

July 2018

Direct-Operated Regulator

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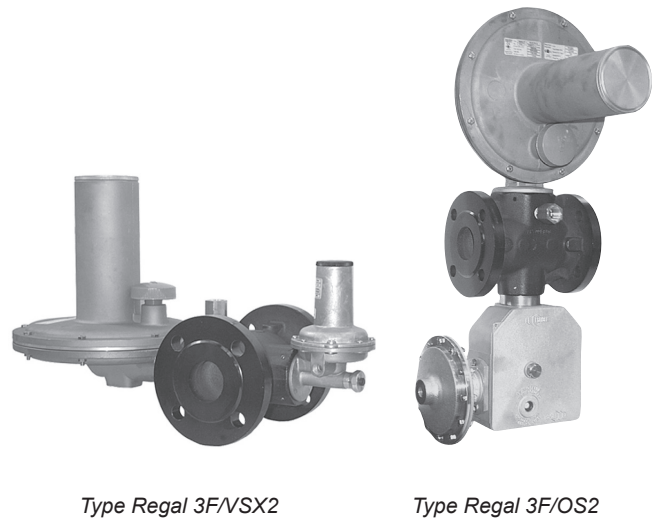


Figure 1. Type REGAL 3F Direct-Operated Regulator

INTRODUCTION

The type REGAL 3F is a direct-operated, spring set point pressure regulator, used for supplying industries and commercial businesses.

As an option, it can be equipped with a slam shut types VSX2 or OS2 which permits the gas flow to be cut off rapidly and totally in the case of under or over outlet regulator pressure.

The type **REGAL 3F** is in conformity with the Pressure Equipment Directive PED 2014/68/UE and is classified under category I.

Equipment and pipeline situated on the outlet side of the regulator are either;

- not subject to the PED ($P_u \leq 0.5$ bar), or
- subject to ($P_u > 0.5$ bar): in this case the type Regal 3F is classified under category 1 maximum.

DECLARATION OF CONFORMITY REGAL 3F

Manufacturer:	FRANCEL	
Address:	3 avenue Victor Hugo, 28008 Chartres	
Equipment:	REGAL 3F	Identification no.:
Conformity Assessment Module:	Module A	

The undersigned declare that the design, manufacture and inspection of this equipment are in conformity with the Pressure Equipment Directive 2014/68/UE (PED)

Name:	Function:	Company stamp:
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Date:	Signature:
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REGAL 3F

DESCRIPTION

The Regal 3F consists of:

A Version without Integral Slam Shut

- A body, a diaphragm actuator, a bottom
- A diaphragm-balanced valve plug, an orifice
Depending on set point required:
 - A Pd set point adjustment spring

A Version with Integral Slam Shut Type VSX2

- A body, a diaphragm actuator
- A diaphragm-balanced valve plug, an orifice
- An integral bypass slam shut in place of the bottom (see D103695X012 manual)
Depending on set point required:
 - A Pd set point adjustment spring
 - A tripping spring set to max
 - A tripping spring set to min

A Version with Integral Slam Shut Type OS2

- A body, a diaphragm actuator
- A diaphragm-balanced valve plug, an orifice
- A slam shut connecting part in place of the bottom
- A valve plug with integral bypass
- A release relay type OS2 (see D103683X012 manual)
 - A safety manometric box (BMS) for connection outlet side of the regulator
 - A mechanism box (BM)

Depending on the set point required:

- A Pd set point adjustment spring
- A max. and min. set point tripping spring

Orientation and Regulator Impulse Line

The actuator and slam shut can be orientated 360°.

The regulator impulse line is connected directly onto the body, which makes maintenance easier (the actuator can be removed without disconnecting the impulse pipeline).

CHARACTERISTICS

Table 1. General Characteristics for Type Regal 3F Regulator

Operating pression			REGULATOR			
Body, valve plug, slam shut	PS	4 bar	Accuracy	AC	5	
Actuator		1.5 bar		SG	10	
BMS* associated, according to size		5 bar		SZ	10	
Operating temperature	TS	- 20 / 60 °C	Inlet/Outlet diameter		DN	50
Outlet pressure	Pd	100/1000 mbar	Fluid	Groups 1& 2 according to PED 2014/68/UE, 1 st and 2 nd family gas according to EN 437, or other gases (compressed air, nitrogen). The gas must be noncorrosive, clean (filtration on inlet side necessary) and dry.		

