

April 2014



# DF Series

## Tank Blanketing Regulators Manual

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## 1. Introduction

DF Series are self-contained, direct-operated pressure regulators designed for low setpoint pressure control. They use the fluid's pressure to drive the actuator and automatically stabilize the outlet pressure. DF Series have large capacity and fast reponse, they can maintain stable pressure control and achieve tight shutoff which make them ideal choices for industrial tank blanketing systems.

**Applicable Industry:** Vessels and Tanks used in Oil and Gas, Petrochemical, Pharmacy, Food and Beverage and other industries where tank blanketing system are used and other applications where low setpoint pressure control are required.

**Applicable Medium:** Nitrogen, Carbon dioxide and other tank blanketing gases.

## 2. Specification

Table 1. DF Series Specifications

		DF SERIES
Body Sizes		DN 25 and DN 50 / 1 and 2 inches
End Connections		GB PN 1.6 MPa RF, CL150 RF
Pressure	Maximum Pressure	1.6 MPa / 232 psig
	Inlet Pressure (P1)	0.1 to 1.0 MPa / 14.5 to 145 psig <sup>(1)</sup>
	Outlet Pressure (P2)	0.4 to 25 kPa / 0.06 to 3.63 psig
Pressure Range	Pressure Range	0.4 to 0.52 kPa / 0.06 to 0.08 psig
		0.46 to 0.8 kPa / 0.07 to 0.12 psig
		0.65 to 1.6 kPa / 0.09 to 0.23 psig
		1.3 to 2.6 kPa / 0.19 to 0.38 psig
		2.2 to 7 kPa / 0.32 to 1.02 psig
		6.5 to 12 kPa / 0.94 to 1.74 psig
Flow Coefficients $C_v$		1-inch Body size: $C_v = 14$ ; 2-inch Body size: $C_v = 48$
Flow Characteristic		Quick Open
Operating Temperature		-29 to 80°C / -20 to 176°F
Performance	Accuracy Class	-1 to 2-inch w.c. $\pm 10\%$
	Shutoff Classification	ANSI Class VI
Material	Body	WCC, CF8M
	Trim	316 Stainless Steel
	Diaphragm, seals	Nitrile (NBR)

1. For more pressure and adjustment ranges, please consult Jeon factory directly.

## 3. Features

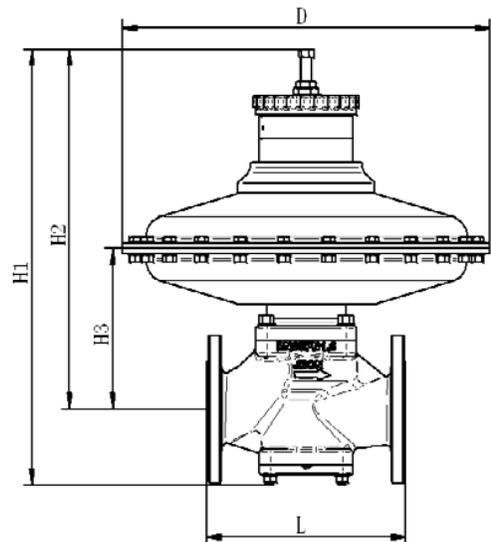
- Standard Single Seat Regulator
- Low-Setpoint Technology
- Modular Construction Design
- Fast Response, Large Capacity
- Fully-Balanced Orifice for High Accuracy
- Simple Construction for Easy In-Line Maintenance

## 4. Dimensions

Table 2. DF Series Dimensions

Type	L	D	H1	H2	H3	WEIGHT, kg / lbs
DF-25	160	436	585	525	165	26 / 57
DF-50	254	436	675	580	213	37 / 82

