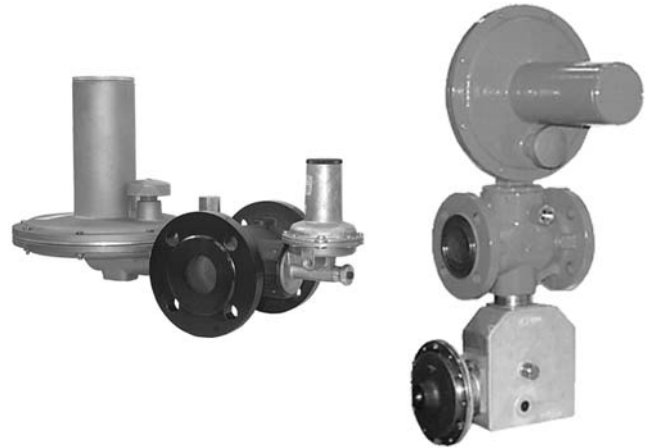


DIRECT-OPERATED REGULATOR

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Type Regal 3/VSX2

Type Regal 3/OS2

INTRODUCTION

The **REGAL 3** 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. As a standard feature for outlet pressure settings inferior or equal to 180 mbar, a relief valve is provided. On request, this relief valve may be disconnected and replaced by a dampener. Upon request, for pressures $180 \text{ mbar} < Pa \leq 1100 \text{ mbar}$, the **REGAL 3** can be equipped with a relief valve. This relief valve can be factory adjusted.

The **REGAL 3** is in conformity with the Pressure Equipment Directive PED 97/23/EC and is classified under category I. Equipment and pipeline situated on the outlet side of the regulator are either;

- not subject to the PED ($Pa \leq 0.5 \text{ bar}$), or
- subject to ($Pa > 0.5 \text{ bar}$) : **in which case they should come under category 1 maximum.**

An Non-PED version of the Regal 3 is also available.

DECLARATION OF CONFORMITY REGAL 3

Manufacturer:	FRANCEL	
Address:	Z.A. La Croix Saint Mathieu, 28320 GALLARDON	
Equipment:	REGAL 3	<i>Identification no.:</i>
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)		
Name:	Function:	Company stamp:
 Date:	 Signature:	

Europe, Middle East, and Africa Document Only



CHARACTERISTICS

Operating pression			
Body, valve plug, slam shut		PS	10 bar
Actuator	(Pa <= 1.5 bar PED version)	PS	1.5 bar
	(Pa <= 3.0 bar Non-PED version)		3.0 bar
BMS* associated, according to size			5 bar
Operating temperature		TS	- 30 / 71 °C
Outlet pressure	(PED version)	Pa	8 / 1500 mbar
	(Non-PED version)		2000/3000mbar

* BMS : Safety manometric box

Regulator set point spring table

Pa (mbar)			Spring		Spring code
Nominal	Min.	Max.	Wire Ø (mm)	Length (mm)	
20	8	25	3.0	171	144 136
35	20	55	4.0	171	122 832
60	40	90	4.5	165	131 919
100	60	140	5.5	165	131 918
160	80	180	6.0	165	142 539
300	100	340	7.5	180	137 054
500	300	550	8.0	170	131 793
1000	400	1100	10.0	170	144 035
1500	750	1500	8.0	170	131 793
2000*	1400	2600	10.0		144 035
3000*	2000	4000			

* Non-PED version

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RELIEF VALVE

Relief valve set point Pa + 20 mbar up to 90 mbar setting
 Pa + 30 mbar up to 140 mbar setting
 Pa + 40 mbar up to 180 mbar setting
 Pa + 60 mbar up to 340 mbar setting (option)
 Pa + 100 mbar up to 550 mbar setting (option)
 Pa + 200 mbar up to 1100 mbar setting (option)

