



DGX Series

Direct-Operated Regulators Manual

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1. Introduction

DGX Series are multipurpose direct-operated regulators that use fluid pressure to drive the actuator and automatically maintains the outlet pressure or inlet pressure constant. They are available in Pressure Reducing (PRV) and Backpressure (BPV) configurations to control outlet pressure or inlet pressure respectively. They have high-capacity, fast response, tight-shutoff, superior control and stability and can be used in a variety of gas and liquid industrial applications such as: Nitrogen, Carbon Dioxide, Natural Gas, Oil, Water, Methanol, Alcohol, Naphtha and similar media.

2. Specification

ITEMS		DGX SERIES PRESSURE REDUCING	DGX SERIES BACKPRESSURE
Body Size		DN 15, 20 and 25 / 1/2, 3/4 and 1 In.	
End Connection		NPT, ANSI 150 RF, ANSI 300 RF, PN 16/25/40 RF	
Inlet Pressure Range		1 to 40 bar / 14.5 to 580 psig (Table 1)	0.35 to 20.7 bar / 5.1 to 300 psig (Table 1)
Spring Range		See Table 2	See Table 3
Flow Coefficients C_v		DN 15 / NPS 1/2- C_v : 2.8; DN 20 / NPS 3/4- C_v : 4.2; DN 25 / NPS 1- C_v : 4.3	DN 15 / NPS 1/2- C_v : 3.6; DN 20 / NPS 3/4- C_v : 7.1; DN 25 / NPS 1- C_v : 8
Flow Characteristic		Quick Open	
Shutoff Classification		ANSI Class VI	
Accuracy		Up to 10%	
Temperature Capabilities		Nitrile (NBR): -29 to 80°C / -20 to 176°F	
		Fluorocarbon (FKM): -7 to 120°C ⁽¹⁾ / 19 to 248°F ⁽¹⁾	
Material	Body	WCC, CF8M	
	Diaphragm, Seals	Nitrile (NBR), Fluorocarbon (FKM)	
	Trim Parts	SST	
1. Fluorocarbon (FKM) is limited to 93°C / 199°F in hot water.			

3. Features

- Modular construction design
- High regulating accuracy
- Fast speed of response
- Tight shutoff
- Wide pressure range, multipurpose
- Simple construction for easy maintenance