* BMS : Safety Manometric Box

Material

Body	Ductile iron
Sitting part	Brass
Actuator	Aluminium
Regulator/slam shut orifice	Brass
Regulator valve plug	Aluminium
Slam shut valve plug	Aluminium
Regulator/slam shut plug disc	Nitrile

Connections

Inlet/Outlet:	ISO PN 10
Actuator impulse line ISM :	1/2" NPT tapped
Actuator vent:	3/4" NPT tapped
Impulse line:	Internal pipe Ø >= 15 mm
Slam shut impulse line (VSX2 / OS2) IS :	1/4" NPT tapped
Impulse line (VSX2) :	Internal pipe Ø >= 4 mm
(OS2) :	Internal pipe Ø >= 8 mm
Slam shut vent (VSX2/OS2) :	1/4" NPT tapped
Contact (OS2) :	See D103683X012 manual

Table 2. Regulator Flow Ranges Table

Pd (mbar)	Pu (bar)	Q (m³/h(n))	AC
100	0.7<Pu<1	520	10
100	> 1	520	5
160	0.7<Pu<1	520	10
160	> 1	520	5
300	0.7<Pu<1	520	10
300	> 1	520	5
500	> 1	500	
1000	> 2	700	

Table 3. Regulator Set Point Spring & Regulator Ranges Table

Pd (mbar)			Spring		Spring code
Nominal	Min.	Max.	Wire Ø (mm)	Length (mm)	
100	60	140	5.5	165	131 918
160	80	180	6.0		142 539
300	100	320	7.0	167	144 300
500	300	550	8.0	170	131 793
1000	400	1100	10.0		144 035

Table 4. Set Point Spring & Slam Shut Range Table


Nominal Pd (mbar)	Wire Ø (mm)		OS2 Springs Min. & Max.	Nominal Set Point (mbar)	
	VSX2 Springs Min.	Max.		Min.	Max.
100	1.4	2.3	3.5	60 ⁽¹⁾ /70 ⁽²⁾	150
160	1.7	2.6		110	225
300	2.4	3.1	5	200	400
500		3.5		350	650
1000	3.2	4.1	6.5	700	1300

(1) For VSX2 (2) For OS2


Table 5. Regulator Types Table

Nominal Pd (mbar)	Slam Shut	Contact	Regulator code	
			PN10	PN20
100	OS2	C1	902 463	FSREG3F-19NR
	VSX2 LP	NO	902 464	FSREG3F-20NR
	NO		902 465	FSREG3F-21NR
160	OS2	C1	902 466	FSREG3F-22NR
	VSX2 LP	NO	902 467	FSREG3F-23NR
	NO		902 468	FSREG3F-24NR
300	OS2	C1	902 283	FSREG3F-13NR
	VSX2 LP	NO	902 237	FSREG3F-10NR
	NO		902 235	FSREG3F-16NR
500	OS2	C1	902 454	FSREG3F-14NR
	VSX2 LP	NO	902 453	FSREG3F-11NR
	NO		902 456	FSREG3F-17NR
1000	OS2	C1	902 455	FSREG3F-15NR
	VSX2 LP	NO	902 238	FSREG3F-12NR
	NO		902 236	FSREG3F-18NR


LABELLING

 <p>Regulateur Regulator FRANCE 28320 Gallardon Groupe fluide 1 (Gaz naturel)</p>	Type	REGAL3F	DN	50	PN	10
	PS	4 bar	TS	-20 / 60°C	Cat.	I
	N°serie/Serial N°					
	Date Fab/Test	JJ MM 20AN				
	Pset max	0.320 bar				
		1.5 bar				

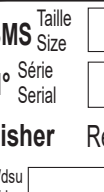
PED label

 <p>Regulateur Regulator FRANCE 28320 Gallardon</p>	Code	902237
	Plage / Range (mbar)	100 / 320
	Réglage / Set (mbar)	300
	Soupape / Relief	NO
	Tarage / Set (mbar)	

