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 damper. Upon request, for pressures 180 mbar < Pa <= 1100 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 <= 0.5 bar), or
- subject to (Pa > 0.5 bar): in which case they should come under category 1 maximum.

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

Operating pressure

| Body, valve plug, slam shut | 10 bar |
| Actuator (Pa <= 1.5 bar PED version) | PS 1.5 bar |
| Actuator (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) Pa | 2000 / 3000 mbar |

* BMS: Safety manometric box

Regulator set point spring table

<table>
<thead>
<tr>
<th>Pa (mbar)</th>
<th>Spring wire Ø</th>
<th>Length (mm)</th>
<th>Spring code</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>3.0</td>
<td>171</td>
<td>144 136</td>
</tr>
<tr>
<td>35</td>
<td>4.0</td>
<td>171</td>
<td>122 832</td>
</tr>
<tr>
<td>60</td>
<td>4.5</td>
<td>165</td>
<td>131 919</td>
</tr>
<tr>
<td>100</td>
<td>5.5</td>
<td>165</td>
<td>131 918</td>
</tr>
<tr>
<td>160</td>
<td>6.0</td>
<td>142 539</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>7.5</td>
<td>180</td>
<td>137 054</td>
</tr>
<tr>
<td>500</td>
<td>8.0</td>
<td>170</td>
<td>131 793</td>
</tr>
<tr>
<td>1000</td>
<td>10.0</td>
<td>170</td>
<td>144 035</td>
</tr>
<tr>
<td>1500</td>
<td>10.0</td>
<td>170</td>
<td>131 793</td>
</tr>
<tr>
<td>2000*</td>
<td>10.0</td>
<td>170</td>
<td>144 035</td>
</tr>
</tbody>
</table>

* Non-PED version

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)

REGULATOR

| Accuracy | AC | 10 |
| Inlet/outlet diameter | DN | 50 |
| Pe min | 0.5 bar |
| Pe max | 10 bar |
| Spring set point (PED version) Pa | 0.008 to 1.5 bar |
| (Non-PED version) Pa | 2.0 / 3.0 bar |

Fluid

Groups 1 & 2 according to PED 97/23/EC, 1st and 2nd family gas
According to EN437, or other gases (compressed air, nitrogen)
The gas must be noncorrosive, clean (filtration on inlet side necessary) and dry.

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
Impulse line (OS2): Internal pipe Ø >= 8 mm
Slam shut vent (VSX2 / OS2): 1/4” NPT tapped
Contact (OS2): See NTAOS2

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

REGAL 3

VSX2 slam shut information (example Pa 500 mbar)

| Code | 1946433 |
| Type | VSRXPL03 |
| PS | 10 bar |
| Min (mbar) | 300 |
| Max (mbar) | 700 |

OS2 slam shut information (example Pa 300 mbar)

| Code | 1946433 |
| BMS | 0 |
| N° | AG max |
| PS | 10 bar |
| Min (mbar) | 300 |
| Max (mbar) | 700 |
# 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 disconnector 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).

## DIMENSIONS AND WEIGHTS

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

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### SPARE PARTS

**Item** | **Description** | **LP** | **HP**
---|---|---|---
1 | Valve plug assembly | 181056 | 
2 | O-ring | 400506 | 
3 | Diaphragm | 142033 | 142980 |
4 | Relief valve/clutch O-ring | 400505 | 
5 | Spring | 
6 | Cap O-ring | 400080 | 
7 | Screw | 403030 | 
8 | Actuator/body O-ring | 400029 | 
9 | Trim ring | 406201 | 
10 | Sensing diaphragm (d2) standard | 138369 | 
11 | Washer | 461173 | 
12 | Orifice | 142017 | 
13 | Orifice O-ring | 400102 | 

**With Slam Shut**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th><strong>LP</strong></th>
<th><strong>HP</strong></th>
<th><strong>BMS 162</strong></th>
</tr>
</thead>
</table>
14 | Circlips | 406153 | 
15 | Spring | 144064 | 
16 | Valve plug | 142130 | 
17 | Slam shut Pe O-ring | 400081 | 
18 | Slam shut Pa O-ring | 400074 | 
19 | Screw | 403028 | 
20 | Bypass O-ring | 400501 | 
21 | Slam O-ring | 400505 | 
22 | Diaphragm assembly | 181017 | 181027 | 181105 |
23 | Slam shut assembly | 196433 | 196250 | 196245 |

