Type 41-23 Universal Pressure Reducing Valve
Self-operated Pressure Regulators

Edition June 2020
Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices. The images shown in these instructions are for illustration purposes only. The actual product may vary.

➔ For the safe and proper use of these instructions, read them carefully and keep them for later reference.

➔ If you have any questions about these instructions, contact SAMSON’s After-sales Service Department (aftersalesservice@samson.de).

The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at www.samson.de > Service & Support > Downloads > Documentation.

Definition of signal words

⚠️ **DANGER**
Hazardous situations which, if not avoided, will result in death or serious injury

⚠️ **WARNING**
Hazardous situations which, if not avoided, could result in death or serious injury

⚠️ **NOTICE**
Property damage message or malfunction

ℹ️ **Note**
Additional information

☀️ **Tip**
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1 Safety instructions and measures

Intended use

The SAMSON Type 41-23 Regulator is a pressure regulator. It consists of a Type 2412 Valve and a Type 2413 Actuator. The valve and actuator (except for tested regulators) are delivered separately and must be assembled together according to these instructions.

The self-operated regulator is used to control the downstream pressure \( p_2 \) in the pipeline to the adjusted set point. Liquids, gases and vapors in processing and industrial plants can be controlled by the regulator.

The regulators are designed to operate under exactly defined conditions (e.g. operating pressure, process medium, temperature). Therefore, operators must ensure that the regulators are only used in operating conditions that meet the specifications used for sizing the devices at the ordering stage. In case operators intend to use the regulators in other applications or conditions than specified, contact SAMSON.

SAMSON does not assume any liability for damage resulting from the failure to use the device for its intended purpose or for damage caused by external forces or any other external factors.

Refer to the technical data and nameplate for limits and fields of application as well as possible uses.

Reasonably foreseeable misuse

The regulators are not suitable for the following applications:

- Use outside the limits defined during sizing and by the technical data
- Use outside the limits defined by the additional fittings mounted on the regulator

Furthermore, the following activities do not comply with the intended use:

- Use of non-original spare parts
- Performing service and repair work not described in these instructions

Qualifications of operating personnel

The regulator must be mounted, started up, serviced and repaired by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
Safety instructions and measures

Personal protective equipment
We recommend checking the hazards posed by the process medium being used (e.g. GESTIS (CLP) hazardous substance database). Depending on the process medium and/or the activity, the protective equipment required includes:

− Protective clothing, safety gloves and eye protection in applications with hot, cold and/or corrosive media
− Wear hearing protection when working near the valve
− Hard hat
− Safety harness when working at height
− Safety footwear, ESD (electrostatic discharge) footwear, if necessary

⇒ Check with the plant operator for details on further protective equipment.

Revisions and other modifications
Revisions, conversions or other modifications of the product are not authorized by SAMSON. They are performed at the user's own risk and may lead to safety hazards, for example. Furthermore, the product may no longer meet the requirements for its intended use.

Warning against residual hazards
To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused in the regulator by the process medium, the operating pressure or by moving parts by taking appropriate precautions. They must observe all hazard statements, warning and caution notes in these mounting and operating instructions.

Hazard resulting from the special working conditions at the installation site of the regulator must be identified in a risk assessment and prevented through the corresponding safety instructions drawn up by the operator.

We also recommend checking the hazards posed by the process medium being used (e.g. GESTIS (CLP) hazardous substance database).

⇒ Observe safety measures for handling the device as well as fire prevention and explosion protection measures.

Safety features
The Type 41-23 Regulator does not have any special safety features. When relieved of pressure, the regulator is opened by the force of the set point springs.
Responsibilities of the operator

The operator is responsible for proper operation and compliance with the safety regulations. Operators are obliged to provide these mounting and operating instructions as well as the referenced documents to the operating personnel and to instruct them in proper operation. Furthermore, the operator must ensure that operating personnel or third persons are not exposed to any danger.

The operator is additionally responsible for ensuring that the limits for the product defined in the technical data are observed. This also applies to the start-up and shutdown procedures. Start-up and shutdown procedures fall within the scope of the operator’s duties and, as such, are not part of these mounting and operating instructions. SAMSON is unable to make any statements about these processes since the operative details (e.g. differential pressures and temperatures) vary in each individual case and are only known to the operator.

Responsibilities of operating personnel

Operating personnel must read and understand these mounting and operating instructions as well as the referenced documents and observe the specified hazard statements, warnings and caution notes. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

Referenced standards and regulations

The regulators comply with the requirements of the European Pressure Equipment Directive 2014/68/EU. Regulators with a CE marking have an EU declaration of conformity, which includes information about the applied conformity assessment procedure. This EU declaration of conformity is included in the 'Certificates' section.

According to the ignition risk assessment performed in accordance with EN 13463-1:2009, section 5.2, the non-electrical regulators do not have their own potential ignition source even in the rare incident of an operating fault. As a result, they do not fall within the scope of Directive 2014/34/EU.

➤ For connection to the equipotential bonding system, observe the requirements specified in section 6.4 of EN 60079-14 (VDE 0165 Part 1).
Safety instructions and measures

Referenced documentation

The following documents apply in addition to these mounting and operating instructions:

− Mounting and operating instructions for
  
  e.g. **Accessories: Compensation chamber** ▶ EB 2595
  
  e.g. **Type 2 NI Strainer** ▶ EB 1015

− Data sheets for
  
  e.g. **Accessories: Compensation chamber · Screw fittings · Control line connection · Control line** ▶ T 2595
  
  e.g. **Type 2 NI Strainer** ▶ T 1015

− Mounting and operating instructions as well as data sheets for additional fittings (e.g. shut-off valves, pressure gauges etc.).

1.1 **Notes on possible severe personal injury**

![DANGER]

**Risk of bursting in pressure equipment.**

Regulators and pipelines are pressure equipment. Impermissible pressure or improper opening can lead to regulator components bursting.

➔ Observe the maximum permissible pressure for regulator and plant.

➔ Before starting any work on the regulator, depressurize all plant sections affected as well as the regulator.

➔ Drain the process medium from all the plant sections affected as well as the regulator.
1.2 Notes on possible personal injury

**WARNING**

Crush hazard arising from moving parts.

The regulator contains moving parts (set point springs), which can injure hands or fingers if inserted into the regulator.

- Do not insert hands or fingers between the set point springs while the regulator is in operation.
- Do not insert hands or fingers between the pillars and set point springs while the regulator is in operation.
- Do not insert hands or fingers between the spring plate and crossbeam while the regulator is in operation.
- Before performing any work on the regulator, depressurize the plant. Disconnect or shut off the control line.