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

PED label - Pa <= 100 mbar

Régulateur Régulateur FRANCE 28020 Gallardon Groupe fluide 1 (Gaz naturel)	Type	REGAL3	DN	50	PN	10 ou 20
	PS	10 bar	TS	- 30 / 71°C	Cat.	I
	N°serie/Serial N°					
	Date Fab/Test	JJ MM 20AN				
	Pset max	1.1 bar				
	PS Servo/Actuator	1.5 bar				

VSX2 slam shut information (example Pa 500 mbar)

Sécurité Slam shut	Type	VSX2LPC3	PS	10 bar
	Code	196433	AG maxi	10
	Min (mbar)		Max (mbar)	
	Plage / Range	100 / 500	400 / 1100	
	Tarage / Set nominal	350	700	

REGULATOR		
Accuracy	AC	10
Inlet/outlet diameter	DN	50
Pe min		0.5 bar
Pe max		10 bar
Spring set point	(PED version)	Pa
	(Non-PED version)	
		0.008 to 1.5 bar
		2.0 / 3.0 bar
Fluid	Groups 1& 2 according to PED 97/23/EC, 1 st and 2 nd family gas according to EN437, or other gases (compressed air, nitrogen). The gas must be noncorrosive, clean (filtration on inlet side necessary) and dry.	

Slam shut set point spring table

Nominal Pa (mbar)	Spring wire Ø			Nominal set point (mbar)		
	VSX2		OS2	Min	Relief valve	
	Min	Max	Min & Max		Max with	Max without
20	1.1	1.7	3.5	10	50	40
35		2		60 ⁽¹⁾ /70 ⁽²⁾	17	70
60	1.4				2.3	35
100		1.7	2.6	110		235
160	2.4			3.1	200	430
300		3.2	4.1		350	700
500	2.4			3.1	700	1400
1000		2.4	3.1		1000	2000
1500	2.4			3.5	1400	2600
2000*		3.2	4.1		2000	4000
3000*						

(1) For VSX2 (2) For OS2 *Non-PED version

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CONNECTIONS

Inlet / Outlet: ISO PN 10 / 16
 ISO PN 20 / ANSI 150
 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 NTAOS2

Regulator information (example Pa 500 mbar)

Régulateur Régulateur FRANCE 28020 Gallardon	Code	FSREG3-31
	Plage / Range (mbar)	300 / 550
	Réglage / Set (mbar)	500
	Soupage / Relief	Yes
	Tarage / Set (mbar)	600

OS2 slam shut information (example Pa 300 mbar)

BMS taille size		PS	
N° serie serial		AG maxi	
Ressort/Spring	Ø		mm
Pt mini		maxi	
			bar

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DESCRIPTION

The Regal 3 consists of:

A version without integral slam shut:

- A body, a diaphragm actuator (LP or HP), a bottom
- A diaphragm-balanced valve plug, an orifice

Depending on set point required:

- A Pa set point adjustment spring

A version with integral slam shut VSX2:

- A body, a diaphragm actuator (LP or HP)
- A diaphragm-balanced valve plug, an orifice
- An integral bypass slam shut (LP or HP) in place of the 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 integral slam shut OS2:

- A body, a diaphragm actuator (LP or HP)
- 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 NTAOS2)
 - A safety manometric box (BMS) for connection outlet side of the regulator
 - A mechanism box (BM)

Depending on the set point required:

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

A version with relief valve (set point option 180 to 1100 mbar):

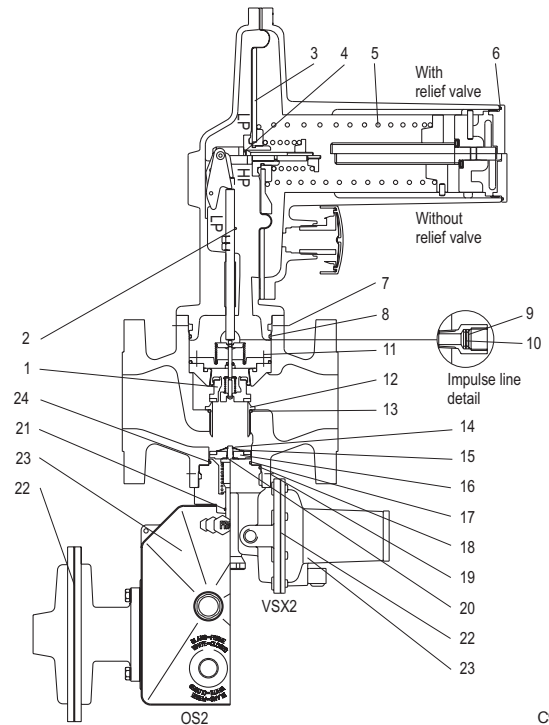
- Replacement of the disconnecter by an internal partial relief valve

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).