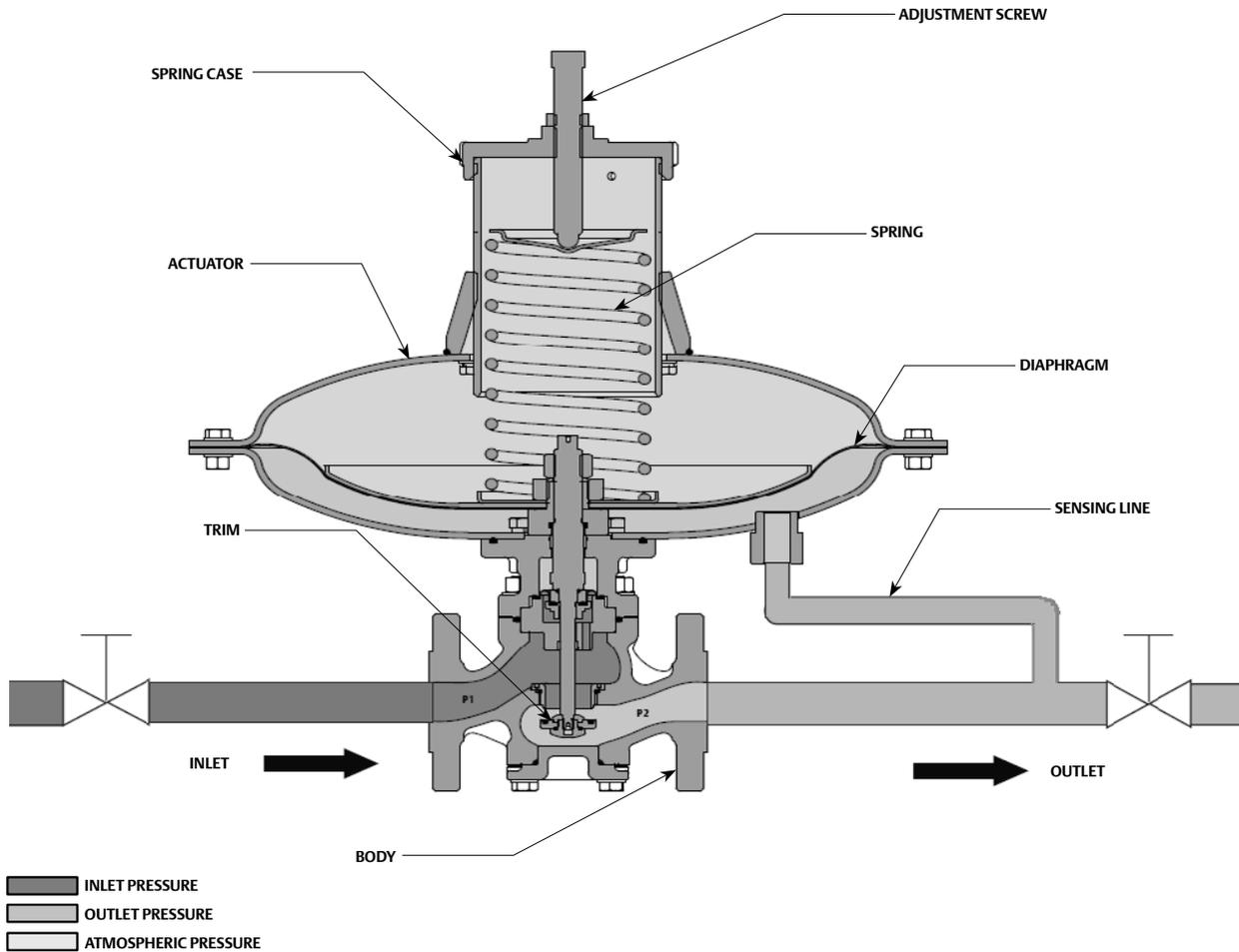
Figure 1. DF Series Dimensions



## 5. Construction and Principle of Operation

### Construction

Figure 2. DF Series Schematics



### Principle of Operation

#### **WARNING**

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire 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 Regulator Technologies, Inc. (Regulator Technologies) instructions. If the regulator vents gas or a leak develops in the system, service to the unit may be required.

Failure to correct trouble could result in a hazardous condition. Call a gas service person to service the unit. Only a qualified person must install or service the regulator.

Refer to Figure 2. The outlet pressure (P2) can be adjusted by turning the adjustment screw or the spring case. The fluid goes from P1 chamber to P2 chamber, outlet pressure (P2) is registered on the diaphragm through the sensing line, this pressure is constantly balanced with the spring force, the stem moves the disk to or away from the orifice to maintain the desired outlet pressure.

When the downstream demand increases, the outlet pressure (P2) decreases, under the spring force, the diaphragm moves the disk away from the orifice making the distance between the main disk and the main orifice larger, allowing more flow to pass through the main orifice, thus outlet pressure (P2) increases until it reaches the setpoint and maintains the downstream pressure.

Contrarily, when the downstream demand decreases, the outlet pressure (P2) increases, the diaphragm moves the disk closer to the orifice until the regulator is closed.

