



DFX Series

Direct-Operated Tank Blanketing Regulator Manual

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DFX Series Regulator

1. Introduction

DFX Series products are self-operated regulators which use the fluid as the medium for pressure to drive the diaphragm to stabilize the outlet pressure. The DFX Series has high capacity, fast response and good pressure stability. It is widely used in pressure control of gas coverage protection systems such as industrial containers and tanks, and it is also used in low pressure control of pipelines.

It is applicable for coverage and protection systems for containers and storage tanks in the petroleum, chemical, pharmaceutical and food sectors as well as the industrial applications that require micro-pressure control.

The applicable medium gases for coverage and protection are nitrogen, carbon dioxide, etc. as well as other gases that require low-pressure control.

2. Specifications

		DFX SERIES			
Body Sizes		DN 15, 20 and 25 / 1/2, 3/4 and 1 Inch			
End Connections		NPT (F), ANSI 150 RF, ANSI 300 RF, PN 16/25/40 RF			
Pressure	Maximum Pressure	1.6 MPa / 232 psig			
	Inlet Pressure P ₁	0.015 to 1.2 MPa / 2.2 to 174 psig ⁽¹⁾			
	Outlet Pressure P ₂	0.25 to 110 kPa / 0.04 to 16 psig ⁽¹⁾			
	Pressure Range	0.25 to 0.7 kPa / 0.04 to 0.1 psig; 0.6 to 1.9 kPa / 0.09 to 0.28 psig; 1.7 to 3.5 kPa / 0.25 to 0.51 psig; 3.1 to 7.2 kPa / 0.45 to 1.0 psig; 6.4 to 13 kPa / 0.93 to 1.9 psig; 11 to 24 kPa / 1.6 to 3.5 psig; 21 to 43 kPa / 3.0 to 6.2 psig; 38 to 73 kPa / 5.5 to 10.6 psig; 65 to 110 kPa ⁽¹⁾ / 9.4 to 16 psig ⁽¹⁾			
Flow Coefficients C _v	DN 15 / 1/2 Inch	0.5	1.8	N/A	N/A
	DN 20 / 3/4 Inch	0.5	1.8	3.6	N/A
	DN 25 / 1 Inch	0.5	1.8	3.7	6.5
Flow Characteristics		Quick Open			
Operating Temperature		Nitrile (NBR): -29 to 80°C / -20 to 176°F Fluorocarbon (FKM): -7 to 120°C / 19 to 248°F			
Performance	Accuracy Class	Up to ±10%			
	Shutoff Classification	ANSI Class VI			
Material	Body	WCC Carbon Steel, CF8M Stainless Steel			
	Trim	Stainless Steel			
	Diaphragm and Seals	Nitrile (NBR), Fluorocarbon (FKM)			
1. For more pressure ranges, please consult Jeon factory directly.					

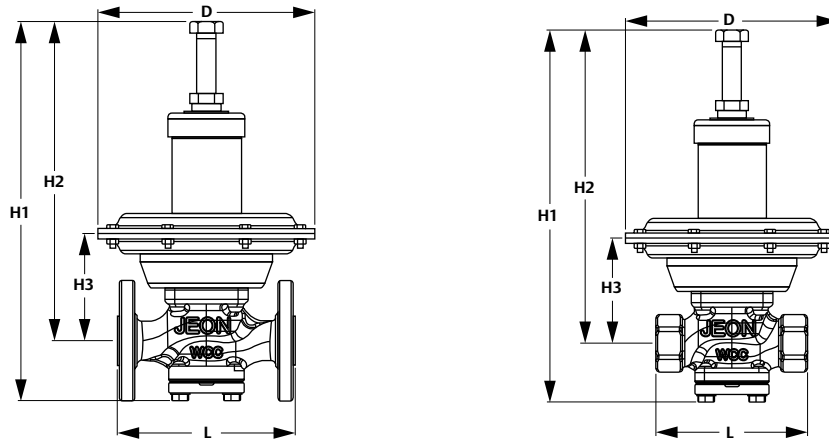
3. Features

- Standard single seat regulator
- Lever-type structural design
- Fast response
- Good sealing performance
- Wide pressure adjustment ranges
- Simple structure with easy operation and maintenance