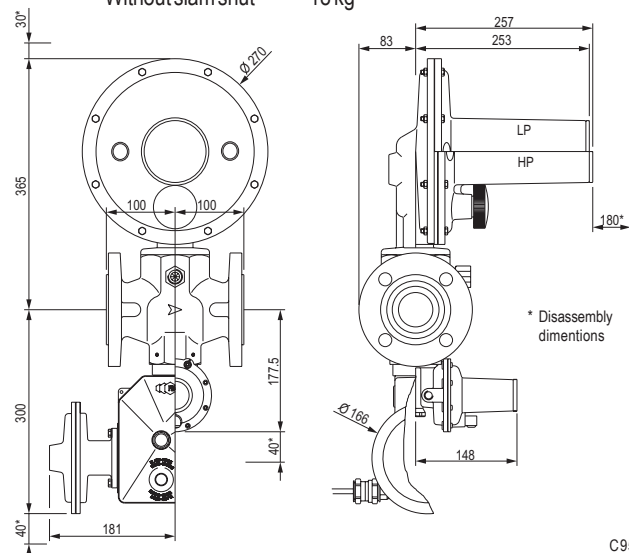
SPARE PARTS



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DIMENSIONS AND WEIGHTS

Weight: With slam shut 18.8 kg VSX2 24 kg OS2
Without slam shut 18 kg



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Item	Description	LP		HP
1	Valve plug assembly			181 058
2	O-ring			400 506
3	Diaphragm	142 033		142 980
4	Relief valve/clutch O-ring			400 505
5	Spring			Tableau
6	Cap O-ring			400 080
7	Screw			403 030
8	Actuator/body O-ring			400 029
9	Truarcing			406 201
10	Sensing diaphragm (d2) standard			138 369
	Sensing diaphragm (d4) ⁽¹⁾			144 155
11	Washer			461 173
12	Orifice			142 017
13	Orifice O-ring			400 102
With Slam Shut		VSX2		OS2
		LP	HP	BMS 162
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	181 027	181 105
23	Slam shut assembly	196 433	196 250	196 245
Without Slam Shut				
		Bottom O-ring		400 081
Spare parts kit (commissioning spares)				197 338 197 347

(1) On special request, for low inlet pressure applications (< 1 bar)

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OPERATION

The Regal 3 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.

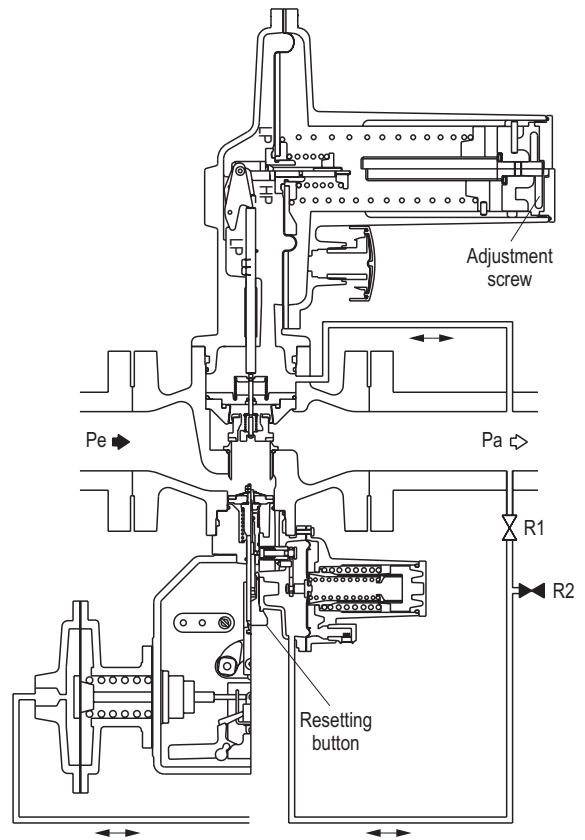
Pressure control is achieved through the actuator diaphragm, which receives, on the one side, the outlet pressure and, on the other side the spring load, adjusted to the desired value by the set point spring.