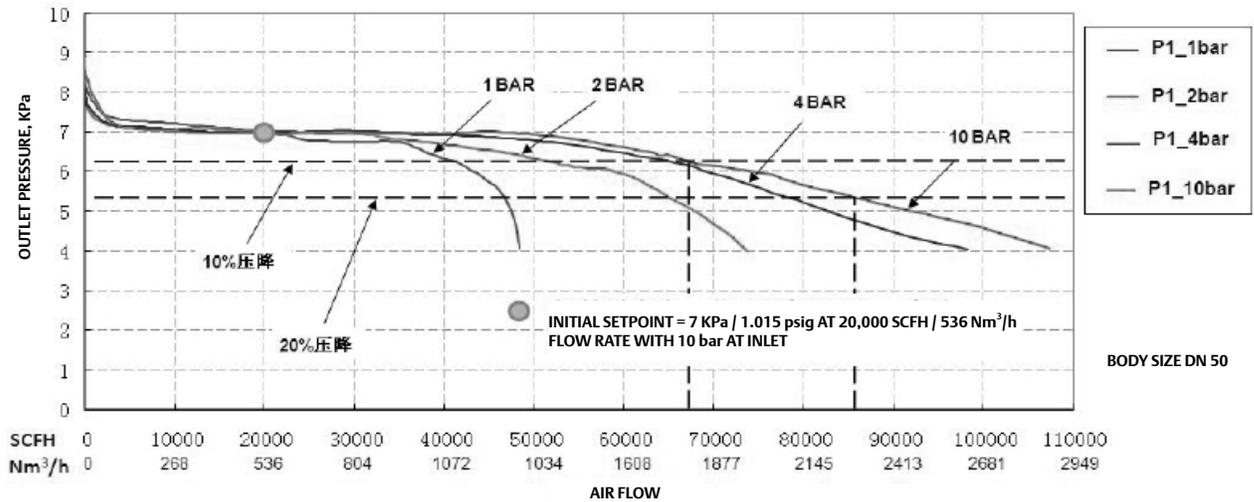
## 6. Selection of Actuator and Spring

**Table 3.** DF Series Spring Range for Body Sizes DN 25 and DN 50 / 1 to 2 Inches

ACTUATOR TYPE	SPRING RANGE, kPa / psig	SPRING WIRE DIAMETER, mm / Inch	SPRING PART NUMBER	SPRING COLOR
SNL436D	0.4 to 0.52 / 0.06 to 0.08	3 / 0.118	ERSA02628A0	Yellow
	0.46 to 0.8 / 0.07 to 0.12	3.5 / 0.138	ERSA02629A0	Silver
	0.65 to 1.6 / 0.09 to 0.23	4 / 0.157	ERSA02529A0	Blue
	1.3 to 2.6 / 0.19 to 0.38	4.5 / 0.117	JJJJ43CXT03	Black
	2.2 to 7 / 0.32 to 1.02	7 / 0.276	JJJJ43CXT05	Green
	6.5 to 12 / 0.94 to 1.74	7.5 / 0.295	JJJJ43CXT06	Blue
	11.5 to 25 / 1.67 to 3.63	9 / 0.354	JJJJ43CXT07	Red

## 7. Flow Curve

To ensure the high accuracy, stability and flow capacity of the DF Series, many tests were performed under different inlet pressure and outlet pressures.



## 8. Installation

### ⚠ WARNING

Personal injury or equipment damage, due to bursting of pressure-containing parts may result if this regulator is overpressured or is installed where service conditions could exceed the limits given in the Specification section and on the appropriate nameplate, or where conditions exceed any rating of the adjacent piping or piping connections. To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices to prevent service conditions from exceeding those limits. Also, be sure the installation is in compliance with all applicable codes and regulations.

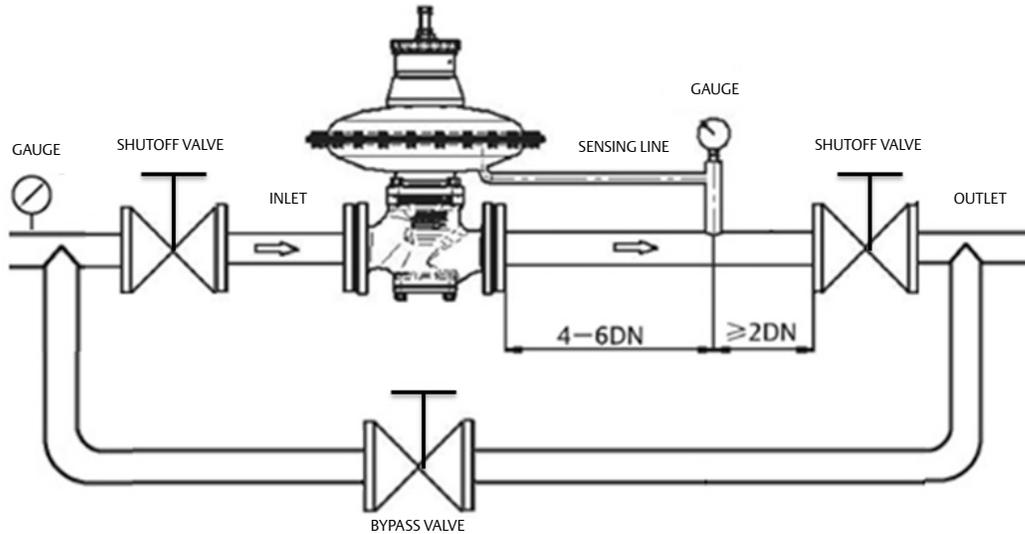
Additionally, physical damage to the regulator could break the pilot off the main valve, causing personal injury and property damage due to bursting of pressure-containing parts. To avoid such injury and damage, install the regulator in a safe location.