DFX Series Regulator

4. Dimensions

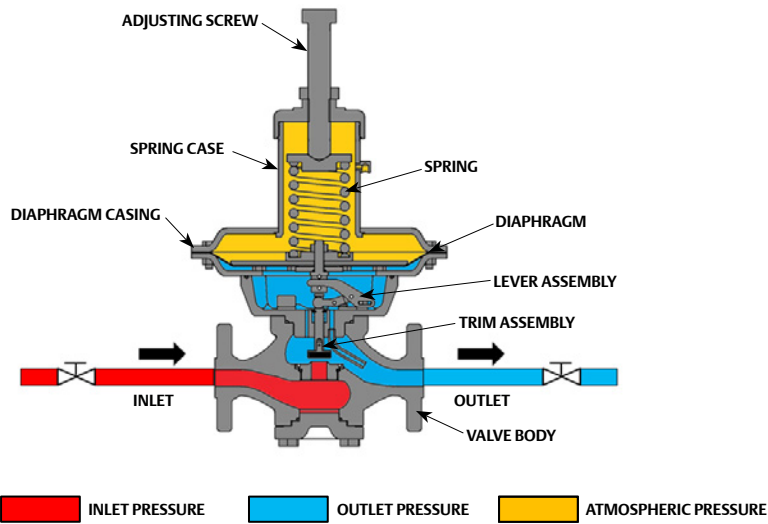
Figure 1. DFX Series Dimensions



DFX SERIES														
Body Size		End Connection	Dimensions										Weight	
			D		L		H1		H2		H3			
DN	Inch		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	kg	lbs
15	1/2	Flange	225	8.9	184	7.2	394	15.5	331	13	111	4.4	12.5	28
20	3/4												13.3	29
25	1												14	31
15	1/2	NPT	225	8.9	160	6.3	394	15.5	331	13	111	4.4	11.9	26
20	3/4												11.8	26
25	1												11.7	26

5. Principle of Operation

Figure 2. DFX Series Operational Schematics



See Figure 2 for the operational schematic of the regulator: The outlet pressure P_2 can be set by turning the adjusting screw. The medium flows from the inlet to the outlet port of the body as indicated by the arrow on the body. The outlet pressure P_2 registers internally to the underside of the diaphragm through the sense tube. When the pressure changes, it acts on the underside of the diaphragm which makes the diaphragm assembly move; the lever then rotates and pushes the stem to throttle and control the disk until the pressure stabilizes.

When the downstream demand increases, the outlet pressure P_2 decreases. The spring force then overcomes the diaphragm force, making the lever rotate thus pushing the stem upward and makes the disk move away from the orifice, allowing the gas flow to increase until it satisfies the setpoint of the regulator.

When the downstream demand decrease, the function is opposite to the described above, till the regulator reach lockup.

