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 mbar <Pd <= 1100 mbar, the REGAL 3 can be equipped with a relief valve.

This relief valve can be factory adjusted.

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

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 (Pd <= 0.5 bar), or
• subject to (Pd > 0.5 bar): in this case the Regal 3 is classified under category 1 maximum.
REGAL 3

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 Pd set point adjustment spring

A Version with Integral Slam Shut Type 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 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 (LP or HP)

CHARACTERISTICS

Table 1. General Characteristics for Type Regal 3 Regulator

<table>
<thead>
<tr>
<th>Operating pressure</th>
<th>REGULATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body, valve plug, slam shut</td>
<td>10 bar</td>
</tr>
<tr>
<td>Actuator (Pd &lt;= 1.5 bar PED version)</td>
<td>PS 1.5 bar</td>
</tr>
<tr>
<td>(Pd &lt;= 3.0 bar Non-PED version)</td>
<td>3.0 bar</td>
</tr>
<tr>
<td>BMS* associed, according to size</td>
<td>5 bar</td>
</tr>
<tr>
<td>Pu max</td>
<td>10 bar</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>TS -30 / 71 °C</td>
</tr>
<tr>
<td>(Non-PED version)</td>
<td>2.0 / 3.0 bar</td>
</tr>
<tr>
<td>Outlet pressure</td>
<td>(PED version) 8/1500 mbar</td>
</tr>
<tr>
<td>(Non-PED version) 2000/3000 mbar</td>
<td></td>
</tr>
</tbody>
</table>

* BMS: Safety Manometric Box

Relief Valve

Relief valve set point:
- Pd + 20 mbar up to 90 mbar setting
- Pd + 30 mbar up to 140 mbar setting
- Pd + 40 mbar up to 180 mbar setting
- Pd + 60 mbar up to 340 mbar setting (option)
- Pd + 100 mbar up to 550 mbar setting (option)
- Pd + 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 |
### Table 2. Regulator Set Point Spring Table

<table>
<thead>
<tr>
<th>Pd (mbar)</th>
<th>Spring</th>
<th>Spring code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>20</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>35</td>
<td>20</td>
<td>55</td>
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<td>60</td>
<td>40</td>
<td>90</td>
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<td>100</td>
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<td>140</td>
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<tr>
<td>160</td>
<td>80</td>
<td>180</td>
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<tr>
<td>300</td>
<td>100</td>
<td>340</td>
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<td>500</td>
<td>300</td>
<td>550</td>
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<tr>
<td>1000</td>
<td>400</td>
<td>1100</td>
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<tr>
<td>1500</td>
<td>750</td>
<td>1500</td>
</tr>
<tr>
<td>2000*</td>
<td>1400</td>
<td>2600</td>
</tr>
<tr>
<td>3000*</td>
<td>2000</td>
<td>4000</td>
</tr>
</tbody>
</table>

* Non-PED version

### Table 3. Slam Shut Set Point Spring Table

<table>
<thead>
<tr>
<th>Nominal Pd (mbar)</th>
<th>Spring wire Ø</th>
<th>Nominal set point (mbar)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max &amp; Max*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>35</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1.4</td>
<td>2.3</td>
</tr>
<tr>
<td>100</td>
<td>2.3</td>
<td>3.5</td>
</tr>
<tr>
<td>160</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>3.1</td>
<td>5.0</td>
</tr>
<tr>
<td>500</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>4.1</td>
<td>6.5</td>
</tr>
<tr>
<td>1500</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>2000*</td>
<td>2.4</td>
<td>3.5</td>
</tr>
<tr>
<td>3000*</td>
<td>3.2</td>
<td>4.1</td>
</tr>
</tbody>
</table>

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

### 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 D103683X012 manual

### LABELLING

PED label - Pd <= 100 mbar

Regulator label (example Pd 500 mbar)

Type VSX2 slam shut label (example Pd 500 mbar)

Type OS2 slam shut label (example Pd 300 mbar)

Figure 2. Type Regal 3/VSX2 and Regal3/OS2 Labels
DIMENSIONS AND WEIGHTS

Weight

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

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 Pd <= 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 (Figure 9)
(Pd < 180 mbar)

• Unscrew the cap (key 6)
• Unscrew the adjustment screw (key 5)
• Press the adjustment screw
• Turn the sub-assembly (key 5) a 1/4 turn to release it
• Remove the adjustment screw assembly (key 5)
• Remove the set point spring (key 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 - Pd + 7 mbar
• Spring 60 and 100 mbar
  - Loading pressure = relief setting - Pd + 8 mbar
• Spring 160 mbar
  - Loading pressure = relief setting - Pd + 15 mbar

For example, for a Pd 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 (key 3) until the relief valve opens
• Replace the set point spring (key 4)
• Replace the adjustment screw assembly (key 5)
• Replace the cap (key 6) (after adjusting the set point)

Table 4. Type Regal 3 Assemblies with/without Relief Valve

<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>Pd (mbar)</td>
<td>Description</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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assembly possibility</th>
<th>Assembly possibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pd (mbar)</td>
<td>Description</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 Pd</td>
</tr>
<tr>
<td>&lt;= 1100</td>
<td>Spring D5.5 Pd</td>
</tr>
</tbody>
</table>

INSTALLATION

⚠️ 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.