# DF Series Tank Blanketing Regulators

Use qualified personnel when installing, operating and maintaining the regulator.

1. The regulator should be installed in a place free from fire, turbulence and under appropriate temperature, in winter when the environment temperature is very low, heat tracing measures should be adopted to protect the pipeline.
2. Check if the pressure in the pipeline is within the pressure range stated on the Regulator nameplate.
3. Make sure that the flow direction of the pipeline matches the arrow stamped on the regulator.
4. Blow out any debris or dirt in the tubing and the pipeline before installation.
5. Install the regulator horizontally, do not forcefully install the regulator when connecting the inlet and outlet pipelines.
6. Install a Dry Gas Filter at the inlet pipe of the regulator. The sensing point should be positioned at the outlet pipe of the regulator at a suitable distance, approximately 4 to 6 times of the diameter of the pipe. An external line can be installed to sense the tank pressure directly. (Refer to Figure 3)

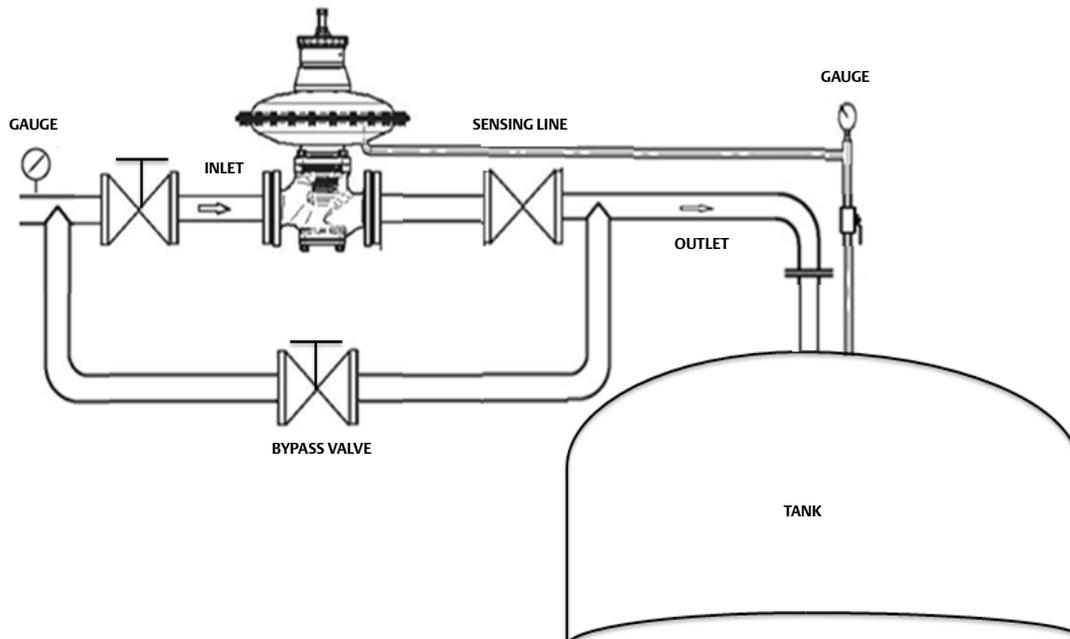
Figure 3. DF Series Installation Schematics



Note: The system should have an overpressure protection device.

## WARNING

Remove or isolate the regulator when the pipeline is undergoing pressure test or purging to avoid damaging the regulator.



## Startup

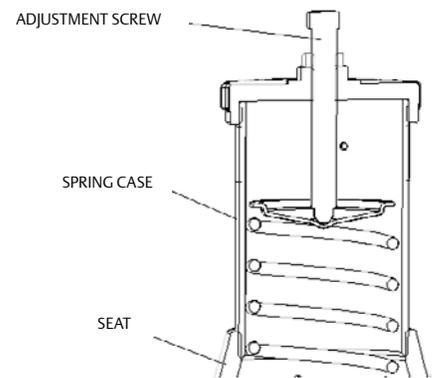
The Startup procedure for the DF Series is as follows:

1. Keep the inlet shutoff valve slightly open.
2. Slowly open the outlet shutoff valve.
3. Keep in this position until the flow stabilizes.
4. Fully open the inlet and outlet isolation valves.