DGX Series Regulators

4. Dimensions

Figure 1. DGX Series PRV Flange RF End Connection Dimensions

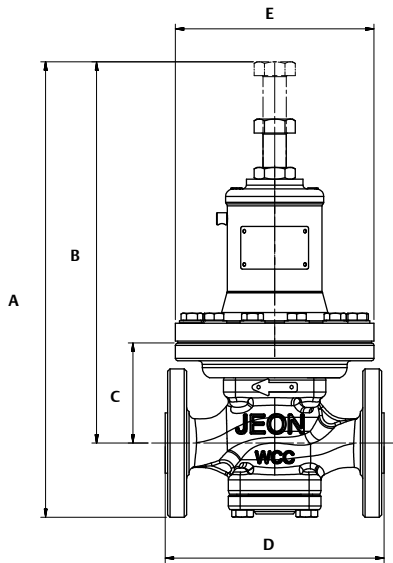


Figure 2. DGX Series BPV Flange RF End Connection Dimensions

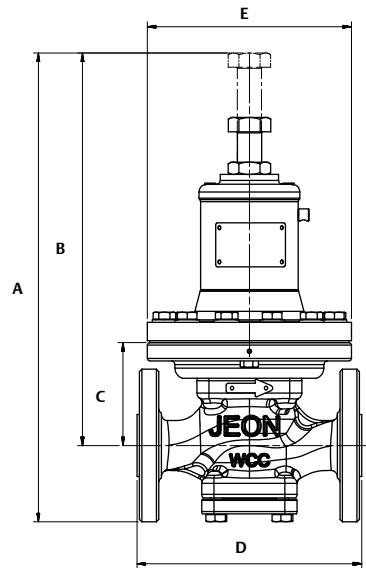


Figure 3. DGX Series PRV NPT End Connection Dimensions

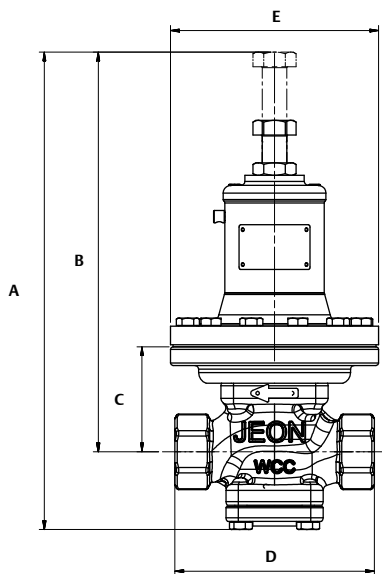
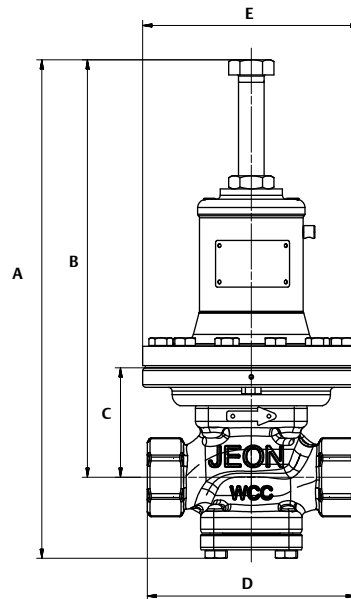


Figure 4. DGX Series BPV NPT End Connection Dimensions

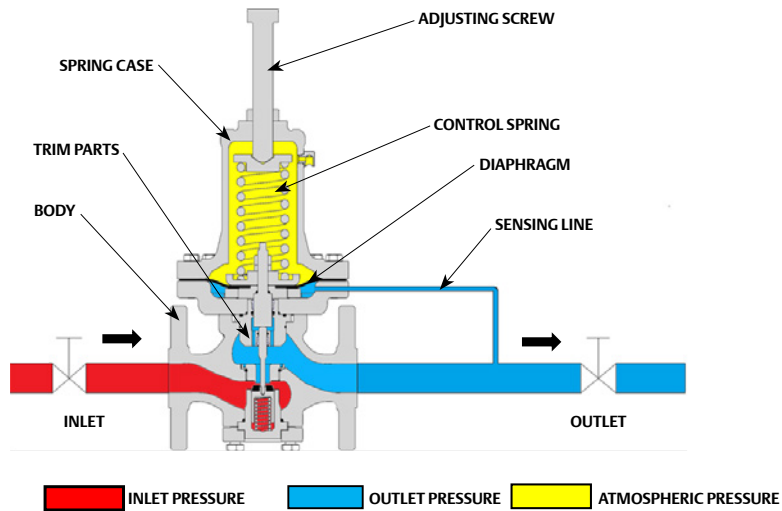


Product dimensions are referred below, all the dimension A in charts are measured with the adjusting screw extended at maximum lengths.

DGX SERIES																		
Body Size			Size														Weight	
			A		B		C		D			E						
			mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	kg	lbs
15	1/2	DGX PRV	386	15.2	344	13.5	84.3	3.3	184	7.2	184	7.2	160	6.3	167	6.6	12.9	28
20	3/4																12.9	28
25	1																13.3	29
15	1/2	DGX BPV	386	15.2	344	13.5	84.3	3.3	184	7.2	184	7.2	160	6.3	167	6.6	12.7	28
20	3/4																12.7	28
25	1																13.1	28.9

5. Principle of Operation

Figure 5. DGX Series PRV Operational Schematic

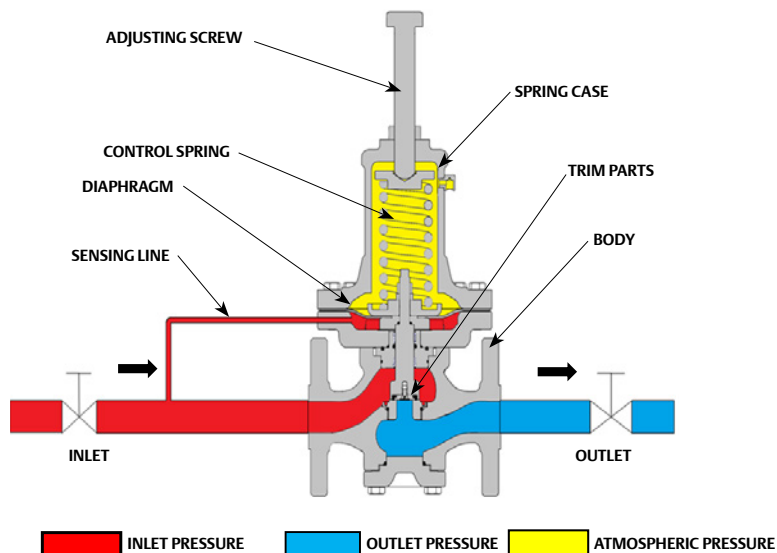


DGX Series PRV is a direct-operated pressure reducing regulator. When operating, fluid flows from the inlet chamber, up through the orifice, and exits the outlet chamber. Downstream pressure is registered at the underside of the diaphragm through an external sensing line that is connected to the lower diaphragm casing. The pressure under the actuator diaphragm is balanced by the spring force acting at the topside of the diaphragm, through the action of the actuator stem which moves to or away from the orifice to achieve pressure reducing and retaining. Downstream pressure is set by turning the adjusting screw.