Risk of personal injury through incorrect operation, use or installation as a result of information on the regulator being illegible.

Over time, markings, labels and nameplates on the regulator may become covered with dirt or become illegible in some other way. As a result, hazards may go unnoticed and the necessary instructions not followed. There is a risk of personal injury.

- Keep all relevant markings and inscriptions on the device in a constantly legible state.
- Immediately renew damaged, missing or incorrect nameplates or labels.

Risk of hearing loss or deafness due to loud noise.

The noise emissions depend on the valve version, plant facilities and process medium.

- Wear hearing protection when working near the valve.

Risk of burn injuries due to hot or cold components and pipelines.

Depending on the process medium, regulator components and pipelines may get very hot or cold and cause burn injuries.

- Allow components and pipelines to cool down or heat up.
- Wear protective clothing and safety gloves.
Safety instructions and measures

**WARNING**

**Damage to health relating to the REACH regulation.**
If a SAMSON device contains a substance which is listed as being a substance of very high concern on the candidate list of the REACH regulation, this circumstance is indicated on the SAMSON delivery note.

⇒ Information on safe use of the part affected ➤ http://www.samson.de/reach-en.html.

**Risk of personal injury due to residual process medium in the regulator.**
While working on the regulator, residual process medium can escape and, depending on its properties, may lead to personal injury, e.g. (chemical) burns.

⇒ If possible, drain the process medium from all the plant sections affected and the regulator.
⇒ Wear protective clothing, safety gloves and eye protection.

**Risk of personal injury due to loaded springs.**
The set point springs of regulators with adjusted set point are preloaded and are under tension.

⇒ Before starting any work on the springs, relieve the compression from the preloaded springs.

### 1.3 Notes on possible property damage

**NOTICE**

**Risk of regulator damage due to incorrectly attached slings.**

⇒ Do not attach load-bearing slings to the actuator housing.
NOTICE

Risk of regulator damage due to unsuitable medium properties.
The regulator is designed for a process medium with defined properties.

➢ Only use the process medium specified for sizing.

Risk of regulator damage due to contamination (e.g. solid particles) in the pipeline.
The plant operator is responsible for cleaning the pipelines in the plant.

➢ Flush the pipelines before start-up.

Risk of regulator damage due to the use of unsuitable lubricants.
The lubricants to be used depend on the regulator material. Unsuitable lubricants may corrode and damage the surface.

➢ Only use lubricants approved by SAMSON.
   When in doubt, consult SAMSON.

Risk of leakage and regulator damage due to excessively high or low tightening torques.
Observe the specified torques on tightening regulator components. Excessively tightened torques lead to parts wearing out quicker. Parts that are too loose may cause leakage.

➢ Observe the specified tightening torques (see Annex).

Risk of regulator damage due to the use of unsuitable tools.
Certain tools are required to work on the regulator.

➢ Only use tools approved by SAMSON.
   When in doubt, consult SAMSON.

Risk of contamination of the process medium through the use of unsuitable lubricant and/or contaminated tools and components.

➢ Keep the regulator and the tools used free from solvents and grease.
➢ Make sure that only suitable lubricants are used.
NOTICE

Risk of excess pressure damaging plant sections due to construction-related seat leakage through the regulator.

Always fit a safety device (e.g. safety excess pressure valve or safety relief valve) in the plant.

Incorrect control due to the formation of ice on the regulator.

Medium temperatures below 0 °C may cause ice to form on the regulator, depending on the air humidity. This may affect, in particular, the functioning of the plug or diaphragm stem guide.

Prevent the formation of ice by taking appropriate precautions (e.g. enclosure, trace heater etc.). The plant operator is responsible for selecting and implementing appropriate precautions. See the 'Installation' section.

Note

SAMSON’s After-sales Service can support you concerning lubricant, tightening torques and tools approved by SAMSON.
## 1.4 Warnings on the regulator

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<th>Meaning of the warning</th>
<th>Location on the device</th>
</tr>
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<td>Attention ! Do not disassemble the valve without relieving the tension from the set point spring.</td>
<td><strong>Warning to indicate that the set point springs are loaded.</strong> There is a risk of serious head or face injury through the sudden release of the set point springs while unscrewing the crossbeam when the set point springs are loaded.</td>
<td>![Image of warning location on the device]</td>
</tr>
<tr>
<td>Completely relieve the tension from the set point springs before unthreading the two nuts.</td>
<td><strong>Warning to indicate that the set point springs are loaded.</strong> There is a risk of injury to hands or fingers through the sudden release of the actuator stem if they are inserted between the crossbeam and set point springs while exchanging the actuator.</td>
<td>![Image of warning location on the device]</td>
</tr>
<tr>
<td>Unlock/unlock the plug stem</td>
<td><strong>Warning to indicate property damage at the bellows seal.</strong> There is a risk of damage to the bellows seal due to the incorrect mounting or removal of the plug stem.</td>
<td>![Image of warning location on the device]</td>
</tr>
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</table>
Safety instructions and measures
2 Markings on the device

Several nameplates are affixed to the device. The nameplates are used to identify the separate regulator components (see Fig. 2-1).

2.1 Nameplates

Valve nameplate

ANSI version - DIN version

- 1 Valve type
- 2 Model number with index
- 3 Configuration ID
- 4 Order number or date
- 5 $K_{Vs}/C_v$
- 6 Set point range or spring range
- 7 Valve size
- 8 Pressure rating
- 9 Perm. differential pressure
- 10 Perm. temperature
- 11 Body material

Actuator nameplate

DIN/ANSI version

- 1 Actuator area (DIN/ANSI)
- 2 Actuator type designation
- 2.1 Valve type designation
- 3 Configuration ID
- 4 ID number
- 5 Year of CE certification
- 6.2 Max. perm. pressure at the actuator, based on the max. adjustable set point (DIN/ANSI)
- 7 Valve size (DIN/ANSI)
- 9 Set point range (DIN/ANSI)
- 10 Diaphragm material
- 11 CE mark
- 12 Number of certification body

Fig. 2-1: Nameplates of regulator parts
2.2 Locations of the nameplate

Fig. 2-2: Nameplate of the Type 2412 Valve and on the Type 2413 Actuator (diaphragm or bellows)

2.3 Material numbers

2.3.1 Type 2412 Valve

See the nameplate (11, ANSI/DIN body material). For more details on the nameplate, see section 2.1.