## Outlet Pressure Settings

To change the outlet pressure, turn the spring case slowly first for initial adjustment, then turn the adjustment screw to adjust the outlet pressure to the desired set value. Clockwise to increase the outlet pressure, or counterclockwise to decrease it.

Figure 4. DF Series Spring Case



## 9. Maintenance

### General Maintenance

#### WARNING

**To avoid personal injury or property damage from sudden release of pressure, isolate the regulator from the pressure system, and release all pressure from the pilot and main valve before performing maintenance operations.**

Before maintenance, close the inlet and outlet valves and exhaust the gas pressure in the valve body. When removing or replacing parts such as the orifice or balance diaphragm, be careful not to damage them. Ensure movable parts can move freely after reassembly. After reassembly, it is necessary to commission again according to the procedures of Installation and Startup and use soap solution as gas detector to run a leak test to ensure that all connections are well sealed.

Regulator Technologies provides training for your maintenance personnel. For other information, consult your local Sales Office.

### Daily Checks

To ensure the smooth operation of the regulator, the operations department should determine the servicing schedule based on the usage condition of the regulator and the inlet gas condition.

1. Use soap solution as gas detector to ensure that there is no leakage on the regulator and tubing connections.
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.

### Periodic Maintenance

Clean the internal parts of the regulator every 3 to 6 months based on the inlet gas condition, check and replace deformed and wearing elastomer parts to ensure the proper gas supply and the smooth operation of the regulator. To ensure the smooth operation of the regulator, the operations department should determine the servicing schedule based on the usage condition of the regulator and the inlet gas condition.

1. Run a test on DF Series lock-up pressure at least once every 3 months: Install a gauge near the regulator outlet and turn it on, slowly close the outlet ball valve, record the lock-up pressure value after 5 minutes to check if it is in the normal range. Under normal circumstances, it is not necessary to disassemble the regulator from the pipeline.
2. Clean the regulator trim parts every 3 to 6 months, check wearing parts such as the disk, balance diaphragm, O-rings and change any parts that are worn out or damaged.
3. Check on the key parts of the regulator to ensure that they are in good working condition, replace them when necessary.

## Troubleshooting

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE MEASURES
The outlet pressure of the regulator drops	The inlet pressure is too low. The actual gas flow exceeds the designed capacity of the regulator. The contaminant build up within the regulator body.	Choose the right regulator. Inspect and clean the regulator trim parts.
The lock-up pressure increases	The balance diaphragm may be deformed, worn or damaged. The elastomer seat may have deformed, lost its efficacy, or there may be presence of dirt. The O-ring at the orifice or the rubber plate is damaged. Debris build up at orifice or the orifice is damaged.	Replace Balance Diaphragm. Replace the deformed elastomer seat.  Replace the O-ring. Clean or change orifice.
The regulator is not working	The set pressure is beyond the spring range and breaks the spring.	Change to the correct Spring.
Outlet pressure is unstable or fluctuating	The flow is too low or the inlet pressure is very high.	If the inlet pressure is very high, take corrective action.