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.

For the EC standard version and for a $P_a \leq 180$ mbar, an actuator with an integral partial relief valve avoids slam shut tripping in the case of the gas flow being abruptly cut off or temperature increase on the outlet side when the regulator is not in operation.

For the version without relief valve, in the case of 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).



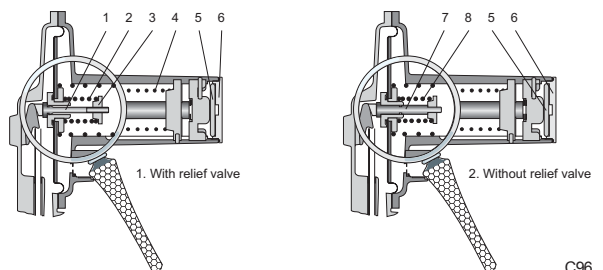
RELIEF VALVE ADJUSTMENT

($P_a < 180$ mbar)

- Unscrew the cap 6
- Unscrew the adjustment screw 5
- Press the adjustment screw
- Turn the sub-assembly 5 a 1/4 turn to release it
- Remove the adjustment screw assembly 5
- Remove the set point spring 4
- Screw the relief valve set point nut 3 to maximum (without blocking it) with a box spanner 30
- Load the relief pressure via the actuator impulse line
- The pressure required depends on the spring
- Spring 20 and 35 mbar
Loading pressure = relief setting - P_a + 7 mbar
- Spring 60 and 100 mbar
Loading pressure = relief setting - P_a + 8 mbar
- Spring 160 mbar
Loading pressure = relief setting - P_a + 15 mbar

For example, for a P_a pressure setting = 25 mbar (20 mbar spring) for a relief pressure setting of 45 mbar, load a pressure of $45 - 25 + 7 = 27$ mbar

- Unscrew the nut 3 until the relief valve opens
- Replace the set point spring 4
- Replace the adjustment screw assembly 5
- Replace the cap 6 (after adjusting the set point)