2.3.2 Type 2413 Actuator

Specifying the configuration ID, you can contact us to find out which material is used. The configuration ID is specified on the nameplate (3, ANSI/DIN configuration ID). For more details on the nameplate, see section 2.1.
3 Design and principle of operation

Refer to Fig. 3-1

The Type 41-23 Pressure Reducing Valve consists of a Type 2412 Closing Valve and a Type 2413 Actuator. The valve and actuator (except for tested regulators) are delivered separately and must be assembled together according to these instructions (see the 'Installation' section).

The pressure reducing valve is used to maintain the pressure downstream of the valve to an adjusted set point.

The process medium flows through the valve between seat (2) and plug (3) in the direction indicated by the arrow on the body. The position of the valve plug determines the flow rate and, as a result, the pressure ratio across the valve. The plug stem is sealed by a frictionless bellows (5.1). The downstream pressure $p_2$ is transmitted over the compensation chamber (18) (for liquids above 150 °C and for steam) and the control line (17) to the operating diaphragm (12) (operating bellows (12.1) in the version with bellows actuator) where it is converted into a positioning force. This force is used to move the valve plug depending on the force of the set point springs (7). The spring force is adjustable at the set point adjuster (6). The valves with $K_{VS}$ 4 and higher have a balancing bellows (4). The upstream pressure acts on the outside of the bellows and the downstream pressure on the inside of the bellows. As a result, the forces produced by the upstream and downstream pressures acting on the plug are balanced out.

Depending on the valve and actuator used, the regulator can be upgraded to create a pressure reducing valve for low flow rates, a steam pressure reducing valve or a pressure reducing valve with increased safety (actuator with two diaphragms).

The valve closes when the downstream pressure rises.

Legend for Fig. 3-1

1 Valve body
2 Seat
3 Plug
4 Balancing bellows
5 Plug stem
5.1 Bellows
6 Set point adjuster
7 Set point springs
7.1 Spring plate
8 Crossbeam
8.1 Pillar (view drawn turned by 90°)
8.2 Nuts for pillars
8.3 Tapped holes
9 Fastening nuts
10 Diaphragm actuator/bellows actuator
11 Actuator stem
12 Operating diaphragm
12.1 Operating bellows
13 Diaphragm plate
14 Diaphragm plate nut
15 Nuts and bolts
16 Control line connection G ¼ (with screw joint with restriction when used with steam)
17 Control line (to be provided on site) (available as control line kit for direct pressure tapping at the body T 2595)
18 Compensation chamber
19 Filler plug
20 Travel stop cap with cotter pin
Design and principle of operation

![Functional diagram for regulators, DN 32 to 100 with balancing bellows]

**Type 2412 Valve**

**Type 2413 Bellows Actuator** for 2 to 6, 5 to 10, 10 to 22 and 20 to 28 bar

**Fig. 3-1:** Functional diagram for regulators, DN 32 to 100 with balancing bellows
3.1 Additional fittings

Refer to Fig. 3-2

Strainers

We recommend installing a SAMSON strainer (2) upstream of the valve. It prevents solid particles in the process medium from damaging the regulator.

Do not use the strainer to permanently filter the process medium.

Select a strainer (mesh size) suitable for the process medium.

Note

Any impurities carried along by the process medium may impair the proper functioning of the regulator. We recommend installing a strainer (e.g. SAMSON Type 2 NI) upstream of the pressure reducing valve (EB 1015).

Pressure gauges

Install a pressure gauge (3 and 5) both upstream and downstream of the regulator to monitor the pressures prevailing in the plant.

Control line connection in pipeline:

Control line connection in manifold:

Control line connection below the middle of the flange:

Connection above the middle of the flange:

1 Shut-off valve 4 Pressure reducing valve
2 Strainer 5 Downstream pressure gauge
3 Upstream pressure gauge

\( H_k = \) Additional condensate head

Fig. 3-2: Sample application
Design and principle of operation

Bypass and shut-off valves
We recommend installing a shut-off valve (1 and 6) both upstream of the strainer and downstream of the regulator and installing a bypass line. The bypass ensures that the plant does not need to be shut down for service and repair work on the regulator.

Insulation
Regulators can be insulated to reduce heat energy transfer. Refer to the instructions in the 'Installation' section.

Noise emission
Trims with flow dividers can be used to reduce noise emission (▶ T 2512).

Note
The Type 41-23 Regulator is not a safety valve. If necessary, a suitable overpressure protection must be installed on site in the plant section.

3.2 Technical data
The valve and actuator nameplates provide information on the valve and actuator versions (see the 'Markings on the device' section).

Note
More information is available in Data Sheet ▶ T 2512.

Compliance
The Type 41-23 Regulator bears both the CE and EAC marks of conformity.

Process medium and scope of application
The Type 41-23 Pressure Reducing Valve is used to maintain the pressure downstream of the regulator to an adjusted set point.
- For liquids, gases and vapors
- Max. temperature 350 °C
- Set points from 0.05 to 28 bar
- Valve size DN 15 to 100
- Pressure ratings from PN 16 to 40
The regulator is open when relieved of pressure. The valve closes when the downstream pressure rises.

Temperature range
Depending on how the regulator is configured, it can be used up to temperatures of 350 °C (see Table 3-1). The minimum temperature is limited by the accessories used and the actuator’s diaphragm material (▶ T 2595).

Leakage class
The metal-seated regulator has the leakage class I according to IEC 60534-4.
The soft-seated regulator has the leakage class IV according to IEC 60534-4.
### Noise emission

SAMSON is unable to make general statements about noise emission as it depends on the regulator version, plant facilities, process medium and operating conditions.

### Dimensions and weights

Table 3-5 provides a summary of the dimensions and weights. The lengths and heights in the dimension diagrams are shown on page 3-10.