## 10. Spare Parts Kit and Parts List

### Spare Parts Kit

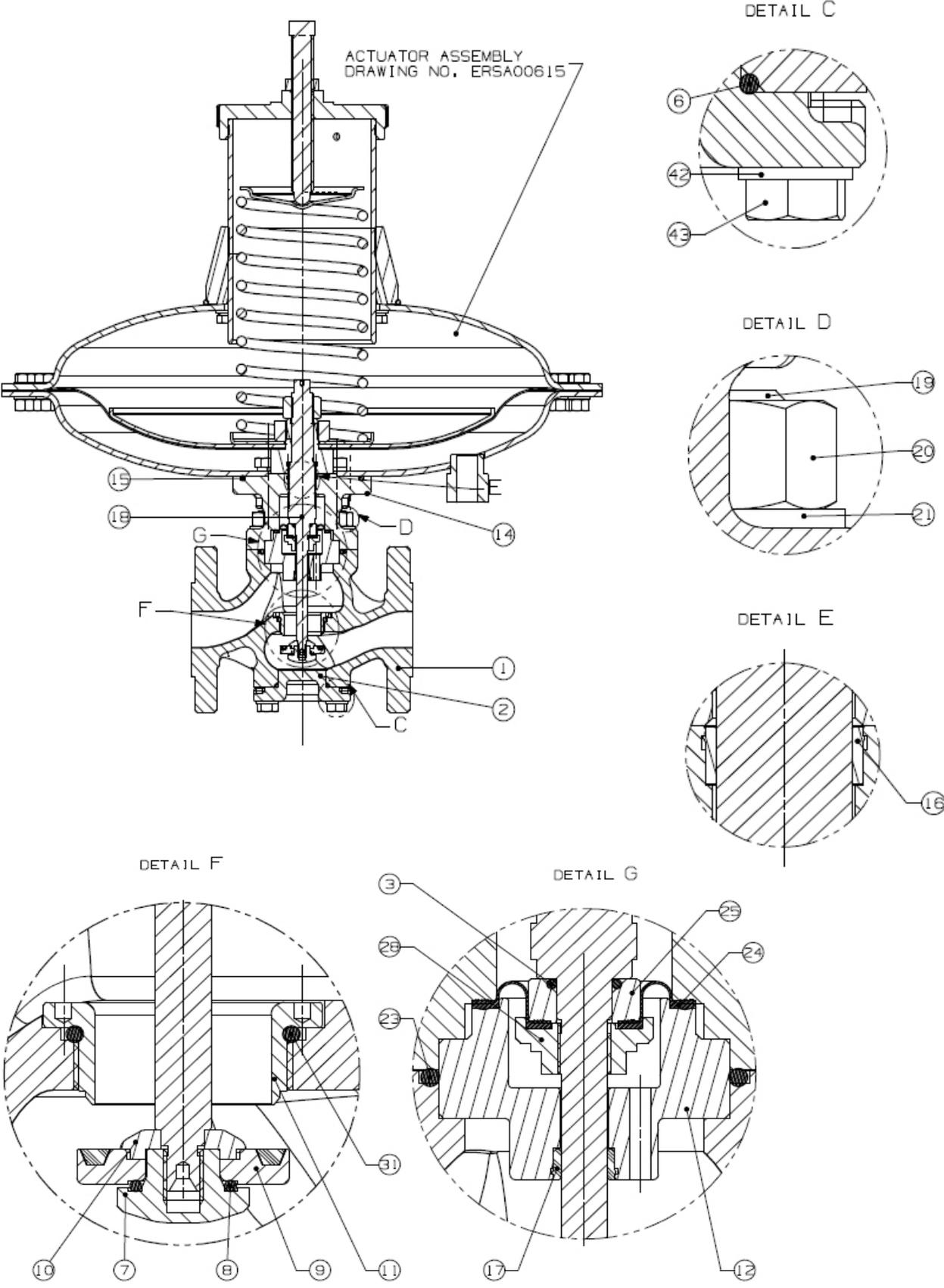
Including: Disk, main diaphragm, balance diaphragm, O-ring, washers, etc.

KEY	PART NAME	MATERIAL	DN 25 BODY SIZE		DN 50 BODY SIZE	
			Quantity	Part Number	Quantity	Part Number
52	Diaphragm	Nitrile (NBR) / Nylon (PA)	1	ERSA02649A0	1	ERSA02649A0
24	Balance Diaphragm	Nitrile (NBR) / Nylon (PA)	1	GE30441X012	1	ERSA02650A0
16	Bushing (Stem)	Polytetrafluoroethylene (PTFE)	1	JJJJ12CX067	2	JJJJ12CX067
17	Bushing (Cage)	Polytetrafluoroethylene (PTFE)	1	ERSA02760A0	----	-----
6	O-ring (Lower Bonnet)	Nitrile (NBR)	1	JJJJ8226034	1	JJJJ8131090
8	O-ring (Disc)	Nitrile (NBR)	1	ERSA02762A0	1	JJJJ8235027
31	O-ring (Orifice)	Nitrile (NBR)	1	ERSA02763A0	1	JJJJ8131070
29	O-ring	Nitrile (NBR)	1	JJJJ8124022	3	JJJJ8124022
23	O-ring (Bonnet)	Nitrile (NBR)	1	ERSA02764A0	1	JJJJ8131110
15	O-ring (Actuator)	Nitrile (NBR)	1	JJJJ8235083	1	JJJJ8157100
3	O-ring (Stem)	Nitrile (NBR)	1	ERSA02766A0	1	-----
53	O-ring	Nitrile (NBR)	1	JJJJ8235136	1	JJJJ8235093
9	Disc	Nitrile (NBR)	1	ERSA02756A0	1	ERSA02645A0