When downstream flow demand decreases, downstream pressure increases, and the pressure registered under the actuator diaphragm also increases. The pressure underneath the diaphragm moves the diaphragm upward and the valve stem together with the valve plug move towards the orifice, decreasing fluid flow, and downstream pressure is maintained at a new equilibrium state.

When downstream flow demand increases, downstream pressure decreases, and the pressure registered under the actuator diaphragm also decreases. Spring force now moves the diaphragm downward and the valve stem together with the valve plug move away from orifice, increasing fluid flow, and downstream pressure is maintained at a new equilibrium state.

Figure 6. DGX Series BPV Operational Schematic



DGX Series BPV is a direct-operated backpressure regulator. When operating, fluid flows from the inlet chamber through the orifice and exits on the outlet chamber. Inlet pressure is registered at the underside of the diaphragm through an external sensing line that is connected to the lower diaphragm casing. The pressure under the actuator diaphragm is balanced by the spring force acting at the topside of the diaphragm. Through the action of the actuator stem, the valve plug moves to or away from the orifice to achieve pressure retaining. Upstream pressure is set by turning the adjusting screw.

When the inlet pressure is above the set pressure, the pressure registered at the actuator diaphragm increases. The pressure underneath the diaphragm moves the diaphragm upward and the valve stem together with the valve plug move away from the orifice, and then it opens the backpressure regulator and allows more flow to the downstream.

When the inlet pressure is below the set pressure, the pressure registered at the actuator diaphragm decreases. Spring force now moves the diaphragm downward and the valve stem together with the valve plug move towards the orifice, decreasing fluid flow, and then it closes the backpressure regulator.

DGX Series Regulators

Table 1. Pressure Ranges

BODY MATERIAL	END CONNECTION	PRV PRESSURE RANGE ⁽²⁾				BPV PRESSURE RANGE			
		Inlet Pressure		Set Pressure		Set Pressure		Inlet Pressure ⁽³⁾	
		bar	psig	bar	psig	bar	psig	bar	psig
WCC	CL150 RF	1 to 16.9	14.5 to 245	0.35 to 14	5.1 to 203	0.35 to 10	5.1 to 145	0.35 to 16.9	5.1 to 245
	CL300 RF	1 to 40	14.5 to 580	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	PN 16	1 to 40	14.5 to 580	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	PN 25	1 to 40	14.5 to 580	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	PN 40	1 to 40	14.5 to 580	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	NPT	1 to 40	14.5 to 580	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
CF8M	CL150 RF	1 to 15.6	14.5 to 226	1 to 13	14.5 to 189	0.35 to 8.7	5.1 to 126	0.35 to 15.6	5.1 to 226
	CL300 RF	1 to 40	14.5 to 580	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	PN 16	1 to 30.2	14.5 to 438	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	PN 25	1 to 30.2	14.5 to 438	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	PN 40	1 to 30.2	14.5 to 438	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300
	NPT	1 to 40	14.5 to 580	0.35 to 20.7	5.1 to 300	0.35 to 13.8	5.1 to 200	0.35 to 20.7	5.1 to 300

Note:
 1. Based on the maximum temperature of 120°C / 248°F (or refer to steel flange standard HG/T20592 and HG/T20615).
 2. Inlet pressure and Set pressure rating range: Gas application: 1.2:1~20:1, Liquid application: 1.2:1~10:1. In the meantime, differential pressure for liquid application should be no more than (inlet pressure + atmospheric pressure) x Km (Km=0.7).
 3. Maximum inlet pressure in BPV equals set pressure plus build-up.