Regulator label

 <p>Sécurité Slam shut FRANCE</p>	Type	VSX2LPC3	PS	10 bar
	Code	196433	AG maxi	10
	Min (mbar)	100 / 350	Max (mbar)	260 / 600
	Plage / Range			
	Tarage / Set nominal	200		400

Type VSX2 slam shut label

 <p>BMS N° Série Serial Fisher Wdsu Wdso</p>	Taille Size	162	PSD BMS	5	bar
	AG maxi	2.5			
	Ressort/Spring Ø		mm		
	Δ1		Δ2		bar

Type OS2 slam shut label

Figure 2. Type Regal 3F/VSX2 and Type Regal3F/OS2 Labels

REGAL 3F

DIMENSIONS AND WEIGHTS

Weight

With slam shut: 18.8 kg VSX2 / 24 kg OS2

Without slam shut: 18 kg

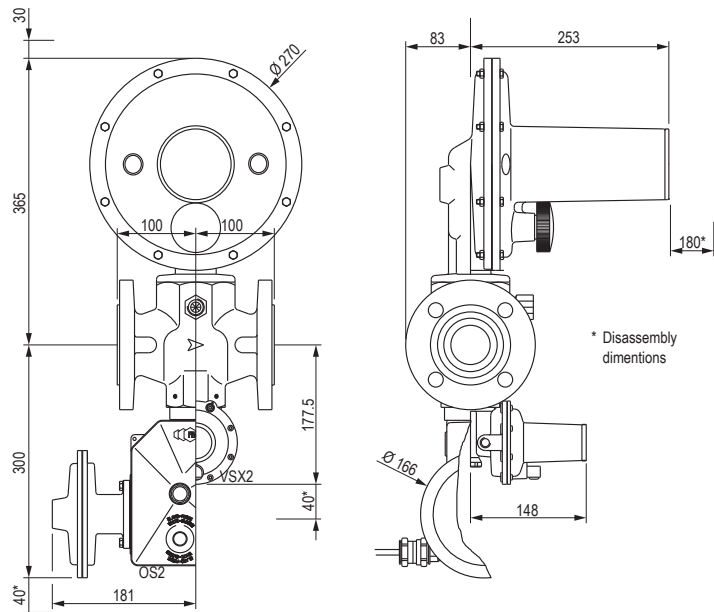


Figure 3. Type Regal 3F/VSX2 and Type Regal3F/OS2 Dimensions (mm)

OPERATION

The type Regal 3F is a pressure regulator with expansion achieved by a balanced valve plug and pressure control by a direct-operated actuator.

The balanced valve plug/stem assures accuracy independent of inlet and outlet pressures.

Pressure control is achieved through the actuator diaphragm, which receives, on the one side, the outlet pressure and, on the other side the spring load, adjusted to the desired value by the set point spring.

Tight shutoff is ensured by the regulator plug disc pushing on the orifice.

The regulator can be equipped with a slam shut using a release relay types VSX2 or OS2.

In the case of temporary over pressure, the diaphragm plate assembly will travel up the actuator and sit into the cap, without any leak or deterioration of the components (disconnecter).