### Parts List

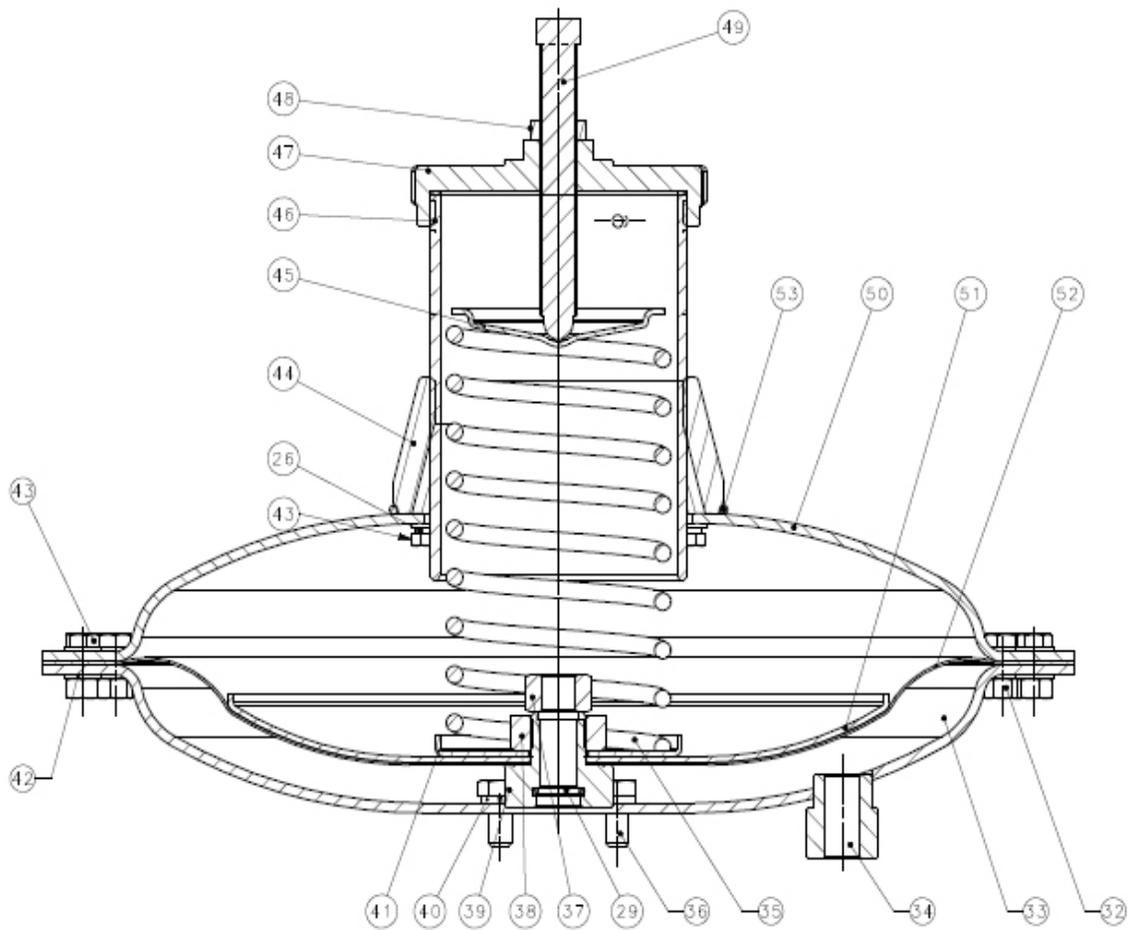
KEY	PART NAME	KEY	PART NAME
1	Valve Body	17	Bushing (Stem)
2	Lower Body Bonnet	18	Stem
3	O-ring (Stem)	19	Stud (Bonnet)
4	Stud (Lower Bonnet)	20	Nut, Hex
5	Washer	21	Washer
6	O-ring (Lower Bonnet)	22	Nut, Diaphragm Head
7	Disc Seat	23	O-ring (Bonnet)
8	O-ring (Disc)	24	Balance Diaphragm
9	Disc	25	Head, Balance Diaphragm
10	Disc Holder	27	Socket Head Screw, Hex
11	Orifice	28	Plate, Balance Diaphragm
12	Cage	30	Pitot Tube
13	Sleeve Guide	31	O-ring (Orifice)
14	Bonnet	42	Washer
15	O-ring (Actuator)	43	Bolt, Hex
16	Bushing (Stem)	----	----