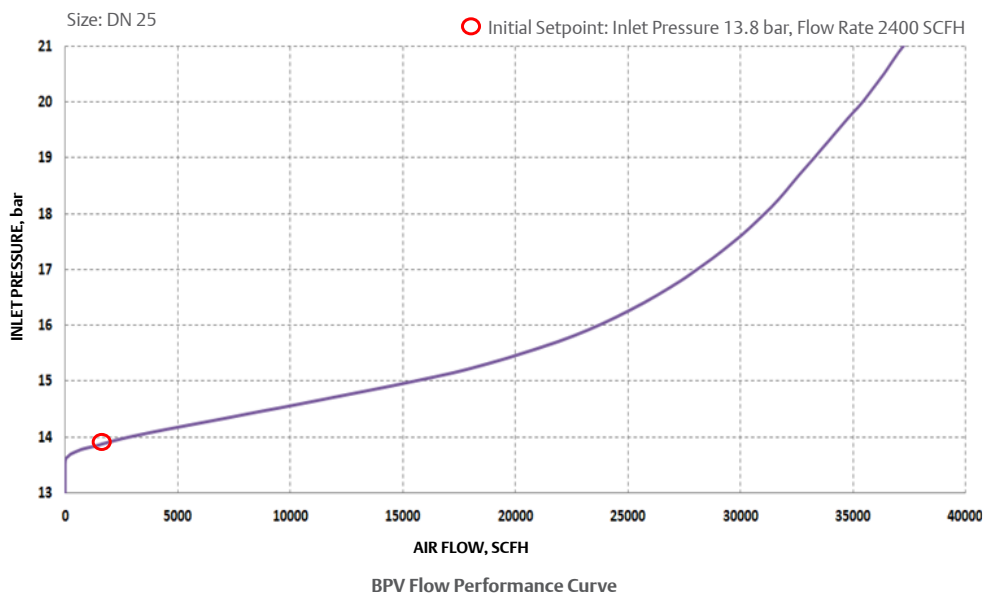
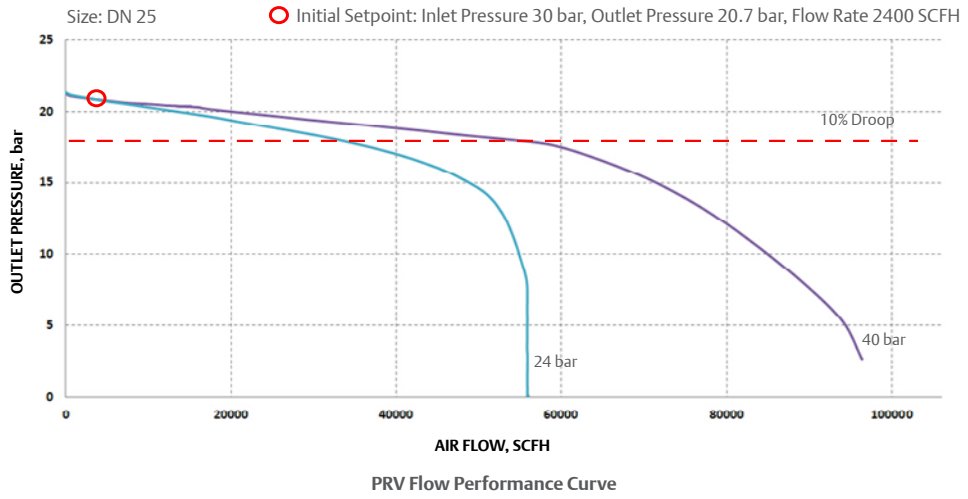
Table 2. DGX Series PRV Spring Ranges

TYPE	SPRING RANGE		SPRING COLOR	SPRING PART NUMBER
	bar	psig		
PRV	0.35 to 0.6	5 to 8.7	Yellow	ERSA04992A0
	0.5 to 1.05	7.3 to 15	Blue	ERAA09412A0
	0.95 to 2.3	14 to 33	White	ERSA05005A0
	2.1 to 3.4	30 to 49	Green	ERAA09413A0
	3.2 to 8.5	46 to 123	Black	ERSA05006A0
	8.0 to 20.7	116 to 300	Red	ERAA07059A0

Table 3. DGX Series BPV Spring Ranges

TYPE	SPRING RANGE		SPRING COLOR	SPRING PART NUMBER
	bar	psig		
BPV	0.35 to 1.05	5 to 15	Yellow	ERSA04992A0
	0.9 to 2.3	13 to 33	White	ERSA05005A0
	2.1 to 5.1	30 to 74	Black	ERSA05006A0
	4.7 to 13.8	68 to 200	Red	ERAA07059A0

6. Performance Curves



7. Installation and Startup

WARNING

Protection device should be installed to release pressure and protect the system during regulator failure or set pressure increase.