**Without Slam Shut**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th><strong>LP</strong></th>
<th><strong>HP</strong></th>
<th><strong>BMS 162</strong></th>
</tr>
</thead>
</table>
24 | Bottom O-ring | 400081 | 

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<table>
<thead>
<tr>
<th>Spare parts kit</th>
<th><strong>Europe, Middle East, and Africa Document Only</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(commissioning spares)</td>
<td>197338</td>
</tr>
</tbody>
</table>

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* Disassembly dimensions

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(1) On special request, for low inlet pressure applications (< 1 bar)
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 Pa \( \leq 180 \) 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 (disconnector).

RELIEF VALVE ADJUSTMENT
(Pa < 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 - Pa + 7 mbar
  - Spring 60 and 100 mbar
    - Loading pressure = relief setting - Pa + 8 mbar
  - Spring 160 mbar
    - Loading pressure = relief setting - Pa + 15 mbar

For example, for a Pa 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)

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<table>
<thead>
<tr>
<th>Assembly with relief valve</th>
<th>Assembly without relief valve</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard assembly</strong></td>
<td><strong>Standard assembly</strong></td>
</tr>
<tr>
<td>Pa (mbar)</td>
<td>Pa (mbar)</td>
</tr>
<tr>
<td>Description</td>
<td>Item</td>
</tr>
<tr>
<td>&lt;= 140</td>
<td>Relief valve stem</td>
</tr>
<tr>
<td></td>
<td>O-ring</td>
</tr>
<tr>
<td></td>
<td>Spring D3</td>
</tr>
<tr>
<td>&gt; 180</td>
<td>Spring D4</td>
</tr>
<tr>
<td><strong>Assembly possibility</strong></td>
<td><strong>Assembly possibility</strong></td>
</tr>
<tr>
<td>Pa (mbar)</td>
<td>Pa (mbar)</td>
</tr>
<tr>
<td>Description</td>
<td>Item</td>
</tr>
<tr>
<td>&gt; 180</td>
<td>Relief valve stem</td>
</tr>
<tr>
<td></td>
<td>O-ring</td>
</tr>
<tr>
<td></td>
<td>Spring D5</td>
</tr>
<tr>
<td></td>
<td>Spring D5.5</td>
</tr>
</tbody>
</table>
INSTALLATION

CAUTION

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.
- 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 lightening 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
- 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
## 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 → In operation
- Regulator → In operation

**Inlet and outlet side of regulator under pressure**

**Tight shut verification (and tripping verification for integral slam shut versions)**
- Inlet valve → Closed
- Outlet valve → Closed
- Observe the evolution of the outlet pressure (control regulator tightness)

<table>
<thead>
<tr>
<th>If the outlet pressure increases</th>
<th>Internal leak</th>
<th>or contact after-sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the outlet pressure decreases</td>
<td>External leak</td>
<td>or contact after-sales</td>
</tr>
<tr>
<td>If the outlet pressure is constant</td>
<td>The regulator is tight shut</td>
<td></td>
</tr>
<tr>
<td>If the outlet pressure is constant</td>
<td>The regulator is tight shut</td>
<td></td>
</tr>
<tr>
<td>If the outlet pressure is constant</td>
<td>Slam shut valve plug is tight shut</td>
<td></td>
</tr>
<tr>
<td>If the outlet pressure is constant</td>
<td>Slam shut valve plug is tight shut</td>
<td></td>
</tr>
</tbody>
</table>

### 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), tight shut rings

**Tools:**
- Male spanners for six-sided wrench 2, 5, 4 and 6
- Flat spanner 10
- Box spanner 30 and 46

<table>
<thead>
<tr>
<th>Spanner</th>
<th>Torque (N.m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>24</td>
<td>2 flat spanners for flanges</td>
</tr>
<tr>
<td>226</td>
<td>Adjustment spanner for VSX2 Ref. 197</td>
</tr>
</tbody>
</table>

**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 axe 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

• 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)