<table>
<thead>
<tr>
<th>Valve</th>
<th>Type 2412</th>
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<tbody>
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<td>Valve size</td>
<td>DN 15 to 50</td>
</tr>
<tr>
<td>Pressure rating</td>
<td>PN 16, 25 or 40</td>
</tr>
<tr>
<td>Max. permissible differential pressure ∆p</td>
<td>25 bar</td>
</tr>
<tr>
<td>Max. permissible temperature</td>
<td>Metal seal: 350 °C · PTFE soft seal: 220 °C EPDM or FKM soft seal: 150 °C · NBR soft seal: 80 °C</td>
</tr>
<tr>
<td>Leakage class according to IEC 60534-4</td>
<td>Metal seal: leakage class I (≤0.05 % of $K_{VS}$ coefficient) Soft seal: leakage class IV (≤0.01 % of $K_{VS}$ coefficient)</td>
</tr>
<tr>
<td>Compliance</td>
<td></td>
</tr>
</tbody>
</table>

### Diaphragm actuator

<table>
<thead>
<tr>
<th>Type 2413</th>
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<tbody>
<tr>
<td>Actuator area cm²</td>
</tr>
<tr>
<td>Set point ranges bar</td>
</tr>
<tr>
<td>Max. permissible temperature Gases 350 °C, however, max. 80 °C at the actuator · Liquids 150 °C, with compensation chamber 350 °C · Steam with compensation chamber 350 °C</td>
</tr>
</tbody>
</table>

### Bellows actuator

<table>
<thead>
<tr>
<th>Type 2413</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator area cm²</td>
</tr>
<tr>
<td>Set point ranges bar</td>
</tr>
<tr>
<td>Set point spring</td>
</tr>
</tbody>
</table>

1) Set point spring 4400 N
2) Version with actuator with two diaphragms: 1 to 2.5 bar
Design and principle of operation

Table 3-2: Max. permissible pressure at actuator

<table>
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<tr>
<th>Set point ranges</th>
<th>Max. perm. pressure above the set point adjusted at the actuator</th>
</tr>
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<td>Diaphragm actuator</td>
<td></td>
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<tr>
<td>0.05 to 0.25 bar · 0.1 to 0.6 bar</td>
<td>0.6 bar</td>
</tr>
<tr>
<td>0.2 to 1.2 bar</td>
<td>1.3 bar</td>
</tr>
<tr>
<td>0.8 to 2.5 bar</td>
<td>2.5 bar</td>
</tr>
<tr>
<td>2 to 5 bar</td>
<td>5 bar</td>
</tr>
<tr>
<td>4.5 to 10 bar · 8 to 16 bar</td>
<td>10 bar</td>
</tr>
<tr>
<td>Bellows actuator</td>
<td></td>
</tr>
<tr>
<td>2 to 6 bar · 5 to 10 bar</td>
<td>6.5 bar</td>
</tr>
<tr>
<td>10 to 22 bar</td>
<td>8 bar</td>
</tr>
<tr>
<td>20 to 28 bar</td>
<td>2 bar</td>
</tr>
</tbody>
</table>

**Note**

The maximum permissible pressure at the actuator depends on the currently adjusted set point. Add the value listed in the table to it.

**Example:**

Set point range: 0.2 to 1.2 bar  
Set point adjusted: 0.8 bar  
Max. permissible pressure at the actuator: 0.8 bar + 1.3 bar = 2.1 bar

Table 3-3: $K_{VS}$ coefficients and $x_{FZ}$ values · Terms for noise level calculation according to VDMA 24422 (edition 1.89)

<table>
<thead>
<tr>
<th>Valve size</th>
<th>DN 15</th>
<th>20</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
<th>65</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>$K_{VS}^{1)}$ · Standard version</td>
<td>4.0</td>
<td>6.3</td>
<td>8.0</td>
<td>16</td>
<td>20</td>
<td>32</td>
<td>50</td>
<td>80</td>
<td>125</td>
</tr>
<tr>
<td>$x_{FZ}$</td>
<td>0.5</td>
<td>0.45</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>$K_{VS}^{1)}$ · Special version</td>
<td>1.0</td>
<td>1.0</td>
<td>4.0</td>
<td>4.0</td>
<td>8.0</td>
<td></td>
<td>32</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>$x_{FZ}$</td>
<td>0.6</td>
<td>0.5</td>
<td>0.45</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$K_{VS}^{1)}$ · With flow divider</td>
<td>3.0</td>
<td>5.0</td>
<td>6.0</td>
<td>12</td>
<td>15</td>
<td>25</td>
<td>38</td>
<td>42</td>
<td>66</td>
</tr>
</tbody>
</table>

1) $K_{VS} \leq 4$: valve without balancing bellows  
2) Max. permissible $\Delta p$: 25 bar
**Table 3-4: Materials · Material numbers according to DIN EN**

<table>
<thead>
<tr>
<th>Valve</th>
<th>Type 2412</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure rating</td>
<td>PN 16</td>
</tr>
<tr>
<td>Max. permissible temperature</td>
<td>300 °C</td>
</tr>
<tr>
<td>Housing</td>
<td>Cast iron EN-GJL-250</td>
</tr>
<tr>
<td>Seat</td>
<td>CrNi steel</td>
</tr>
<tr>
<td>Plug</td>
<td>Material</td>
</tr>
<tr>
<td></td>
<td>CrNi steel</td>
</tr>
<tr>
<td>Seal</td>
<td>PTFE with 15 % glass fiber · EPDM · NBR · FKM</td>
</tr>
<tr>
<td>Guide bushing</td>
<td>CrNi steel</td>
</tr>
<tr>
<td>Balancing bellows and bellows seal</td>
<td>Stainless steel 1.4571</td>
</tr>
</tbody>
</table>

**Actuator**

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Type 2413</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm actuator</td>
<td>Bellows actuator</td>
</tr>
<tr>
<td>Diaphragm cases</td>
<td>Sheet steel S 235 JR (St 37-2) 1)</td>
</tr>
<tr>
<td>Diaphragm</td>
<td>EPDM · FKM · NBR · EPDM with PTFE protective facing</td>
</tr>
<tr>
<td>Bellows housing</td>
<td>–</td>
</tr>
<tr>
<td>Bellows</td>
<td>–</td>
</tr>
</tbody>
</table>

1) In corrosion-resistant version (CrNi steel)

**Table 3-5: Dimensions in mm and weights in kg**

<table>
<thead>
<tr>
<th>Pressure reducing valve</th>
<th>Type 41-23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve size</td>
<td>DN 15</td>
</tr>
<tr>
<td>Length L</td>
<td>130</td>
</tr>
<tr>
<td>Height H1</td>
<td>335</td>
</tr>
<tr>
<td>Height H2</td>
<td>Forged steel</td>
</tr>
<tr>
<td>Other materials</td>
<td>44</td>
</tr>
</tbody>
</table>

1) +10 % for all other materials
2) Actuator with two diaphragms: 1 to 2.5 bar
3) Actuator with two diaphragms: Height H + 50 mm
Design and principle of operation