PRV Installation

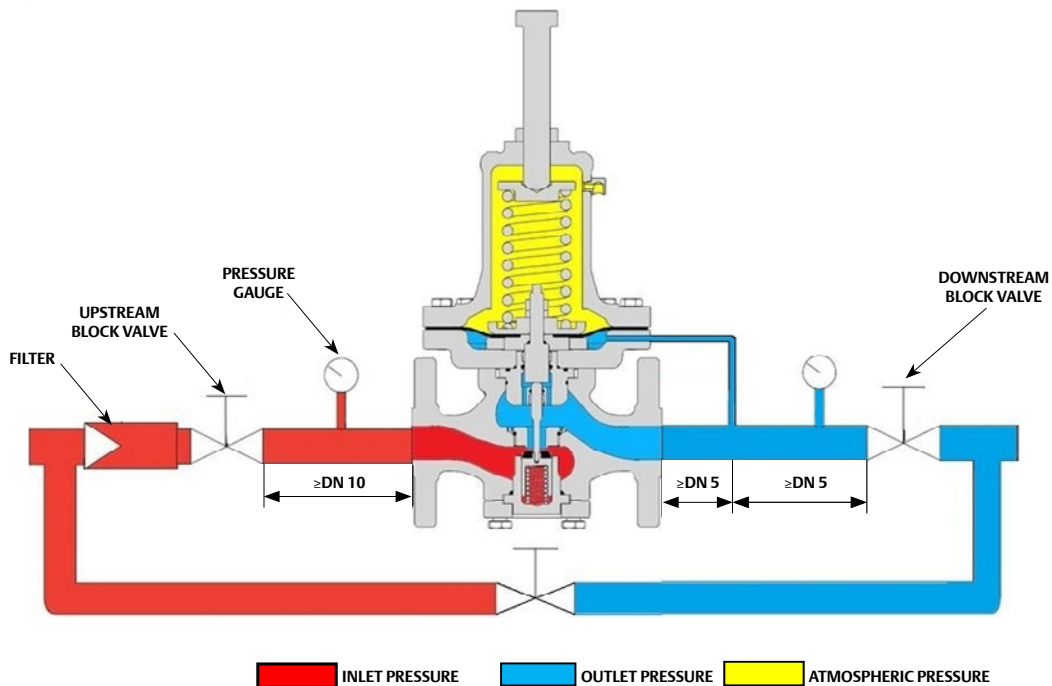
Installing, operating and maintaining PRV and BPV should be performed by qualified personnel.

1. Before installing PRV :
 - Check for damage which might have occurred during shipment.
 - Inspect regulator body inlet and outlet ports and remove any dirt or foreign material that may be present.
 - Blow out any debris or dirt in the tubing and the pipeline.
 - Check if the pressure in the pipeline is within the pressure range stated on the regulator nameplate.
 - Make sure fluid flow through the regulator is in the same direction as the arrow on the body.
2. Install PRV away from fire source, vibration, water accumulation and ice formation areas, and the environment temperature should comply with the requirements. In low temperature areas, heat tracing measures may be considered to heat the pipelines of the PRV in winter. At special occasions, such as installations in areas with heavy snow, may require a hood or enclosure to protect the PRV from snow load and vent freeze over.
3. Body installed vertically with the actuator spring case pointing upward is required.
4. Do not forcefully install the regulator when connecting the inlet and outlet pipelines.
5. If a quick exhausting device or valve is to be installed downstream of the PRV, make sure to leave enough gas piping volume between the PRV and the device to avoid sharp pressure drop due to rapid changing flow rates.
6. The filter should be installed on the upstream of the PRV and leave enough straight run of pipe downstream. Attach a 10 mm / 0.39 in. OD sensing line with a 1/4 NPT fitting no less than 5 x DN (the nominal diameter of the pipework) away from the PRV outlet port and at a point away from any source of turbulence and no less than 5 x DN (the nominal diameter of the pipework) away from downstream block valve. When outlet pressure is at or above 0.5 bar / 7.25 psig, gas velocity should not exceed 50 m/s. When outlet pressure is below 0.5 bar / 7.25 psig, gas velocity should not exceed 25 m/s. The nominal diameter of the pipework connecting the regulator shall not be smaller than the nominal diameter of the regulator.

WARNING

Remove or isolate (utilizing blind flange) the regulator when the pipeline is undergoing pressure test or purging to avoid damaging the regulator.

DGX Series PRV Installation Schematic



⚠ WARNING

All vents should be kept open to permit free flow of gas to the atmosphere. Protect openings against entrance of snow, insects or any other foreign material that may plug the vent. Under enclosed conditions or indoors, escaping gas may accumulate and be an explosion hazard.

