.

3. Quarterly Checks

The operations department shall determine the servicing schedule based on the usage condition of the regulator and inlet gas conditions.

1. Connect a pressure gauge to the testing port at the outlet of the regulator, switch the test port valve open, slowly close the ball valve at outlet of the regulator and record the shut-off pressure value 3 minutes later. Check then, if the value is normal. Disassembly and repair are not required if the shut-off pressure of the regulator is normal.
2. Clean the internal parts of the regulator and the slam-shut valve. Inspect seals of valve disks, balanced diaphragms, and O-rings. Replace them if they have swelled, aged, or dented.
3. Inspect key parts inside the regulator for wear and tear. Replace them if necessary.
4. Check the mobility of all movable parts after re-assembly.

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4. Troubleshooting

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE MEASURES
The regulator does not work.	The slam-shut has tripped. The diaphragm of the regulator is damaged.	Reset the slam-shut device. Replace the diaphragm of the regulator.
Outlet pressure of the regulator drops.	Actual flow exceeds the design flow of the regulator. Inlet filter is clogged. Inlet pressure of the regulator is low.	Reduce the flow to specified limit or review the selected regulator for the present process conditions. Clean the filter. Increase the inlet pressure.
Lockup pressure of the regulator increases.	The orifice is damaged filled with debris. The seal at the orifice has swelled, aged, or damaged. O-ring that seals the orifice has swelled or has been damaged.	Replace or clean the orifice. Replace swelled seals. Replace the O-ring.
The slam-shut does not work.	The diaphragm is damaged. The shut-off stem is deformed.	Replace the diaphragm. Replace the stem.
Shut-off pressure rises or drops.	The set value of the spring is incorrect. Movable parts such as the stem is deformed or excessively worn out.	Select a suitable spring and reset the value. Replace related parts.
The shut-off valve cannot be reset.	The cause of shut-off is not rectified. Outlet pressure is excessively high or low.	Rectify the shut-off root cause. Make appropriate adjustments to the outlet pressure setting.

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9. Ordering Guide

Body Size (Select One)

- DN 50 / NPS 2

End Connection Style (Select One)

- CL125 FF
- PN 16 RF

Slam Shut Valve (Select One)

- Without Slam Shut Valve

With Slam Shut Valve, Slam-Shut Trip Pressure Setting

Overpressure Protection Only (OPSO)

- Supply setpoint required ____ mbar

Overpressure and Underpressure Protection Only (OPSO/UPS0)

- Supply overpressure setpoint required ____ mbar; Supply underpressure setpoint required ____ mbar

Main Actuator Pressure Range (Select One)

- 10 to 50 mbar / 0.15 to 0.72 psig
- 50 to 300 mbar / 0.72 to 4.35 psig
- 300 to 500 mbar / 4.35 to 7.25 psig

Main Actuator Spring (Select One)

- 15 to 23 mbar / 0.22 to 0.33 psig, Red
- 22 to 32 mbar / 0.32 to 0.46 psig, Yellow
- 31 to 57 mbar / 0.45 to 0.53 psig, Blue
- 56 to 115 mbar / 0.81 to 1.66 psig, Green
- 110 to 195 mbar / 1.60 to 2.82 psig, Black
- 190 to 310 mbar / 2.76 to 4.49 psig, White
- 250 to 360 mbar / 3.63 to 5.22 psig, Black
- 350 to 500 mbar / 15.08 to 7.25 psig, White

Slam Shut Adjusting Spring (Select One)

For Overpressure Protection (OPSO)

- 20 to 70 mbar / 0.29 to 1.01 psig, Yellow
- 50 to 220 mbar / 0.73 to 3.19 psig, Blue
- 200 to 450 mbar / 2.90 to 6.52 psig, Black
- 400 to 850 mbar / 5.80 to 12.32 psig, Green

For Underpressure Protection (UPS0)

- 5 to 30 mbar / 0.07 to 0.43 psig, Yellow
- 20 to 80 mbar / 0.29 to 1.16 psig, Blue
- 30 to 120 mbar / 0.44 to 1.74 psig, Black
- 80 to 300 mbar / 1.15 to 4.35 psig, Green
- 200 to 450 mbar / 2.90 to 6.52 psig, Green

Spare Part Kit (Optional)

- JJJJB7BX051, Type FVB
- JJJJB7BX061, Type FVB without Slam Shut Valve

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