

# DIRECT-OPERATED REGULATOR

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Type REGAL 3F

## INTRODUCTION

The **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 type 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 **REGAL 3F** is in conformity with the Pressure Equipment Directive PED 97/23/EC and is classified in category I. Equipment and pipeline situated on the outlet side of the regulator are either not concerned by the PED ( $P_a \leq 0.5$  bar) or concerned by the PED ( $P_a > 0.5$  bar): **in which case they must be classified in category I minimum.**

### DECLARATION OF CONFORMITY CERTIFICATE REGAL 3F

Manufacturer:	<b>FRANCEL</b>	
Address:	Z.A. La Croix Saint Mathieu, 28320 GALLARDON	
Equipment:	REGAL 3F EC	<b>Identification no.:</b>
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 97/23/EC (PED)

<b>Name:</b>	<b>Function:</b>	<b>Company stamp:</b>
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<b>Date:</b>	<b>Signature:</b>
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## CHARACTERISTICS

Operating pressure		
Body, valve plug, slam shut	PS	4 bar
Actuator		1.5 bar
BMS, according to size		5 bar
Operating temperature		
	TS	- 20 / 60 °C
Outlet pressure		
	Pa	100 / 1000 mbar
REGULATOR		
Regulator accuracy		
	AC	5
	SG	10
	SZ	10
Inlet/Outlet diameter		
	DN	50
Fluid		
Groups 1 & 2 according to PED 97/23/EC, 1 <sup>st</sup> and 2 <sup>nd</sup> family gas according to EN437, or other gases (compressed air, nitrogen). The gas must be noncorrosive, clean (filtration on inlet side necessary) and dry.		

### Flow Ranges

Pa (mbar)	Pe (bar)	Q (m <sup>3</sup> /h(n))	AC
100	0.7 < Pe < 1	520	10
100	> 1	520	5
160	0.7 < Pe < 1	520	10
160	> 1	520	5
300	0.7 < Pe < 1	520	10
300	> 1	520	5
500	> 1	500	
1000	> 2	700	

C104a

### Set Point Spring and Regulator Ranges

Pa (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		144 300
500	300	550	8.0	170	131 793
1000	400	1100	10.0		144 035

C104b

## 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

## LABELLING

### Regulator standard label

Regulateur Regulator	Type	REGAL3F	DN	50	PN	10
CE	PS	4 bar	TS	- 20 / 60°C	Cat.	I
FRANCEL	N°serial/Serial N°					
FRANCE 28320 Gallardon	Date Fab/Test	DD MM YEAR				
Grande Route 1 (Cité industrielle)	Pset max	0.320 bar				
	PS Servo/Actuator	1.5 bar				

### Regulator label (exemple)

Regulateur Regulator	Code	902237
FRANCEL	Plage / Range (mbar)	100 / 320
FRANCE 28320 Gallardon	Réglage / Set (mbar)	300
	Soupape / Relief	Non/No
	Tarage / Set (mbar)	

### VSX2 slam shut label

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

### OS2 BMS slam shut label

BMS	taille size	162	PS	5 bar
N° serie serial	AG maxi	2,5		
FRANCEL	Ressort/Spring	Ø	5	mm
Pt mini	0,140	/	maxi	/
			0,750	bar

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## SLAM SHUT

See NTAVSX2 and NTAOS2

### Set Point Spring and Slam Shut Range

Nominal Pa (mbar)	Wire Ø (mm)			Nominal Set Point (mbar)	
	VSX2 Springs Min.	VSX2 Springs Max.	OS2 Springs Min. & Max.	Min.	Max.
100	1.4	2.3	3.5	60 <sup>(1)</sup> /70 <sup>(2)</sup>	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

C104c

## Types

Nominal Pa (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

C104d

## CONNECTIONS

Inlet/Outlet:	ISO PN 10
Actuator impulse line (ISM):	1/2" NPT tapped
Actuator vent:	3/4" NPT tapped
Impulse line connector:	Internal pipe Ø >= 15 mm
Slam shut (VSX2/OS2) impulse line (IS):	1/4" NPT tapped
Impulse line connector (VSX2):	Internal pipe Ø >= 4 mm
Impulse line connector (OS2):	Internal pipe Ø >= 8 mm
Slam shut (VSX2/OS2) vent:	1/4 NPT tapped
Contact (OS2):	See NTAOS2

## 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 Pa set point adjustment spring

### A version with a VSX2 integral slam shut:

- A body, a diaphragm actuator
  - A diaphragm-balanced valve plug, an orifice
  - An integral bypass slam shut instead of a bottom (see NTAVSX2)
- Depending on set point required:
- A Pa set point adjustment spring
  - A tripping spring set to max.
  - A tripping spring set to min.