PRV Startup Procedures

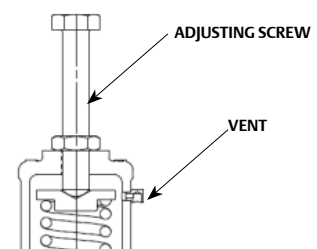
1. Make sure bypass valve is closed. Open the system Shutoff Valve.
2. Slowly open the inlet block valve in front of the PRV.
3. Slightly open the outlet block valve behind the PRV.
4. When used in liquid service, the PRV has bleed design to exhaust the air trapped under the actuator diaphragm depending on medium type. Slowly unscrew the bleed plug to exhaust the air. Then, screw and tighten the plug. Exercise caution at all times.
5. Keep in this position until pressure is stabilized.
6. Fully open the outlet block valve.

PRV Outlet Pressure Settings

To change the outlet pressure, unscrew the jam nut and slowly turn the adjusting screw and set the outlet pressure to the desired setting, screw the jam nut. Screw the adjusting screw into the spring case to increase pressure. Screw the adjusting screw out of the spring case to decrease pressure.

PRV Shutdown Procedures

1. Close the inlet block valve.
2. Close the outlet block valve.
3. Unload the adjusting spring.
4. Slowly open the outlet block valve to release downstream pressure.
5. Keep the outlet block valve open, release inlet pressure and all remaining pressure in PRV.



⚠ WARNING

Protective device should be installed to release pressure and protect the system during regulator failure or set pressure increase.

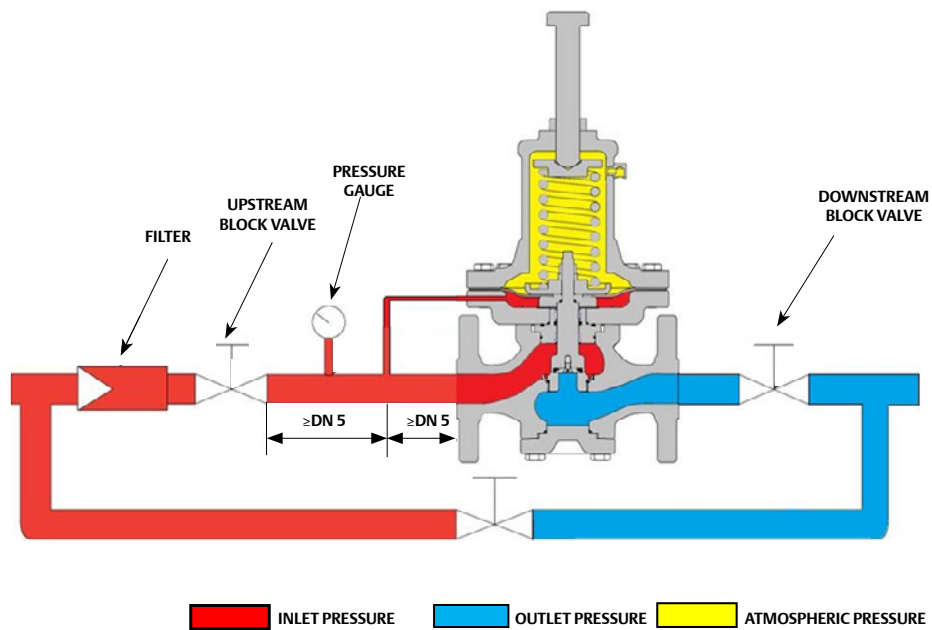
DGX Series Regulators

BPV Installation

Installing, operating and maintaining BPV should be performed by qualified personnel.

1. Before installing BPV :
 - Check for damage which might have occurred during shipment.
 - Inspect regulator body inlet and outlet ports and remove any dirt or foreign material that may be present.
 - Blow out any debris or dirt in the tubing and the pipeline.
 - Check if the pressure in the pipeline is within the pressure range stated on the regulator nameplate.
 - Make sure fluid flow through the regulator is in the same direction as the arrow on the body.
2. Install BPV away from fire source, vibration, water accumulation and ice formation areas and the environment temperature should comply with the requirements. In low temperature areas, heat tracing measures may be considered to heat the pipelines of the BPV in winter. At special occasions, such as installations in areas with heavy snow, may require a hood or enclosure to protect the BPV from snow load and vent freeze over.
3. Body installed horizontally with the actuator spring case pointing upward is required.
4. Do not forcefully install the regulator when connecting the inlet and outlet pipelines.
5. If a quick exhausting device or valve is to be installed downstream of the PRV, make sure to leave enough gas piping volume between the PRV and the device to avoid sharp pressure drop due to rapid changing flow rates.
6. The filter should be installed on the upstream of the BPV and leave enough straight run of pipe upstream. Attach a 10 mm / 0.39 in. OD sensing line with a 1/4 NPT fitting no less than 5 x DN (the nominal diameter of the pipework) away from the BPV on the upstream and at a point away from any source of turbulence and no less than 5 x DN (the nominal diameter of the pipework) away from the upstream block valve.