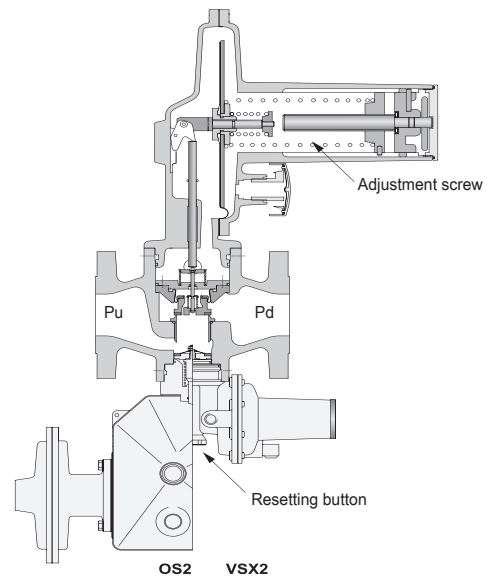


Figure 4. Type Regal 3/VSX2 and Type Regal3/OS2 Operational Schematic

INSTALLATION

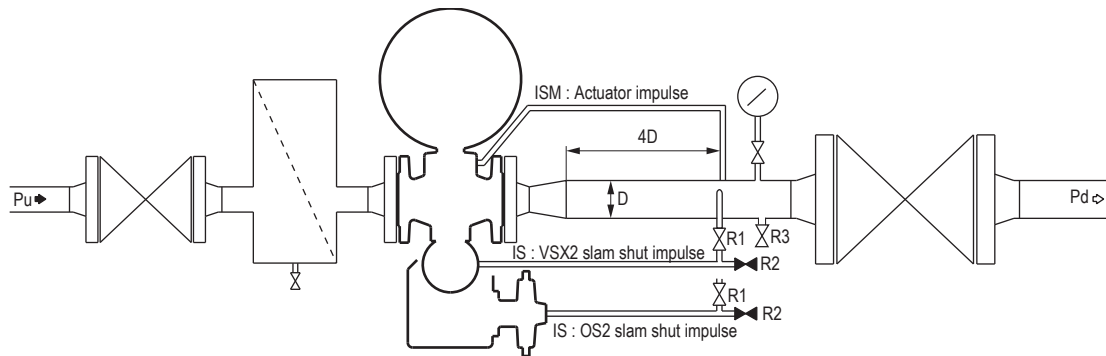


Figure 6. Type Regal 3F/VSX2 and Type Regal3F/OS2 Installation Schematic



CAUTION

All interventions on equipment should only be performed by qualified and trained personnel.



WARNING

The regulator is installed on horizontal (recommended) or vertical pipeline. Version with slam shut, the release relay can be situated towards the bottom or the top.

Installation according to EN12186 or EN12279 recommended.

Install according to direction of fluid flow (arrow).

When assembling with adjacent elements care must be taken not to create pressure force on the body and the assembling elements (bolts, O-rings, flanges) should be compatible with the geometry and working conditions of the equipment.

If the case arises a support must be used to avoid pressure force on the body (a support can be installed under the flanges).

Connect the actuator (ISM) to the impulse at 4D minimum on a straight run of the outlet pipe.

Version with integral slam shut, connect the safety manometric box (IS) to the impulse at 4D on a straight run of the outlet pipe.

It is recommended to separate the slam shut impulse line (IS) from that of the actuator (ISM). Do not connect the impulses on the lower generator line.

Version with integral slam shut, it is recommended to install an isolation valve (R1) and an atmospheric valve (R2), which are useful for tripping and verifications.

No modification should be made to the structure of the equipment (drilling, grinding, soldering...).

It is recommended to install a servicing valve (R3) on the outlet pipeline to facilitate adjustments and bleeding off to the atmosphere.

Verify that the inlet side is protected by an appropriate device(s) to avoid exceeding the limits of utilization (PS, TS).

Verify that the limits of utilization correspond to the appropriate operating conditions.

Version without slam shut, verify that a pressure limiting device on the outlet side of the regulator guarantees a pressure limit $<$ or equal to the actuator PS.

Version with slam shut, verify that the springs (for VSX2), and the safety manometric box (BMS) and its spring (for OS2) correspond to the appropriate operating conditions on the outlet side of the regulator.

The equipment should not receive any type of shocks.

Fire, seismic and lightning are not taken into consideration for standard regulators. If required, a special product selection and/or specific calculations may be supplied according to specific requirements.

REGAL 3F

The user should verify or carry out a protection adapted to the environment.

Version with slam shut, if the outlet side is subject to the PED and not protected by any other means, verify that no component is superior to category 1.

COMMISSIONING (Figure 4)



CAUTION

All interventions on equipment should only be performed by qualified personnel.

Operations concerning the integral slam shut version types VSX2 and OS2 are in *italic*.