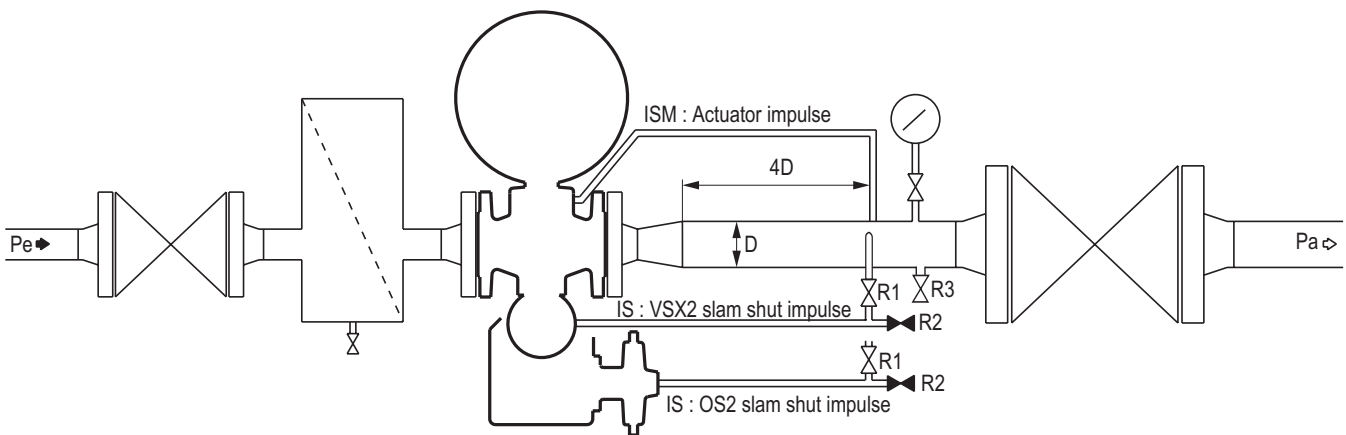


Assembly with relief valve				Assembly without relief valve			
Standard assembly				Standard assembly			
P_a (mbar)	Description	Item	Code	P_a (mbar)	Description	Item	Code
≤ 140	Relief valve stem	1	144089	> 180	Disconnecter stem	7	144041
	O-ring		400505		O-ring		400505
	Spring D3	2	116006		Spring D4	8	116816
Spring D4	116816						
> 180							
Assembly possibility				Assembly possibility			
P_a (mbar)	Description	Item	Code	P_a (mbar)	Description	Item	Code
> 180 < 1100	Relief valve stem	1	144089	≤ 180	Disconnecter stem	7	144041
	O-ring		400505		O-ring		400505
	Spring D5 $P_a \leq 550$	2	120588		Spring D4	8	116816
	Spring D5.5 $P_a > 550$		120904				

INSTALLATION

CAUTION

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



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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...).

WARNING

- 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.
- 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



CAUTION

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

Operations concerning the integral slam shut version type 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 NTAVSX2))
→ Progressively increase the pressure to reach tripping
→ Adjust the 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

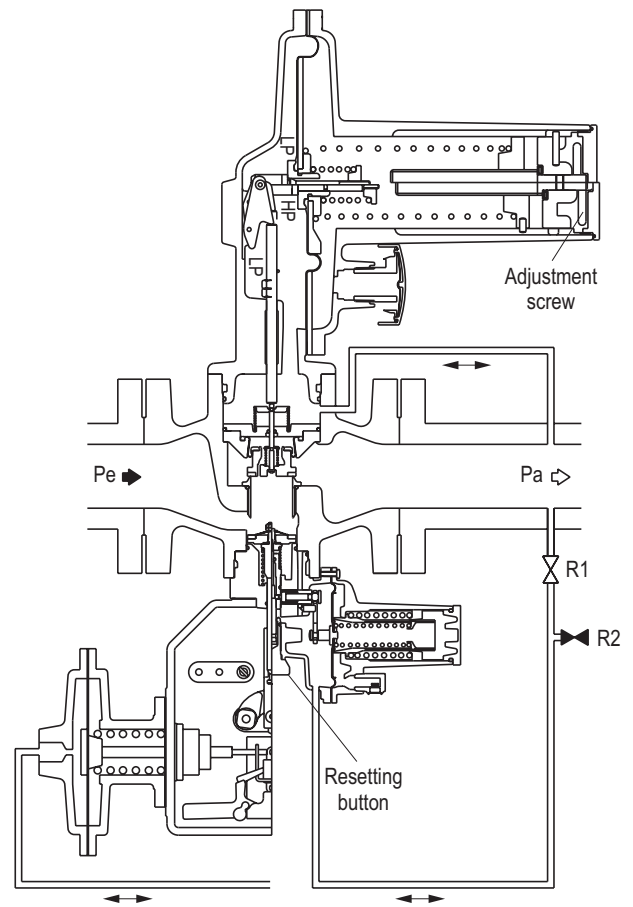
- 1st release relay stage
→ Set (Stage 1)
- Slam shut valve plug
→ Set (Stages 2 and 3)
→ Progressively increase the pressure to reach tripping
→ Adjust the setting if necessary (NTAOS2)

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)

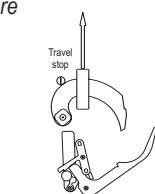
Verify that the outlet pressure corresponds to the set point required
If not, adjust the regulator set point (adjustment screw)
Pull (set, when the bypassage is completed)
Gently push back and rescrew