DGX Series BPV Installation Schematic



WARNING

Remove or isolate (utilizing blind flange) the regulator when the pipeline is undergoing pressure test or purging to avoid damaging the regulator.

DGX Series Regulators

WARNING

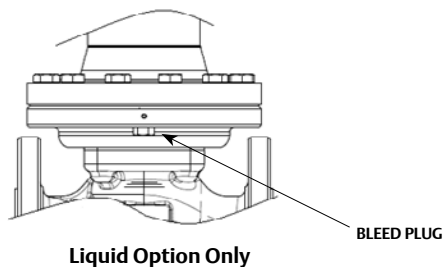
Overpressuring any portion of this equipment may cause equipment damage, leaks in the backpressure regulator, or personal injury due to bursting of pressure containing parts. The backpressure regulator should be inspected for damage regularly and after any overpressure condition.

The pressure range for relief / backpressure regulator is 0.35 to 13.8 bar / 5 to 200 psig. Every spring set range for the regulator is on the nameplate.

The maximum inlet pressure depends on the body materials and operating temperatures. The information about regulator maximum inlet pressure please see the pressure ranges section. The backpressure regulator should be inspected for damage regularly and after any overpressure condition.

WARNING

Before startup, the regulator must be tested in accordance with the procedure specified in the Maintenance section.



BPV Startup Procedures

1. Make sure bypass valve is closed, open the system shutoff valve.
2. Slowly open the outlet block valve behind the BPV.
3. Slowly open the inlet block valve in front of the BPV.
4. When used in liquid service, the BPV has bleed design to exhaust the air trapped under the actuator diaphragm depending on medium type. Slowly unscrew the bleed plug to exhaust the air. Then, screw and tighten the plug. Exercise caution at all times.

BPV Inlet Pressure Settings

To change the inlet pressure, unscrew the jam nut and slowly turn the adjusting screw and set the inlet pressure to the desired setting, screw the jam nut. Screw the adjusting screw into the spring case to increase pressure. Screw the adjusting screw out of the spring case to decrease pressure.

BPV Shutdown Procedures

1. Close the upstream BPV inlet block valve.
2. Close the downstream BPV outlet block valve.
3. Unload the adjusting spring.
4. Slowly open the outlet block valve to release downstream pressure.
5. Keep the outlet block valve open, release inlet pressure and the remaining pressure in BPV.

WARNING

If using DGX Series BPV on hazardous or flammable gas service, personal injury and property damage could occur due to fire or explosion of vented gas that may have accumulated.

To prevent such injury or damage, provide piping or tubing to vent the gas to a safe, well-ventilated area. Also, when venting a hazardous gas, the piping or tubing should be located far enough away from any buildings or windows so to not create a further hazard, and the vent opening should be protected against anything that could clog it.

Handle with care during maintenance, carefully vent the pressure in the actuator and other pressured parts, use recommended torques for assembly.

8. Maintenance

Before maintenance, close the inlet and outlet block valves and exhaust the gas pressure in the valve body and piping. When removing or replacing parts such as the orifice or diaphragm, be careful not to damage them. Ensure movable parts can move freely after reassembly. Recommission according to the Installation and Startup procedures. Ensure all connections are tight and check for leaks. Emerson Process Management Regulator Technologies, Inc. (Emerson™) provides training for your maintenance personnel. For other information, consult your local Sales Office.

Routine Maintenance

The frequency of routine maintenance depend on the medium type and service condition to keep safety:

1. Make sure that there is no leakage on the regulator.
2. Observe the gauges to make sure that the pressure being controlled is stable and at the correct set point.
3. Clean the outside of the regulator.

Periodic Check

The frequency of periodic check depend on the medium type and service condition to make sure the proper functioning of the regulator. Apart from monitoring the set pressure:

1. Check DGX Series PRV lock up pressure every 1 to 3 months: Open the upstream valve, using the downstream pressure gauge to monitor the pressure, slowly close the downstream valve, ensure that the downstream pressure does not increase.
2. Check DGX Series BPV lock up pressure every 1 to 3 months: Slowly increase the inlet pressure until the relieving pressure starts to rise, then slowly decrease the inlet pressure until the valve closed, ensure the downstream pressure does not increase.
3. Clean internal parts every 3 to 6 months like the Disk, Diaphragm, O-rings and Seat Ring. Give due diligence to check and replace deformed and worn out seals upon necessary.
4. Check wear parts every 3 to 6 months for damage and replace upon necessary, replace crush installed O-rings after disassembly.