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 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 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 (D103683X012)

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)
- 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.

Figure 7. Release Relay Activation Stages
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

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)

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>
<thead>
<tr>
<th>Table 5. Corresponding Spanner / Torque Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanner</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 6. Troubleshooting for Types Regal 3/VSX2 and Regal 3/OS2 Regulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYMPTOMS</td>
</tr>
<tr>
<td>----------</td>
</tr>
</tbody>
</table>
| If the outlet pressure increases | Internal leak | Control the regulator valve plug
| | | 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)
| If the slam shut valve plug will not close | Operating fault | Control the release relay
| | | Control the slam shut valve plug
| | | or contact after-sales
| If the slam shut valve plug closes | Operating correctly | Observe the evolution of the outlet pressure (control tightness)
| | | or contact after-sales
| If the outlet pressure is constant | Slam shut valve plug is tightshut | Purge the outlet side of the regulator
| | | Observe the evolution of the outlet pressure (control tightness)
| If the outlet pressure increases | Internal leak | Control the slam shut valve plug
| | | Control the slam shut orifice
| | | Control the internal bypass
| | | or contact after-sales
| If the outlet pressure is constant | Slam shut valve plug is tightshut |
**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)

**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 manual D103683X012

**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 axe (key 15) from the mechanism box yoke (key 16)
- Remove the connecting part (key 18) and the valve axe (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
REGAL 3

- 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)

SPARE PARTS

Figure 9. Type Regal 3/VSX2 and Regal 3/OS2 Spare Parts detail
### Table 7. Spare Parts

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>LP</th>
<th>HP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Valve plug assembly</td>
<td></td>
<td>181 058</td>
</tr>
<tr>
<td>2</td>
<td>O-ring</td>
<td>400 506</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Diaphragm</td>
<td></td>
<td>142 033</td>
</tr>
<tr>
<td>4</td>
<td>Relief valve/clutch O-ring</td>
<td></td>
<td>400 505</td>
</tr>
<tr>
<td>5</td>
<td>Spring</td>
<td>See Table 2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Cap O-ring</td>
<td>400 080</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Screw</td>
<td>403 030</td>
<td></td>
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<tr>
<td>8</td>
<td>Actuator/body O-ring</td>
<td>400 029</td>
<td></td>
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<tr>
<td>9</td>
<td>Truarc ring</td>
<td>406 201</td>
<td></td>
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<tr>
<td>10</td>
<td>Sensing diaphragm (d2) standard</td>
<td>138 369</td>
<td></td>
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<td></td>
<td>Sensing diaphragm (d4)&lt;sup&gt;(1)&lt;/sup&gt;</td>
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<td>144 155</td>
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<td>11</td>
<td>Washer</td>
<td>461 173</td>
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<td>12</td>
<td>Orifice</td>
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<td>13</td>
<td>Orifice O-ring</td>
<td>400 102</td>
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<td></td>
<td><strong>With Slam Shut</strong></td>
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<tr>
<td>14</td>
<td>Circlips</td>
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<td>406 153</td>
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<tr>
<td>15</td>
<td>Spring</td>
<td>144 064</td>
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<td>16</td>
<td>Valve plug</td>
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<td>17</td>
<td>Slam shut Pu O-ring</td>
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<td>18</td>
<td>Slam shut Pd O-ring</td>
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<tr>
<td>19</td>
<td>Screw</td>
<td>403 028</td>
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<tr>
<td>20</td>
<td>Bypass O-ring</td>
<td>400 501</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Stem O-ring</td>
<td>-</td>
<td>400 505</td>
</tr>
<tr>
<td>22</td>
<td>Diaphragm assembly</td>
<td>181 017</td>
<td>181 027</td>
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<td>23</td>
<td>Slam shut assembly</td>
<td>196 433</td>
<td>196 250</td>
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<td></td>
<td><strong>Without Slam Shut</strong></td>
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<tr>
<td>24</td>
<td>Bottom O-ring</td>
<td>400 081</td>
<td></td>
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<tr>
<td></td>
<td>Spare parts kit (commissioning spares)</td>
<td>197 338</td>
<td>197 347</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> On special request, for low inlet pressure applications (< 1 bar)
Industrial Regulators

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