Table 3-5: *Dimensions in mm and weights in kg*

<table>
<thead>
<tr>
<th>Pressure reducing valve</th>
<th>Type 41-23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve size</td>
<td>DN 15</td>
</tr>
<tr>
<td>Standard version with Type 2413 Diaphragm Actuator</td>
<td></td>
</tr>
<tr>
<td>0.05 to 0.25 bar</td>
<td>Height H $^{[3]}$</td>
</tr>
<tr>
<td></td>
<td>Actuator</td>
</tr>
<tr>
<td></td>
<td>Valve spring force F</td>
</tr>
<tr>
<td>0.1 to 0.6 bar</td>
<td>Height H $^{[3]}$</td>
</tr>
<tr>
<td></td>
<td>Actuator</td>
</tr>
<tr>
<td></td>
<td>Valve spring force F</td>
</tr>
<tr>
<td>0.2 to 1.2 bar</td>
<td>Height H $^{[3]}$</td>
</tr>
<tr>
<td></td>
<td>Actuator</td>
</tr>
<tr>
<td></td>
<td>Valve spring force F</td>
</tr>
<tr>
<td>0.8 to 2.5 bar $^{[2]}$</td>
<td>Height H $^{[3]}$</td>
</tr>
<tr>
<td></td>
<td>Actuator</td>
</tr>
<tr>
<td></td>
<td>Valve spring force F</td>
</tr>
<tr>
<td>2 to 5 bar</td>
<td>Height H $^{[3]}$</td>
</tr>
<tr>
<td></td>
<td>Actuator</td>
</tr>
<tr>
<td></td>
<td>Valve spring force F</td>
</tr>
<tr>
<td>4.5 to 10 bar</td>
<td>Height H $^{[3]}$</td>
</tr>
<tr>
<td></td>
<td>Actuator</td>
</tr>
<tr>
<td></td>
<td>Valve spring force F</td>
</tr>
<tr>
<td>8 to 16 bar</td>
<td>Height H $^{[3]}$</td>
</tr>
<tr>
<td></td>
<td>Actuator</td>
</tr>
<tr>
<td></td>
<td>Valve spring force F</td>
</tr>
</tbody>
</table>

Weight for version with Type 2413 Diaphragm Actuator

<table>
<thead>
<tr>
<th>Set point ranges</th>
<th>Weight, based on cast iron $^{[1]}$, approx. kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 to 0.6 bar</td>
<td>22.5</td>
</tr>
<tr>
<td>0.2 to 2.5 bar</td>
<td>16</td>
</tr>
<tr>
<td>2 to 16 bar</td>
<td>12</td>
</tr>
</tbody>
</table>

1) +10% for all other materials
2) Actuator with two diaphragms: 1 to 2.5 bar
3) Actuator with two diaphragms: Height H + 50 mm
### Table 3-5: Dimensions in mm and weights in kg

<table>
<thead>
<tr>
<th>Pressure reducing valve</th>
<th>Type 41-23</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Valve size</strong></td>
<td>DN 15</td>
</tr>
<tr>
<td><strong>Version</strong></td>
<td>with Type 2413 Bellows Actuator</td>
</tr>
<tr>
<td><strong>Set point ranges</strong></td>
<td>2 to 6 bar</td>
</tr>
<tr>
<td>Height H</td>
<td>550</td>
</tr>
<tr>
<td>Actuator</td>
<td></td>
</tr>
<tr>
<td>ØD = 120 mm, A = 62 cm²</td>
<td></td>
</tr>
<tr>
<td>Valve spring force F</td>
<td>4400 N</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>for version with bellows actuator</td>
</tr>
<tr>
<td><strong>Set point ranges</strong></td>
<td>2 to 10 bar</td>
</tr>
<tr>
<td>Weight, based on cast iron ¹)</td>
<td>16.5</td>
</tr>
<tr>
<td>approx. kg</td>
<td>20.9</td>
</tr>
</tbody>
</table>

¹) +10% for all other materials

²) Actuator with two diaphragms: 1 to 2.5 bar

³) Actuator with two diaphragms: Height H + 50 mm
Design and principle of operation

Dimensional drawings

Fig. 3-3: Dimensions

Type 41-23 with diaphragm actuator

Type 41-23 with bellows actuator
4  Shipment and on-site transport

The work described in this section is only to be performed by personnel qualified for the assignment accordingly.

4.1 Accepting the delivered goods

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Check that the specifications on the valve and actuator nameplate match the specifications in the delivery note. See the 'Markings on the device' section for nameplate details.

2. Check the shipment for transportation damage. Report any damage to SAMSON and the forwarding agent (refer to delivery note).

3. Determine the weight and dimensions of the units to be lifted and transported in order to select the appropriate lifting equipment and lifting accessories. Refer to the transport documents and the 'Design and principle of operation' section.

4.2 Removing the packaging from the valve and actuator

The components (valve, actuator and, if applicable, control line) of the regulator are delivered separately. A tested regulator is delivered as an assembled unit.

Proceed as follows to lift and install the valve:

⇒ Do not open or remove the packaging until immediately before lifting to install the valve into the pipeline.

⇒ Leave the regulator components in its transport container or on the pallet to transport it on site.

⇒ Do not remove the protective caps from the inlet and outlet until immediately before installing the valve into the pipeline. They prevent foreign particles from entering the valve.

⇒ Dispose and recycle the packaging in accordance with the local regulations.
4.3 Transporting and lifting the regulator

**DANGER**
Risk due to suspended loads falling.
- Stay clear of suspended or moving loads.
- Close off and secure the transport paths.

**WARNING**
Risk of lifting equipment tipping over and risk of damage to lifting accessories due to exceeding the rated lifting capacity.
- Only use approved lifting equipment and accessories whose minimum lifting capacity is higher than the weight of the valve (including actuator and packaging, if applicable).
- Refer to the 'Design and principle of operation' section for the weights.

**WARNING**
Risk of injury due to incorrect lifting without the use of lifting equipment.
Lifting the regulator without the use of lifting equipment may lead to injuries (back injury in particular) depending on the weight of the regulator.
- Observe the guideline weight for manual handling: 15 to max. 55 kg taking into account age, gender and physical fitness
- Observe the occupational health and safety regulations valid in the country of use.

**WARNING**
Risk of personal injury due to the regulator tipping.
- Observe the regulator's center of gravity.
- Secure the regulator against tipping over or turning.

**Tip**
Our after-sales service can provide more detailed transport and lifting instructions on request.

### 4.3.1 Transporting the regulator

The regulator can be transported using lifting equipment (e.g. crane or forklift).
- Leave the regulator in its transport container or on the pallet to transport it.
- Observe the transport instructions.

**Transport instructions**
- Protect the regulator against external influences (e.g. impact).
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the piping and any mounted valve accessories against damage.
- Protect the regulator against moisture and dirt.
- The permissible ambient temperature of standard regulators is –20 to +80 °C.
4.3.2 Lifting the regulator

To install a large regulator into the pipeline, use lifting equipment (e.g. crane or forklift) to lift it.