Preliminary Verifications

Start-up Positions

- Inlet and outlet valves
 - Closed

Verify the absence of pressure between inlet and outlet valves

- Set point adjustment screw
 - Unscrewed (case 1) or set (case 2)
- Slam shut valve plug
 - Closed
- Impulse isolating valve (R1)
 - Closed

SLAM SHUT SET POINT VERIFICATION

Type VSX2

Using the atmospheric valve (R2), inject a pressure equal to the pressure required for the regulator

- Slam shut valve plug
 - Set (Unscrew, pull, rescrew the resetting button (see D103683X012 manual))
 - Progressively increase the pressure to reach tripping
 - Adjust the setting if necessary (see D103695X012 manual)

Note the set point value on the equipment or mark it on a commissioning document

Type OS2 (Figure 7)

Using the atmospheric valve (R2), inject a pressure equal to the pressure required for the regulator

- 1st release relay stage
 - Set (Stage 1)
- Slam shut valve plug
 - Set (Stages 2 and 3)
 - Progressively increase the pressure to reach tripping
 - Adjust the setting if necessary (see D103683X012 manual)

Note the set point value on the equipment or mark it on a commissioning document

Positions before Commissioning

- Impulse isolating valve (R1)
 - Open
- Impulse atmospheric valve (R2)
 - Closed
- Slam shut valve plug
 - Closed
- Servicing valve
 - Closed

The equipment is commissioned

Commissioning

- Inlet valve
 - Open **very** slowly
- Slam shut valve plug

Type VSX2

- Slowly unscrew (*bypassage*)
 - Verify that the outlet pressure corresponds to the set point required. If not, adjust the regulator set point (adjustment screw)
 - Pull (set, when the *bypassage* is completed)
 - Gently push back and rescrew

Type OS2 (Figure 7)

- 1st release relay stage
 - Set (Stage 1)

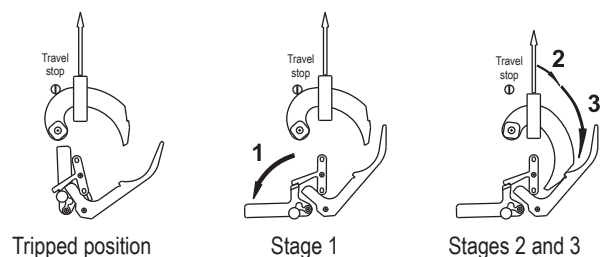


Figure 7. Release Relay Activation Stages

- *Slam shut valve plug*
 - *Bypassage (Stage 2)*
 - *Open (Stage 3)*
- Servicing valve
 - Slightly open
- Set point adjustment screw
 - Slowly adjust to required value (adjustment screw)
- Outlet valve
 - Open slowly
- Servicing valve
 - Closed

The equipment is commissioned.

It is recommended to seal the release relay.

MAINTENANCE

Operations concerning the integral slam shut versions are in italic.

Servicing Check

Recommended frequency:

Twice yearly minimum

Verification:

- Verification of the set point

- Regulator valve plug tightness
- *Tripping and slam shut valve plug set point value*
- *Slam shut valve plug tightness*

Departure positions

- Inlet valve
 - Open
- Outlet valve
 - Open
- *Slam shut valve plug*
 - *Open*
- Regulator
 - In operation

Inlet and outlet sides of regulator under pressure

Tightshut verification (and tripping verification for versions with integral slam shut)

- *Inlet valve*
 - *Closed*
- *Outlet valve*
 - *Closed*
- *Regulator*
 - *Observe the evolution of the outlet pressure (control regulator tightness)*

Table 6. Troubleshooting for Type Regal 3F/VSX2 and Type Regal 3F/OS2 Regulators

SYMPTOMS	CAUSE	ACTIONS
If the outlet pressure increases	Internal leak	Control the regulator valve plug Control the regulator orifice or contact after-sales
If the outlet pressure decreases	External leak	Locate and seal the leak or contact after-sales
If the outlet pressure is constant	The regulator is tightshut	Close the impulse isolation valve Open the impulse atmospheric valve Progressively inject pressure (without exceeding outlet pressure limits)
<i>If the slam shut valve plug will not close</i>	<i>Operating fault</i>	<i>Control the release relay Control the slam shut valve plug or contact after-sales</i>
<i>If the slam shut valve plug closes</i>	<i>Operating correctly</i>	
<i>Observe the evolution of the outlet pressure (control tightness)</i>		
If the outlet pressure is constant		Purge the outlet side of the regulator
Observe the evolution of the outlet pressure (control tightness)		
<i>If the outlet pressure increases</i>	<i>Internal leak</i>	<i>Control the slam shut valve plug Control the slam shut orifice Control the internal bypass or contact after-sales</i>
<i>If the outlet pressure is constant</i>	<i>Slam shut valve plug is tightshut</i>	