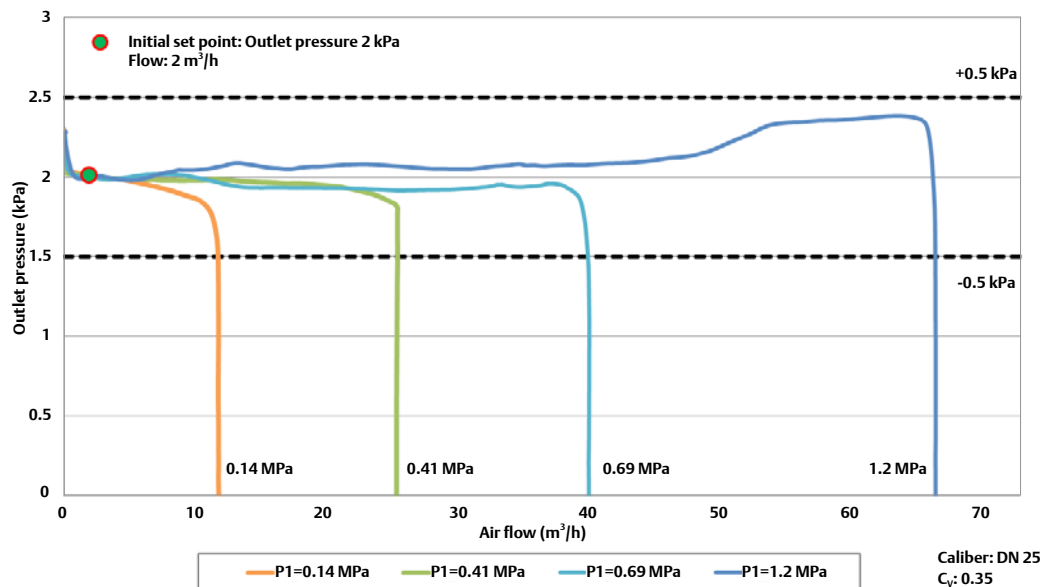
6. Spring Range Selection

Table 1. DFX Series Spring Range

SPRING RANGE		SPRING WIRE DIAMETER		SPRING PART NUMBER	SPRING COLOR
kPa	psig	mm	Inch		
0.25 to 0.7	0.04 to 0.1	2.4	0.09	ERAA07320A0	White
0.6 to 1.9	0.09 to 0.28	2.4	0.09	ERAA07321A0	Black
1.7 to 3.5	0.25 to 0.51	3	0.12	ERAA07322A0	Red
3.1 to 7.2	0.45 to 1.0	3	0.12	ERAA07323A0	Yellow
6.4 to 13	0.93 to 1.9	4	0.16	ERAA07324A0	Purple
11 to 24	1.6 to 3.5	5	0.20	ERAA07325A0	Orange
21 to 43	3.0 to 6.2	6	0.24	ERAA07326A0	Green
38 to 73	5.5 to 10.6	7	0.28	ERAA07327A0	Blue
65 to 110	9.4 to 16	8	0.32	ERAA07328A0	Grey

7. Flow Curve

Performance tests have been done based on various inlet and outlet pressures; products have been constantly optimized so as to ensure that the products have high adjusting precision, stability and excellent flow capacity.



8. Installation and Startup

Installation



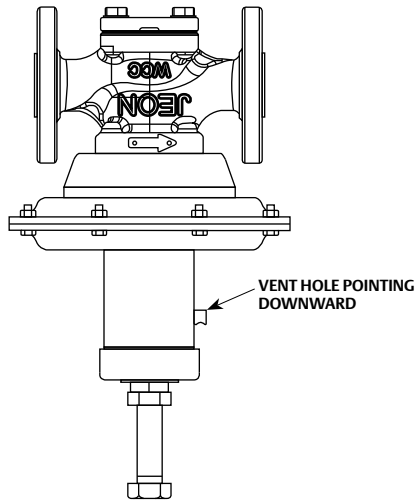
WARNING

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

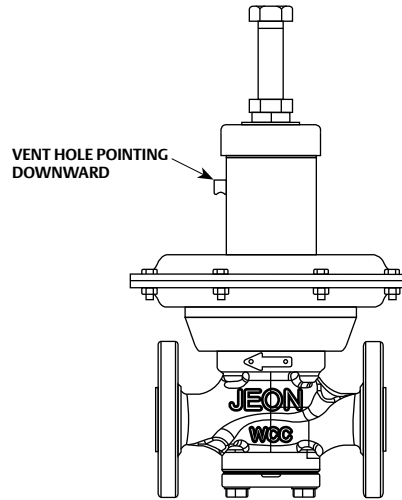
The installation, startup and maintenance must be done by qualified personnel.

- Before installing the regulator:
 - Check the regulator and make sure it has not been damaged during shipment.
 - Check and remove any dust or foreign objects accumulated in the body of the regulator.
 - Remove any fragments and dust in the pipeline.
 - Make sure that the inside surface of the pipeline is smooth and no bumps are accumulated from welding.
 - Make sure that the pressure in the pipeline is consistent with the pressure range shown on the nameplate of the regulator.
 - Ensure the fluid that flows through the regulator is in the same direction as shown by the arrow on the valve body.
- The regulator should be installed far away from the heat source and vibration, and ambient temperature should meet the requirement. In low temperature conditions, heat tracing measures should be provided to the upstream and downstream pipeline.

DFX Series Regulator



INSTALLED IN AN UPSIDE DOWN POSITION
(0.25 kPa–1.7 kPa)



INSTALLED IN AN UPRIGHT POSITION
(ABOVE 1.7 kPa)

3. When pressure regulator range is less or equal to 1.7 kPa, the spring case should be installed in an upside down position; when the pressure regulator range is greater than 1.7 kPa, the spring case should be installed in an upright position.
4. Be certain that the pipeline ends point straight at each other. Do not use the regulator as a coupling to align pipe.
5. If a quick exhausting device is to be installed downstream of the regulator, make sure to leave enough fluid piping volume between the regulator and the device to avoid abrupt pressure drop due to quick-changing flow rates.
6. A filter should be installed upstream of regulator, with the flow rate velocity of ≤ 25 m/s, and the normal diameter of pipe should be greater than the regulator's body normal diameter.

Startup

WARNING

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

DFX Series Startup Procedures:

1. Shut off the bypass valve and open the slam shut valve.
2. Slowly open the inlet block valve in front of the regulator.
3. Slightly open the outlet block valve of the regulator.
4. Keep in this position until the pressure is stabilized.
5. Fully open the outlet block valve.

DFX Series 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. Turn clockwise to increase and counterclockwise to decrease.