Note: Must use Emerson parts for replacements.

DGX Series Regulators



WARNING

Handle with care during maintenance, carefully vent the pressure in the actuator and other pressured parts, use recommended torques for assembly.

Table 4. Troubleshooting

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Regulator is not working	Regulator is undersized or oversized	Review sizing
	Damaged diaphragm	Replace diaphragm
PRV outlet pressure decreases	Inlet pressure too low	Increase inlet pressure
	Actual flow capacity surpass designed capacity	Review sizing
	Debris caught in the regulator	Remove debris
BPV inlet pressure increases	Actual flow capacity surpass designed capacity	Review sizing
	Debris caught in the regulator	Remove debris
BPV lock-up pressure increases BPV lock-up pressure decreases	Damaged, deformed or worn out diaphragm	Replace diaphragm
	Deformed or worn out disk or disk holder	Replace disk or disk holder
	Debris caught in between disk and orifice or parts being damaged	Clean or replace disk and orifice
PRV outlet pressure fluctuates BPV inlet pressure fluctuates	PRV upstream pressure fluctuates	Check upstream valve when upstream pressure fluctuates
	Actual flow capacity much lower than normal	
PRV inlet pressure equals to outlet pressure	Damaged diaphragm	Replace diaphragm
	Control spring over adjusted	Review pressure range of the spring, and change the spring

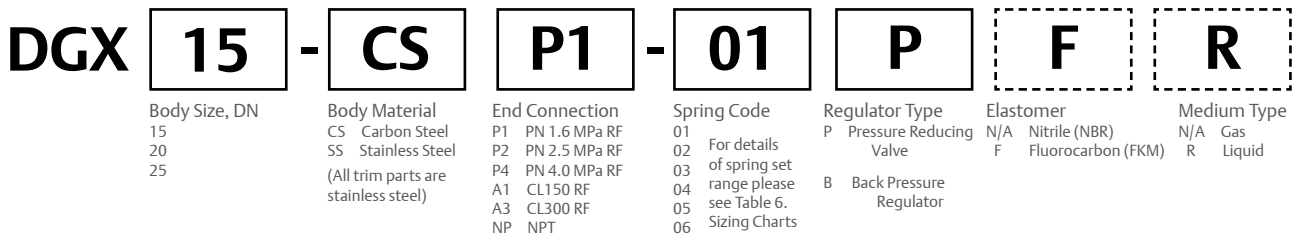
9. Spare Parts Kits

Includes: Diaphragm, O-rings, Orifice, Seat, etc.

Table 5. Spare Parts Kit

REGULATOR TYPE	ELASTOMER TYPE	BODY SIZE	SPARE PART NUMBERS
PRV	Nitrile (NBR)	DN15/20/25	ERAA09343A0
	Fluorocarbon (FKM)		ERAA09345A0
BPV	Nitrile (NBR)		ERAA09346A0
	Fluorocarbon (FKM)		ERAA09347A0

10. Model Description



The product description example: **DGX15 - CSP1-01PF**

Example: DGX15-CSP1-01PF indicates that this is a direct-operated pressure reducing valve. Medium type is gas. Nominal diameter is 15 mm. Body material is WCC. Trim material is stainless steel. End connection type is PN16 Flange RF. Spring code is 01. Elastomer type is Fluorocarbon (FKM).

Table 6. Sizing Charts

REGULATOR TYPE	BODY SIZE	SPRING SET RANGE		SPRING CODE
		bar	psig	
PRV	DN 15, 20 and 25 / 1/2, 3/4 and 1 In.	0.35 to 0.6	5 to 8.7	01
		0.5 to 1.05	7.3 to 15	02
		0.95 to 2.3	14 to 33	03
		2.1 to 3.4	30 to 49	04
		3.2 to 8.5	46 to 123	05
		8.0 to 20.7	116 to 300	06
BPV	DN 15, 20 and 25 / 1/2, 3/4 and 1 In.	0.35 to 1.05	5 to 15	01
		0.9 to 2.3	13 to 33	03
		2.1 to 5.1	30 to 74	05
		4.7 to 13.8	68 to 200	06

11. Ordering Information

Please provide information below when ordering.

1. Regulator nominal pressure, nominal size.
2. Inlet pressure, outlet pressure, flow capacity and characteristics.
3. Fluid type and operating temperature.
4. Body and Trim parts Material.
5. Accessories and other special requirements.

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