Lifting instructions

- Use a hook with safety latch to secure the slings from slipping during lifting and transporting (see Fig. 4-1).
- Secure slings against slipping.
- Make sure the slings can be removed after installation.
- Prevent the regulator from tilting or tipping over.
- Do not leave loads suspended when interrupting work for longer periods of time.
- Make sure that the axis of the pipeline is always horizontal during lifting and the axis of the plug stem is always vertical.

Lifting

1. Attach one sling to the flange of the body and to the rigging equipment (e.g. hook) of the crane or forklift (see Fig. 4-1).
2. Carefully lift the regulator. Check whether the lifting equipment and accessories can bear the weight.
3. Move the regulator at an even pace to the site of installation.
4. Install the regulator into the pipeline (see the 'Installation' section).
5. After installation in the pipeline, check whether the regulator flanges are bolted tight.
6. Remove slings.

Fig. 4-1: Schematic drawing of lifting points on the regulator
4.4 Storing the valve

**NOTICE**

_Risk of regulator damage due to improper storage._

- Observe the storage instructions.
- Avoid long storage times.
- Contact SAMSON in case of different storage conditions or long storage periods.

**Note**

We recommend regularly checking the regulator and the prevailing storage conditions during long storage periods.

### Storage instructions

- Protect the regulator against external influences (e.g. impact).
- Secure the regulator in the stored position against slipping or tipping over.
- Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
- Protect the regulator against moisture and dirt. Store it at a relative humidity of less than 75%. In damp spaces, prevent condensation. If necessary, use a drying agent or heating.
- Make sure that the ambient air is free of acids or other corrosive media.
- The permissible storage temperature of standard regulators is –20 to +65 °C.

- Do not place any objects on the regulator.

**Special storage instructions for elastomers**

_Elastomer, e.g. operating diaphragm_

- To keep elastomers in shape and to prevent cracking, do not bend them or hang them up.
- Store elastomers away from lubricants, chemicals, solutions and fuels.
- We recommend a storage temperature of 15 °C for elastomers.

**Tip**

SAMSON’s After-sales Service can provide more detailed storage instructions on request.
5 Installation

The work described in this section is only to be performed by personnel qualified for the assignment accordingly.

5.1 Installation conditions

Work position

The work position for the regulator is the front view onto all operating controls on the regulator (including any additional fittings) seen from the position of operating personnel.

Plant operators must ensure that, after installation of the device, the operating personnel can perform all necessary work safely and easily access the device from the work position.

Pipeline routing

The inlet and outlet lengths vary depending on the process medium. To ensure that the regulator functions properly, proceed as follows:

- Observe the inlet and outlet lengths (see Table 5-6). Contact SAMSON if the regulator conditions or state of the medium process deviate.

- For media with a tendency to condensate, install the pipeline with a slight downward slope on both sides so that the condensate can drain properly. If the pipeline upstream and downstream of the regulator run vertically upwards, an automatic water drainage is required.

- Install the regulator allowing sufficient space to remove the actuator and valve or to perform service work on them.

Mounting position

To ensure that the regulator functions properly, proceed as follows:

- Install the actuator housing with the set point springs suspended downward in horizontal pipelines (see Fig. 5-1).

- Make sure the direction of flow matches the direction indicated by the arrow on the body.

- Contact SAMSON if the mounting position is not as specified above.

---

**NOTICE**

Damage due to freezing.

Protect the regulator from icing up when controlling media that can freeze. Remove the regulator from the pipeline when the plant is shut down if the regulator is not installed areas free from frost.
Support or suspension

**Note**

The plant engineering company is responsible for selecting and implementing a suitable support or suspension of the installed regulator and the pipeline.

Depending on the regulator version and mounting position, the valve, actuator and pipeline must be supported or suspended.

---

**NOTICE**

Do not attach supports directly to the valve or actuator.

---

Control line

The control line must be provided at the site of installation, e.g. a ¾” pipe for steam or an 8x1 or 6x1 mm pipe for air/water.

Connect the control line to the downstream line (p₂) at least one meter away from the valve outlet.

Weld the control line at the side in the middle of the pipe, inclining at a ratio of approximately 1:10 up to the compensation chamber. If a manifold is located downstream of the pressure reducing valve, connect the valve to the manifold, even if it is several meters away (see Table 5-6 and Fig. 5-2).

---

Control line kit

A control line kit for tapping pressure at the valve body is available as an accessory part from SAMSON.
Compensation chamber

A compensation chamber (18) is required for liquids above 150 °C as well as for steam. The mounting position of the compensation chamber is indicated by an adhesive label on the chamber itself as well as by an arrow and the word "top" stamped on the top of the chamber.

This mounting position must be adhered to; otherwise the safe functioning of the regulator cannot be guaranteed.

Weld the line coming from the pressure tapping point to the ¾” pipe socket on the chamber.

Install the compensation chamber at the highest point of the pipeline. Consequently, the control line between compensation chamber and actuator must also be installed with a downward slope. In this case, use a ¾” pipe with screw fittings.

If the control line connection is located below the middle of the valve inlet flange, arrange the compensation chamber at the same level as the inlet flange. In this case, use a pipe which is at least ½” in size for the control line from the tapping point to the compensation chamber.

If the control line is connected above the middle of the valve inlet flange, install the compensation chamber at the same level as the upstream pressure tapping point. The additional pressure of the condensate head (Hₖ, Fig. 5-3) must be compensated for by adjusting the set point.

Needle valve

If the regulator tends to hunt, we recommend installing a needle valve at the control line connection (16) in addition to the standard SAMSON screw joint with restriction.

Fig. 5-2: Control line connection, depending on how the pipeline is routed
5.2 Preparation for installation

Valve and actuator can be assembled before or after the valve has been installed in the pipeline. We recommend first installing the valve without the actuator into the pipeline. Before installation, make sure the following conditions are met:

- The valve is clean.
- The valve, actuator and all piping are not damaged.
- Install a strainer upstream of the regulator.
- The valve data on the nameplate (type designation, valve size, material, pressure rating and temperature range) match the plant conditions (size and pressure rating of the pipeline, medium temperature etc.). See the 'Markings on the device' section for nameplate details.
- The requested or required additional fittings (see the 'Design and principle of operation' section) have been installed or prepared as necessary before installing the valve.