REGAL 3F

Disassembly of Regulator and Slam Shut

Recommended frequency:

Every 4 to 6 years (or less depending on operating conditions)

Verification:

Diaphragms, valve disc plug, lubrication

Replacement:

O-rings, diaphragms (depending on condition and usage), tightshut rings

Table 5. Corresponding Spanner / Torque Information

Spanner	Torque (N.m)
4	4
6	15
10	6
13	15

Tools

Male spanners for six-sided wrench: 2.5, 4 and 6

Flat spanner: 10

Box spanner: 30 and 46

2 flat spanners for flanges: 24

Adjustment spanner for VSX2: Ref. 197 226

Regulator

- Valve plug closed (no flow)
- Inlet and outlet valves closed
- **Bleed off outlet pressure**
- **Bleed off inlet pressure**
- Unscrew the cap (key 6)
- Unscrew the adjustment screw (key 5)
- Remove the adjustment screw assembly (key 5)
- Unscrew the actuator screws (key 3)
- Remove the cover (key 4)
- Unscrew the main diaphragm assembly (key 2)

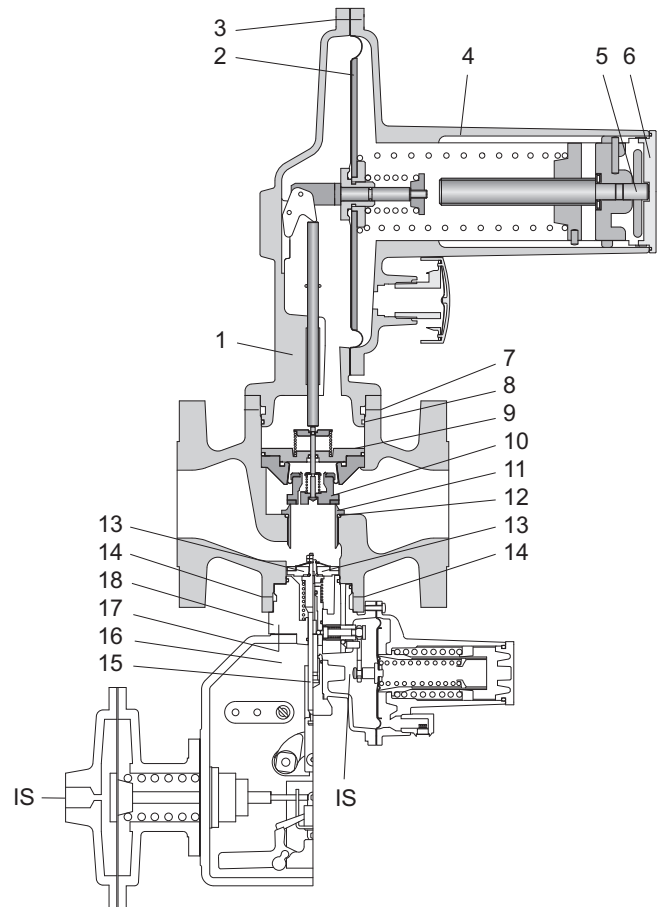


Figure 8. Type Regal 3F/V SX2 and Type Regal 3F/OS2 detail

CAUTION

Before disassembling the diaphragm, note the dimension between the relief valve setpoint nut and the diaphragm plate assembly (key 2)

- Unscrew screws (key 7) and remove the actuator body (key 1)
- Control the O-ring (key 8)
- Unscrew screws (key 9)
- Remove the valve plug assembly (key 10)
- Unscrew the orifice (key 11)
- Control the O-ring (key 12)

Slam Shut

Version with Type VSX2 integral slam shut

- Disconnect the impulse pipe (IS)
- Unscrew the screws (key 14) and remove the VSX2 slam shut
- Control the valve plug (key 13)
- Disassembly : see D103683X012 manual

Version with Type OS2 integral slam shut

- Disconnect the impulse pipe (IS)
- Unscrew the screws (key 14) and remove the OS2 slam shut
- Unscrew screws (key 17) from the mechanism box (key 16)
- Disconnect the valve axle (key 15) from the mechanism box yoke (key 16)
- Remove the connecting part (key 18) and the valve axle (key 15)
- Contrôler le clapet de sécurité (key 13)