Figure 5. DF Series Assembly



# DF Series Tank Blanketing Regulators

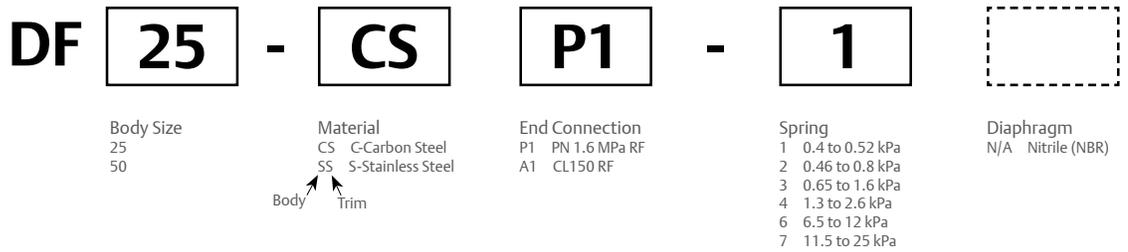
Figure 5. DF Series Assembly (continued)



## Parts List (continued)

KEY	PART NAME	KEY	PART NAME
26	Washer, Spring	42	Washer
29	O-ring	43	Bolt, Hex
32	Nut, Hex (Actuator)	44	Holder
33	Diaphragm Casing, Lower	45	Spring Seat, Upper
34	Bushing, Pipe	46	Spring case
35	Spring	47	Cover
36	Bolt, Hex	48	Nut, Hex (Screw, Adjusting)
37	Locknut (Stem)	49	Screw Adjusting
38	Nut	50	Diaphragm Casing, Upper
39	Diaphragm Head	51	Diaphragm Plate
40	Washer, Spring	52	Diaphragm
41	Spring Seat, Lower	53	O-ring

## 11. Model Description



The product description is **DF25-CSP1-1**

For example: DF25-CSP1-1 indicates that the model is DF, Body size is 25mm, Body Material is WCC, Trim Material is 316 SST, End Connection type is GB PN 1.6 MPa flange RF, pressure range is 0.4 to 0.52 kPa / 0.06 to 0.08 psig, the diaphragm material is Nitrile (NBR).

### Product Code List

SIZE	BODY MATERIAL	END CONNECTION	SPRING RANGE						
			0.4 to 0.52 kPa / 0.06 to 0.08 psig	0.46 to 0.8 kPa / 0.07 to 0.12 psig	0.65 to 1.6 kPa / 0.09 to 0.23 psig	1.3 to 2.6 kPa / 0.19 to 0.38 psig	2.2 to 7 kPa / 0.32 to 1.02 psig	6.5 to 12 kPa / 0.94 to 1.74 psig	11.5 to 25 kPa / 1.67 to 3.63 psig
DN 25 / 1-Inch	Carbon Steel	GB PN 1.6 MPa RF	DF25-CSP1-1	DF25-CSP1-2	DF25-CSP1-3	DF25-CSP1-4	DF25-CSP1-5	DF25-CSP1-6	DF25-CSP1-7
		CL150 RF	DF25-CSA1-1	DF25-CSA1-2	DF25-CSA1-3	DF25-CSA1-4	DF25-CSA1-5	DF25-CSA1-6	DF25-CSA1-7
	Stainless Steel	GB PN 1.6 MPa RF	DF25-SSP1-1	DF25-SSP1-2	DF25-SSP1-3	DF25-SSP1-4	DF25-SSP1-5	DF25-SSP1-6	DF25-SSP1-7
		CL150 RF	DF25-SSA1-1	DF25-SSA1-2	DF25-SSA1-3	DF25-SSA1-4	DF25-SSA1-5	DF25-SSA1-6	DF25-SSA1-7
DN 50 / 2-inch	Carbon Steel	GB PN 1.6 MPa RF	DF50-CSP1-1	DF50-CSP1-2	DF50-CSP1-3	DF50-CSP1-4	DF50-CSP1-5	DF50-CSP1-6	DF50-CSP1-7
		CL150 RF	DF50-CSA1-1	DF50-CSA1-2	DF50-CSA1-3	DF50-CSA1-4	DF50-CSA1-5	DF50-CSA1-6	DF50-CSA1-7
	Stainless Steel	GB PN 1.6 MPa RF	DF50-SSP1-1	DF50-SSP1-2	DF50-SSP1-3	DF50-SSP1-4	DF50-SSP1-5	DF50-SSP1-6	DF50-SSP1-7
		CL150 RF	DF50-SSA1-1	DF50-SSA1-2	DF50-SSA1-3	DF50-SSA1-4	DF50-SSA1-5	DF50-SSA1-6	DF50-SSA1-7

## 12. Ordering Information

Please provide information below when ordering:

1. Regulator set pressure, line size.
2. Inlet pressure, outlet pressure, flow capacity and characteristics.
3. Gas type and operating temperature.
4. Body and trim parts material.
5. Accessories and other special requirements.

# DF Series Tank Blanketing Regulators

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