Proceed as follows:

- Lay out the necessary material and tools to have them ready during installation work.
- Flush the pipeline before installing the regulator. The plant operator is responsible for cleaning the pipelines in the plant.
- For steam applications, dry the pipelines. Moisture will damage the inside of the regulator.
- Check any mounted pressure gauges to make sure they function properly.
Table 5-6: *Inlet and outlet lengths*

<table>
<thead>
<tr>
<th>State of process medium</th>
<th>Valve conditions</th>
<th>Inlet length a</th>
<th>Outlet length b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>Ma ≤ 0.3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Vapors ¹)</td>
<td>Ma ≤ 0.3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Liquid</td>
<td>Free of cavitation/w &lt; 3 m/s</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cavitation producing noise/w ≤ 3 m/s</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

¹) No saturated steam

Connection above the middle of the flange:

Additional condensate head

4 Pressure reducing valve
18 Compensation chamber

*Fig. 5-3: Example of installation with steam*
5.3 Assembly

Tested SAMSON regulators are delivered as an assembled unit. In all other cases, the separate components (valve, actuator and control line) of the regulator are delivered separately. Upon delivery, the separate components must be assembled together. Proceed as follows to assemble the regulator and to prepare for start-up.

⚠️ NOTICE

Risk of regulator damage due to excessively high or low tightening torques. Observe the specified torques on tightening regulator components. Excessively tightened torques lead to parts wearing out quicker. Parts that are too loose may cause leakage.

- Observe the specified tightening torques (see Annex).

⚠️ NOTICE

Risk of regulator damage due to the use of unsuitable tools.

- Only use tools approved by SAMSON (see Annex).

⚠️ NOTICE

Risk of regulator damage due to the use of unsuitable lubricants.

- Only use lubricants approved by SAMSON (see Annex).

5.3.1 Installing the regulator

1. Close the shut-off valves upstream and downstream of the regulator while the regulator is being installed.

2. Remove the protective caps from the valve ports before installing the valve.

3. Lift the valve using suitable lifting equipment to the site of installation. Observe the flow direction through the valve. The arrow on the valve indicates the direction of flow.

4. Make sure that the correct flange gaskets are used.

5. Bolt the pipe to the valve free of stress.

6. Mount the actuator.

- Diaphragm actuator DN 15 to 100
  - Insert the actuator stem (11) through the hole in the crossbeam (8) into the travel stop cap with cotter pin (20) and fasten the actuator with the nuts (9). Observe the tightening torques specified in the Annex.

- Bellows actuator DN 15 to 50
  - Remove the crossbeam (8) from the valve.
  - Insert the actuator stem (11) into the travel stop cap with cotter pin (20).
  - Align pillars (8.1) and fasten the actuator with the nuts (8.2). Observe the tightening torques specified in the Annex.
Bellows actuator DN 65 to 100

- Remove the crossbeam (8) from the valve.
- Unscrew the pillars (8.1).
- Screw the pillars (8.1) into the threaded holes (8.3) of the actuator flange as far as they will go.
- Insert the actuator stem (11) into the travel stop cap with cotter pin (20).
- Fasten the pillars (8.1) with the nuts (8.2) onto the valve flange. Observe the tightening torques specified in the Annex.

7. Lock the cotter pin (20) on the travel stop cap.

8. Mount the control line (17) onto the valve and actuator. Observe the tightening torques specified in the Annex.

With diaphragm actuators

- For steam or liquids above 150 °C install the compensation chamber and fill it with the process medium. Observe the tightening torques specified in the Annex.

9. Slowly open the shut-off valves in the pipeline after the valve has been installed.

5.3.2 Cleaning the pipeline

We recommend additionally flushing the pipeline with installed regulator before start-up.

- Unscrew the control line (17) from the valve body.
- Seal the valve body with G ¼ stoppers (accessories: stopper 8323-0030 and seal 8412-0771).
- Observe the mesh size of the upstream strainer for the maximum particle size. Use strainers to suit the process medium.
- Check the strainer for dirt each time the pipeline is flushed and clean it, if necessary.

If the regulator malfunctions due to clogging after flushing the pipeline, proceed as described in the ‘Malfunctions’ section.
5.4 Testing the regulator

**DANGER**

**Risk of bursting due to incorrect opening of pressurized equipment or components.**
Regulators and pipelines are pressure equipment that may burst when handled incorrectly. Flying projectile fragments or the release of compressed medium can cause serious injury or even death.

Before working on the regulator:
- Depressurize all plant sections affected and the regulator.
- Disconnect the control line.
- Drain the process medium from all the plant sections affected as well as the valve.

**WARNING**

**Risk of personal injury due to process medium escaping under pressure.**
- First start up the regulator after mounting all parts.

**WARNING**

**Risk of hearing loss or deafness due to loud noise.**
Noise emission (e.g. cavitation or flashing) may occur during operation caused by the process medium and the operating conditions.
- Wear hearing protection when working near the regulator.

**WARNING**

Crush hazard arising from moving parts.
- Do not insert hands or fingers between the set point springs while the regulator is in operation.
- Do not insert hands or fingers between the pillars and set point springs while the regulator is in operation.
- Do not insert hands or fingers between the spring plate and crossbeam while the regulator is in operation.
- Before starting any work on the regulator, depressurize plant sections as well as the regulator.

**WARNING**

Risk of burn injuries due to hot or very cold components and pipelines.
Depending on the process medium, valve components and pipelines may get very hot or cold and cause burn injuries.
- Wear protective clothing and safety gloves.

SAMSON regulators are delivered ready for use. To test the regulator functioning before start-up or putting back the regulator into service, perform the following tests:
5.4.1 Leak test

The plant operator is responsible for performing the leak test and selecting the test method. The leak test must comply with the requirements of the national and international standards that apply at the site of installation.

Our after-sales service can support you to plan and perform a leak test for your plant.

1. Slowly open the shut-off valve installed upstream of the regulator.
2. Apply the required test pressure.
3. Check the regulator for leakage to the atmosphere.
4. Depressurize the pipeline section and valve.
5. Rework any parts that leak and repeat the leak test.

5.4.2 Pressure test

Risk of valve damage due to a sudden pressure increase and resulting high flow velocities.

- Slowly open the shut-off valves.

During the pressure test, make sure the following conditions are met:

- Do not allow the pressure to exceed the 1.5 times the pressure rating of the valve body.
- The regulator must remain open. Therefore, set the maximum set point to ensure that the regulator does not close. Alternatively, detach the control line and seal the opening at the valve body with a G ¼ stopper (accessories: stopper 8323-0030 and seal 8412-0771).
- Make sure that the pressure rises simultaneously upstream and downstream of the regulator to avoid damaging the balancing bellows.

Tip

Our after-sales service can support you to plan and perform a leak test for your plant.