Reassembly

- Perform the above operations in reverse order (respect tightening torques)
- Diaphragms to be changed every 6 years or less depending on condition
- Respect the relief valve setpoint dimension noted during disassembly
- Replace O-rings at each disassembly
- Lubricate screws before tightening
- Lightly lubricate O-rings (silicone grease)
- Lightly lubricate the valve plug stem (silicone grease)
- Lightly lubricate the slam shut valve plug stem (silicone grease)
- Lubricate springs (molybdenum graphite grease)

REGAL 3F

SPARE PARTS

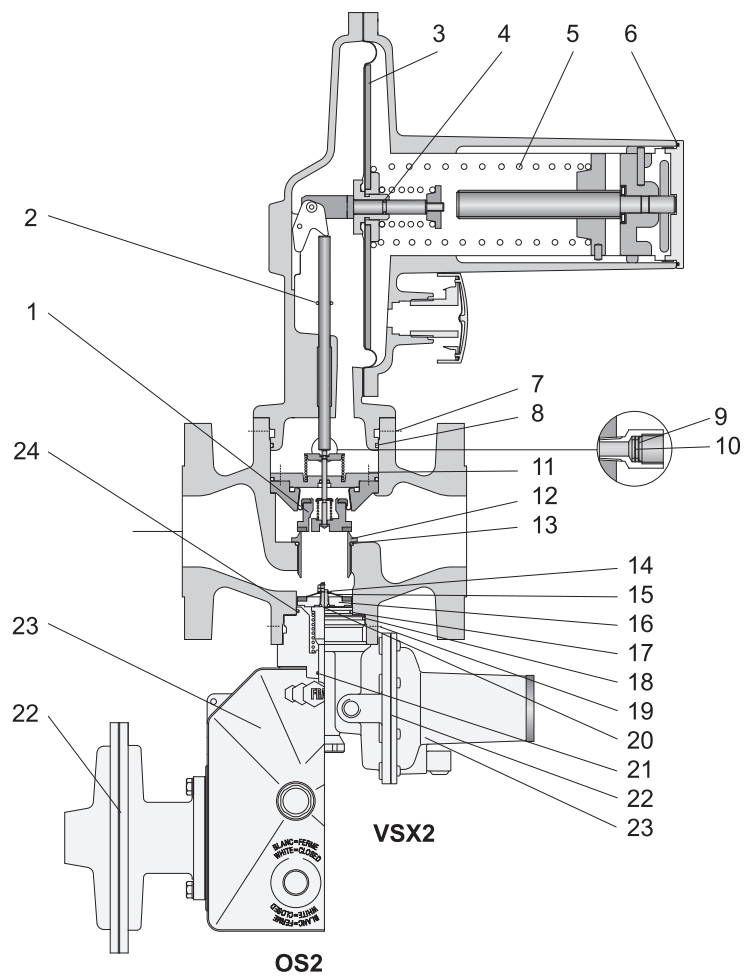


Figure 9. Type Regal 3F/VSX2 and Type Regal 3F/OS2 Spare Parts detail

Table 7. Spare Parts

Item	Description	Reference		
1	Valve plug assembly	181 058		
2	O-ring	400 506		
3	Diaphragm	142 033		
4	Clutch O-ring	400 505		
5	Spring	See Table 3		
6	Cap O-ring	400 080		
7	Screw	403 030		
8	Actuator/body O-ring	400 029		
9	Truarc ring	406 201		
10	Sensing diaphragm	138 369		
11	Tightshut washer	461 173		
12	Orifice	142 017		
13	Orifice O-ring	400 102		
With Slam Shut		Type VSX2		Type OS2
14	Circlips	406 153		
15	Spring	144 064		
16	Valve plug	142 130		
17	Slam shut Pu O-ring	400 081		
18	Slam shut Pd O-ring	400 074	-	
19	Screw	403 028		
20	Bypass O-ring	400 501		
21	Stem O-ring	-		400 505
22	Diaphragm assembly	181 017	181 027	181105
23	Slam shut assembly	196 433	196 250	196245
Without Slam Shut				
24	Bottom O-ring	400 081		
Spare parts kit (commissioning spares)		197 480		

REGAL 3F

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