### A version with an OS2 integral slam shut:

- A body, a diaphragm actuator

- A diaphragm-balanced valve plug, an orifice
  - A slam shut connecting part instead of a bottom
  - A integral bypass slam shut
  - A release relay type OS2 (see NTAOS2)
    - A safety manometric box (BMS) to be connected on the outlet side of the regulator
    - A mechanism box (BM)
- Depending on set point required:
- A Pa set point adjustment spring
  - A tripping spring set to max. and min.

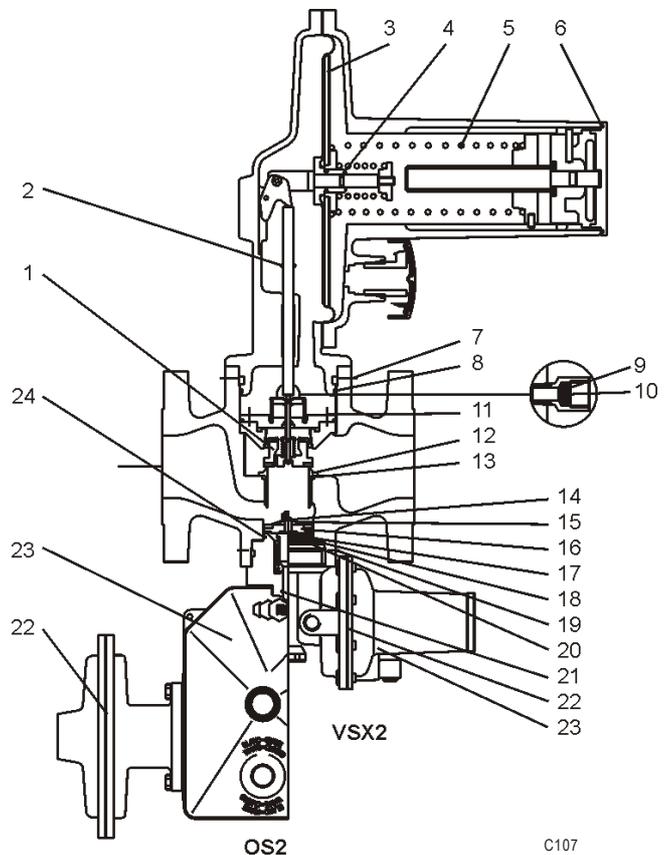
As an option, an electrical contact in the mechanism box is possible

### 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).

## SPARE PARTS

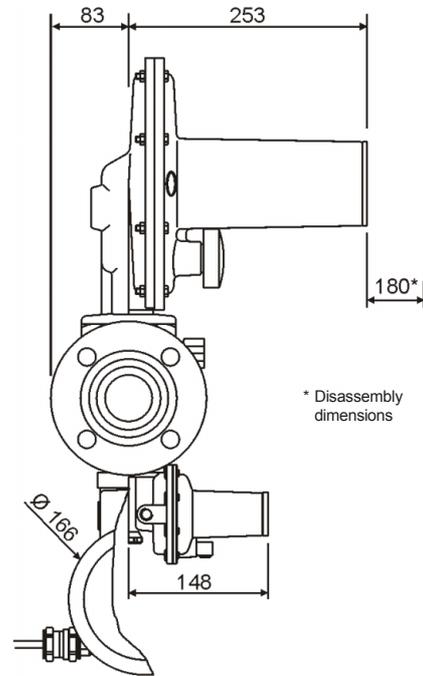
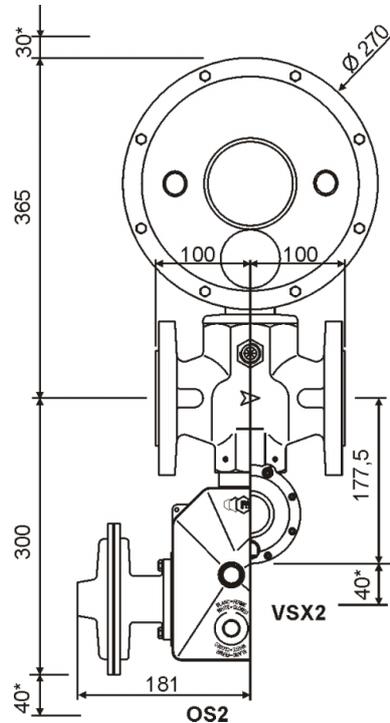
Item	Description	Reference
1	Valve plug assembly	181 058
2	O-ring	400 506
3	Diaphragm	142 033
4	Clutch O-ring	400 505
5	Spring	See table C104b
6	Cap O-ring	400 080
7	Screw	403 030
8	Actuator/body O-ring	400 029
9	Truarc ring	406 201
10	Sensing diaphragm	138 369
11	Tightshut washer	461 173
12	Orifice	142 017
13	Orifice O-ring	400 102
<b>With Slam Shut</b>		<b>VSX2 OS2</b>
14	Circlips	406 153
15	Spring	144 064
16	Valve plug	142 130
17	Slam shut Pe O-ring	400 081
18	Slam shut Pa O-ring	400 074
19	Screw	403 028
20	Bypass O-ring	400 501
21	Stem O-ring	400 505
22	Diaphragm assembly	181 017 181 105
23	Slam shut assembly	196 433 196 245
<b>Without Slam Shut</b>		
24	Bottom O-ring	400 081
Spare parts kit (commissioning spares)		197 480