Type OS2

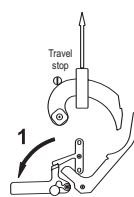
- 1st release relay stage
→ Set (Stage 1)
- Slam shut valve plug
→ Bypassage (Stage 2)
→ Open (Stage 3)
- Servicing valve
→ Slightly open
- Set point adjustment screw
→ Slowly adjust to required value (adjustment screw)
- Outlet valve
→ Open slowly
- Servicing valve
→ **Closed**

The equipment is commissioned

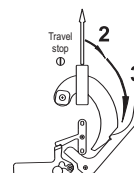
It is recommended to seal the release relay



Tripped position



Stage 1



Stages 2 and 3

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 side 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)

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</i> <i>Control the slam shut valve plug</i> <i>or contact after-sales</i>
<i>If the slam shut valve plug closes</i> <i>Observe the evolution of the outlet pressure (control tightness)</i>	<i>Operating correctly</i>
If the outlet pressure is constant <i>Purge the outlet side of the regulator</i> <i>Observe the evolution of the outlet pressure (control tightness)</i>	
<i>If the outlet pressure increases</i>	<i>Internal leak</i> <i>Control the slam shut valve plug</i> <i>Control the slam shut orifice</i> <i>Control the internal bypass</i> <i>or contact after-sales</i>
<i>If the outlet pressure is constant</i>	<i>Slam shut valve plug is tightshut</i>

DISASSEMBLY OF THE 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 length of usage), tightshut rings

Tools:

- Male spanners for six-sided wrench 2.5, 4 and 6
- Flat spanner 10
- Box spanner 30 and 46

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

C101

- 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 **6**
- Unscrew the adjustment screw **5**
- Remove the adjustment screw assembly **5**
- Unscrew the actuator screws **3**
- Remove the cover **4**

REGULATOR (continued)

- Unscrew the main diaphragm assembly 2



CAUTION

Before disassembling the diaphragm, note the dimension between the relief valve setpoint nut and the diaphragm plate 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)

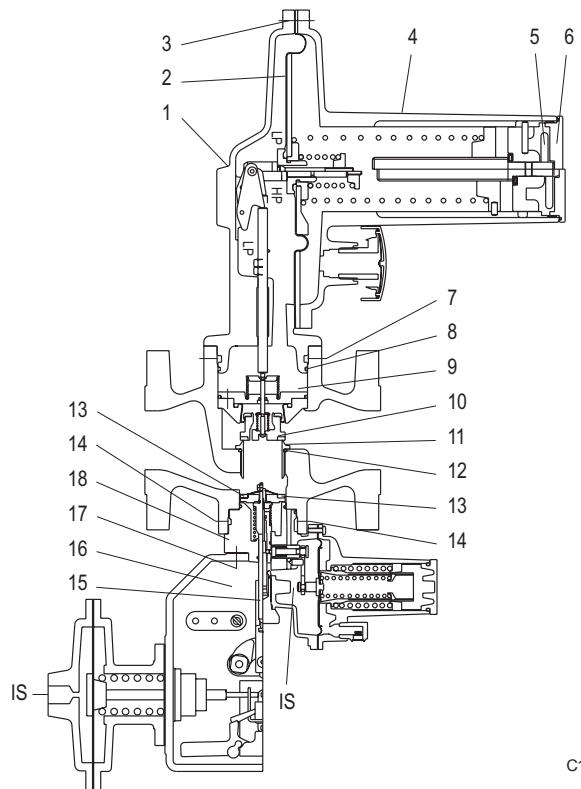
- Disconnect the impulse pipe (IS)
- Unscrew the screws 14 and remove the VSX2 slam shut
- Control the valve plug 13
- Disassembly : see NTAVSX2

Version with integral slam shut (type OS2)

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

REASSEMBLY

- Perform the above operations in reverse order (respect tightening torques)
- Diaphragms to be changed every 6 years or less depending on condition



C100

- 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)

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