9. Maintenance

General Rules for 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, stem and diaphragm assembly, be careful not to damage them. Ensure movable parts can move freely after reassembly. After completing maintenance and reassembly, set post-maintenance settings of the regulator using the ventilation operation method, then use liquid soap to examine all the connected and sealed parts to see if there is external leakage. Emerson Process Management Regulator Technologies, Inc. provides training for 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. Use liquid soap or other specialized gas testing devices to examine the regulator to see if there is external leakage.
2. Observe the gauges to make sure that the pressure being controlled is stable and at the correct setpoint.
3. Clean the outside of the regulator.

Periodic Maintenance



WARNING

When the outlet pressure of the regulator is higher than the set point of 20 kPa, inspect the lever assembly to see if it is deformed or damaged; if there is deformation, replace it.

Based on the quality of gas in use, perform periodic cleaning and maintenance of the regulator every three to six months. Inspect or replace the swelling or worn out rubber components so as to ensure safe gas supply and normal use.

The frequency of periodic check depend on the gas quality and service condition to make sure the proper functioning of the regulator.

1. Inspect the shut-off pressure of the regulator at least once every three months: connect the pressure gauge at the inspection port of the outlet valve of the regulator. Turn on the switch and slowly shut off the block valve at the outlet port of the regulator; after five minutes, record the shut-off pressure value to see if it is within the normal range. If the shut-off pressure of the regulator is normal, do not disassemble the regulator for repair.
2. Cleaning and maintenance of internal components of the regulator should be done every 3 to 6 months: Check components that are easily worn such as disk sealing components, main diaphragm and O-ring, and replace the swelling and aged sealing components that have uneven pressure marks.
3. Inspect critical components for damage and deformation inside the regulator and replace them when necessary.

Troubleshooting

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE MEASURES
The outlet pressure of regulator decreases	Inlet pressure is too low Actual flow capacity exceeds the valve's designed capacity Blockage inside the regulator due to debris and impurities	Increase inlet pressure or reset outlet pressure Select a proper regulator Clean inside of the regulator
The shut-off pressure of regulator increases	Damaged, deformed or worn out diaphragm; Damaged, deformed or worn out O-ring in disk assembly; debris caught in between disk and seat ring; damaged or deformed Lever assembly	Replace main diaphragm; replace worn out disk assembly washer; replace O-ring; clean or replace disk assembly; replace lever assembly
Regulator is not working	Wrong selection of regulator model Damaged diaphragm Control spring is working at solid height and restrictor is blocked	Review sizing Replace diaphragm Check spring range and replace spring Examine pressure tapping and get rid of impurities inside
Outlet pressure of regulator fluctuates	Inlet pressure fluctuates; Actual flow capacity much lower than normal	Check upstream valve when upstream pressure fluctuates

10. Spare-parts Kit

Including: Disk Assembly, Washer, Main Diaphragm, O-ring, etc.

MATERIAL	PART NUMBER
Nitrile (NBR)	ERAA09348A0
Fluorocarbon (FKM)	ERAA09349A0

11. Model Description

DFX	15	-	CS	-	A1	-	01		2		F
	Body Size, DN 15 20 25		Valve Body Material CS - Carbon steel SS - Stainless steel (Trim parts are all stainless steel)		End Connection P1 PN 16 RF P2 PN 25 RF P4 PN 40 RF A1 ANSI 150 RF A3 ANSI 300 RF NP NPT		Spring Range 01 - 0.25 to 0.7 kPa 02 - 0.6 to 1.9 kPa 03 - 1.7 to 3.5 kPa 04 - 3.1 to 7.2 kPa 05 - 6.4 to 13 kPa 06 - 11 to 24 kPa 07 - 21 to 43 kPa 08 - 38 to 73 kPa 09 - 65 to 110 kPa		Orifice Size 1 - 3.2 mm 2 - 6.4 mm 3 - 9.5 mm 4 - 14 mm		Elastomer N/A Nitrile (NBR) F Fluorocarbon (FKM)

Product description demonstration: **DFX15-CSA1-012F**

Example: DFX15-CSA1-012F, automatic low-pressure regulator, the body size is DN 15, material of valve body is WCC Carbon steel, End Connection type is ANSI 150 flange, RF surface, pressure spring range is 0.25 to 0.7 kPa, orifice size is 6.4 mm, and the elastomer material is Fluorocarbon (FKM).

12. Ordering Information

Please provide the following information when ordering:

1. Regulator nominal pressure, and nominal body diameter
2. Inlet pressure, outlet pressure, flow capacity and characteristics
3. Medium type and temperature
4. Body and Trim parts material
5. Accessories and other special requirements

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