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## DIMENSIONS AND WEIGHTS

<b>Weight:</b>	With VSX2 slam shut	18.8 kg
	With OS2 slam shut	24 kg
	Without slam shut	18 kg



\* Disassembly dimensions

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## OPERATION

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

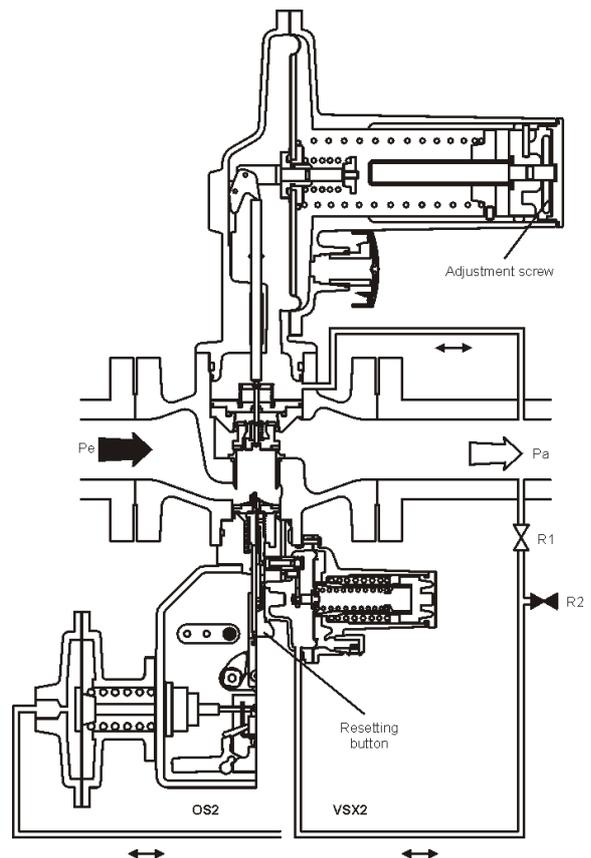
The balanced valve plug/stem assures accuracy independent of inlet and outlet pressures.

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.

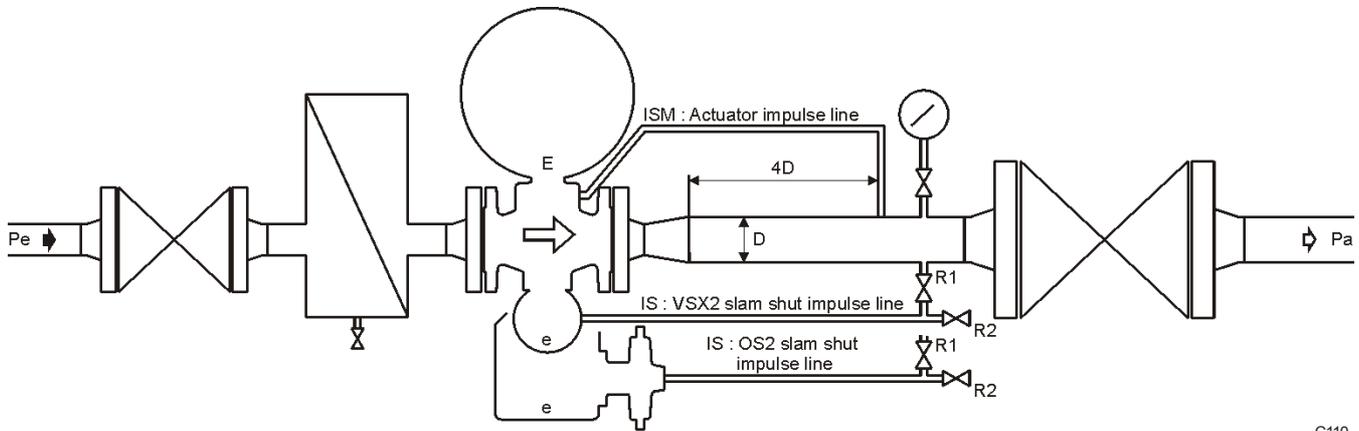
The regulator can be equipped with a slam shut using a release relay type VSX2 or OS2.

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).



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## INSTALLATION



All interventions on the 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.



### WARNING

- No modification should be made to the structure of the equipment (drilling, grinding, soldering...).
- It is recommended to install a servicing valve 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 safety manometric box (BMS) with 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.
- The user should verify or carry out a protection adapted to the environment.
- 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.
- Version with slam shut, if the outlet side is concerned by the DESP and not protected by any other means, verify that none of the components are superior to category 1.

# COMMISSIONING

Operations concerning the integral slam shut versions type VSX2 or OS2 are in *italic*.

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

## 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 line 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 NTAVSX2))  
 → Progressively increase the pressure to reach tripping  
 → Adjust setting if necessary (NTAVSX2)

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

### Type OS2

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

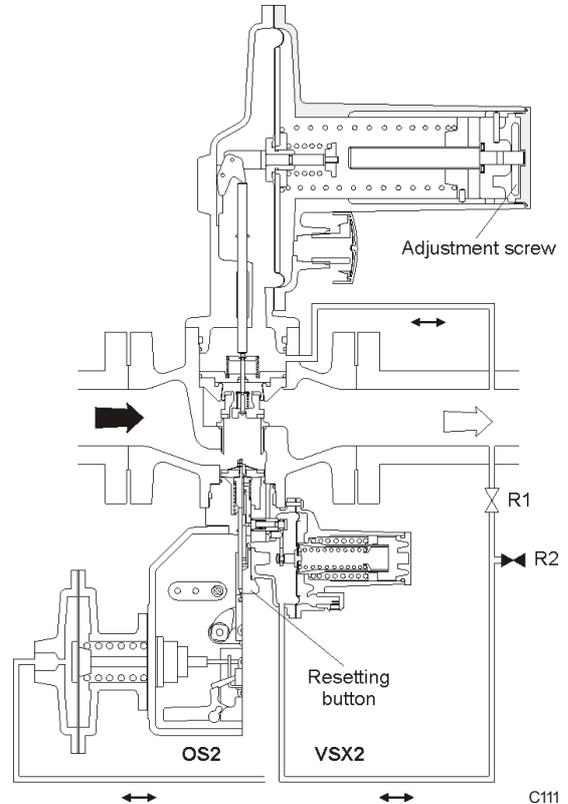
- 1<sup>st</sup> release relay stage  
 → Set (Stage 1)
- Slam shut valve plug  
 → Set (Stages 2 and 3)  
 → Progressively increase the pressure to reach tripping  
 → Adjust setting if necessary (NTAOS2)

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

## Positions before commissioning

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

The equipment is ready to be commissioned



## COMMISSIONING

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

### Type VSX2

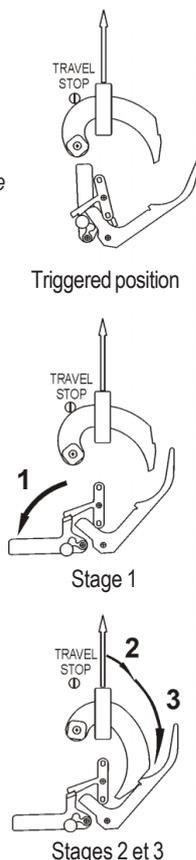
- Slowly unscrew (bypassage)
- Verify that the outlet pressure corresponds to the set point required  
 If not, adjust the regulator set point (adjustment screw)  
 Pull (set, when the bypassage is complete)  
 Gently push back and rescrew

### Type OS2

- 1<sup>st</sup> release relay stage  
 → Set (Stage 1)
- Slam shut valve plug  
 → Bypass (Stage 2)  
 → Open (Stage 3)
- Servicing valve  
 → Slightly open
- Adjustment set point screw  
 → Slowly adjust to required value (adjustment screw)
- Outlet valve  
 → Slowly open
- Servicing valve  
 → **Closed**

The equipment is commissioned

*It is recommended to seal the release relay*



# MAINTENANCE

Operations concerning the integral slam shut versions type VSX2 or OS2 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 integral slam shut versions)

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

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

## MAINTENANCE

### DISASSEMBLY OF THE REGULATOR AND SLAM SHUT

**Recommended frequency:**

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

**Verification:**

Condition of diaphragms, valve disc plug, lubrication

**Replacement:**

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

**Tools:**

Male spanners for six-sided wrench	2.5, 4 and 6
Flat spanner	10 and 13
Box spanner	30 and 46
2 flat spanner for flanges	24
Adjustment spanner for VSX2	Ref. 197 226

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

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#### REGULATOR

- Valve plug closed (no flow)
- Inlet and outlet valves closed
- **Bleed off outlet pressure**
- **Bleed off inlet pressure**
- Unscrew the cap 6
- Unscrew the adjustment screw 5
- Remove the adjustment screw assembly 3
- Unscrew the actuator screws 3
- Remove the cover 4
- Unscrew the main diaphragm assembly 2
- Unscrew screws 7 and remove the actuator body 1
- Control the O-ring 8
- Unscrew screws 9
- Remove the valve plug assembly 10
- Unscrew the orifice 11
- Control the O-ring 12

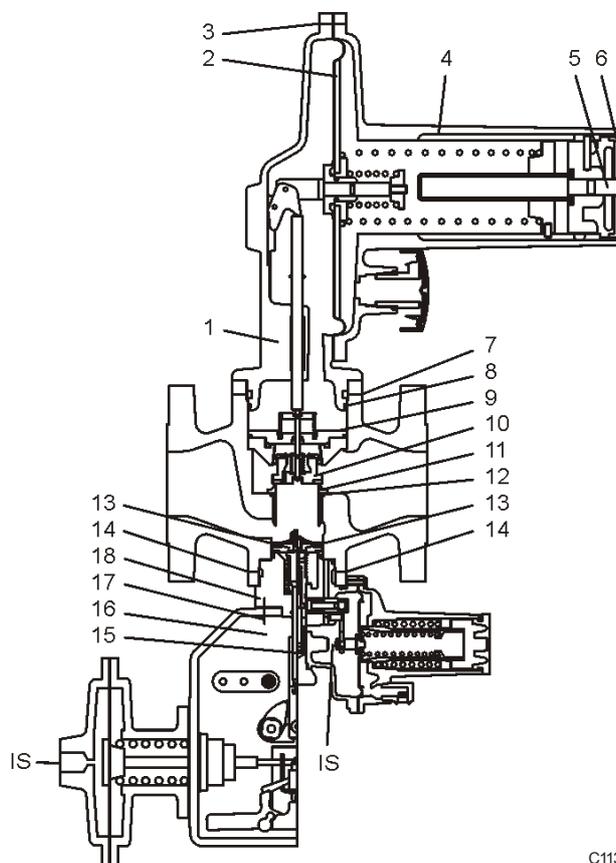
#### SLAM SHUT

**(version with integral slam shut type VSX2)**

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

**(version with integral slam shut type OS2)**

- Disconnect the impulse line pipe (IS)
- Unscrew screws 14 and remove the slam shut OS2
- Unscrew fixing screws 17 and the mechanism box 16
- Remove the valve plug axe 15 from the shell of the mechanism box 16



C113

- Remove the connecting part 18 and the valve plug axe 15
- Control the valve plug 13

#### REASSEMBLY

- Perform the above operations in reverse order (respect tightening torques)
- Diaphragms to be changed every 6 years or less depending on condition
- 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 the OS2 release relay mechanism (yoke and bolt) (molybdenum graphite grease)
- Lubricate springs (molybdenum graphite grease)

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