Note

The plant operator is responsible for performing the pressure test. SAMSON's After-sales Service can support you to plan and perform a pressure test for your plant.
5.5 Insulation

To insulate cold systems, we recommend first filling the plant and carefully rinsing it. The regulator must not yet be insulated at this stage.

**NOTICE**

**Risk of regulator damage due to incorrect insulation.**

> Only insulate the regulator up to the actuator for medium temperatures below 0 °C or above 220 °C.

1. Start up the plant and adjust the set point (see the 'Start-up' section).
2. Shut down the plant again and let it heat up until the condensation water has dried off.
3. Insulate the regulator and pipes conveying the process medium using insulation material with a water vapor barrier. If a control line is to be routed through the insulation, special care must be taken with the sealing since slight changes in shape may occur. The insulation thickness depends on the medium temperature and the ambient conditions. 50 mm is a typical thickness.
6 Start-up

The work described in this section is only to be performed by personnel qualified for the assignment accordingly.

**DANGER**

**Risk of personal injury due to process medium escaping under pressure.**
→ First start up the regulator after mounting all parts.

**WARNING**

**Risk of burn injuries due to hot or cold components and pipeline.**
Regulator components and the pipeline may become very hot or cold. Risk of burn injuries.
→ Allow components and pipelines to cool down or heat up.
→ Wear protective clothing and safety gloves.

**WARNING**

**Risk of personal injury due to pressurized components and process medium escaping under pressure.**
→ Do not loosen the control line while the valve is pressurized.

**WARNING**

**Risk of hearing loss or deafness due to loud noise.**
Noise emission (e.g. cavitation or flashing) may occur during operation caused by the process medium and the operating conditions.
→ Wear hearing protection when working near the valve.

**WARNING**

**Crush hazard arising from moving parts.**
→ Do not insert hands or fingers between the set point springs while the regulator is in operation.
→ Do not insert hands or fingers between the pillars and set point springs while the regulator is in operation.
→ Do not insert hands or fingers between the spring plate and crossbeam while the regulator is in operation.
→ Before starting any work on the regulator, depressurize plant sections as well as the regulator.

Before start-up or putting the valve back into operation, make sure the following conditions are met:
- The regulator is properly installed into the pipeline (see the 'Installation' section).
- The leak and function tests have been completed successfully (see 'Testing the regulator').
- The prevailing conditions in the plant section affected meet the regulator sizing requirements (see information under 'Intended use' in the 'Safety instructions and measures' section).
Start-up/putting the valve back into operation

1. Depending on the field of application, allow the regulator to cool down or heat up to reach ambient temperature before start up.

2. Slowly open the shut-off valves in the pipeline. Slowly opening these valves prevents a sudden surge in pressure and resulting high velocities that can damage the valve.

3. Check the regulator to ensure it functions properly.

Before starting up the plant, make sure the following conditions are met:

- The control line is open and correctly connected.

6.1 Starting up the plant

1. Open the shut-off valves slowly preferably starting from the upstream pressure side. Afterwards, open all the valves on the consumer side (downstream of the regulator).

2. Fill the plant slowly with the process medium. Avoid pressure surges.

3. Make sure that the pressure rises simultaneously upstream and downstream of the regulator to avoid damaging the balancing bellows.

6.1.1 Regulation of liquids

→ To start up the pressure regulator, open shut-off valves slowly.

→ For liquid medium temperatures above 150 °C, first fill the compensation chamber with the process medium. Proceed as follows:

1. Unscrew filler plug from the compensation chamber.

2. Use the included plastic funnel or a jug to pour in the process medium until it starts to overflow.

3. Screw the filler plug back in and tighten it.

6.1.2 Regulation of steam

1. Unscrew filler plug from the compensation chamber.

2. Use the included plastic funnel or a jug to pour in water until it starts to overflow.

3. Screw the filler plug back in and tighten it.

- All pipes conveying the process medium must be completely drained and dry.

- Air and condensate must be allowed to escape from the plant.

- Allow time for the pipes and valves to heat up.
7 Operation

Immediately after completing start-up or placing the regulator back into operation (see the 'Start-up' section), the regulator is ready for use.

**WARNING**

*Risk of burn injuries due to hot or cold components and pipeline.*
Regulator components and the pipeline may become very hot or cold. Risk of burn injuries.

- Allow components and pipelines to cool down or heat up.
- Wear protective clothing and safety gloves.

**WARNING**

*Risk of personal injury due to pressurized components and process medium escaping under pressure.*

- Do not loosen the control line while the valve is pressurized.

**WARNING**

*Risk of hearing loss or deafness due to loud noise.*
Noise emission (e.g. cavitation or flashing) may occur during operation caused by the process medium and the operating conditions.

- Wear hearing protection when working near the valve.

### 7.1 Adjusting the set point

- The required downstream pressure is set by turning the set point adjuster (6) using an open-end wrench:
  - DN 15 to 50 with width across flats SW 19
  - DN 65 and 100 with width across flats SW 24
- The set point of the stainless steel regulator must be adjusted using the rod included.
  - Turn the set point adjuster clockwise (↺) to increase the pressure set point.
  - Turn the set point adjuster counterclockwise (↻) to reduce the pressure set point.

The pressure gauge located on the downstream pressure side allows the adjusted set point to be monitored.
An initial adjustment of the set point can also be made by changing the spring tension until the distance x (see Fig. 7-1 and Table 7-1) is reached.

**Note**

Note that during initial set point adjustment only a rough set point adjustment is performed by turning the set point adjustment until the distance x is reached. The special properties of the process medium and plant are not taken into account in this case. Check the pressure at the pressure gauge downstream of the regulator for a precise set point adjustment.

**Fig. 7-1: Set point adjustment with dimension x**

**Table 7-1: Set point adjustment · Dimension x**

<table>
<thead>
<tr>
<th>Set point range</th>
<th>Valve size DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 to 16 bar</td>
<td>15 to 25</td>
</tr>
<tr>
<td>10 bar</td>
<td>x=89 mm</td>
</tr>
<tr>
<td>12 bar</td>
<td>x=97 mm</td>
</tr>
<tr>
<td>14 bar</td>
<td>x=104 mm</td>
</tr>
<tr>
<td>4.5 to 10 bar</td>
<td></td>
</tr>
<tr>
<td>5.9 bar</td>
<td>x=85 mm</td>
</tr>
<tr>
<td>7.3 bar</td>
<td>x=93 mm</td>
</tr>
<tr>
<td>8.6 bar</td>
<td>x=101 mm</td>
</tr>
<tr>
<td>2 to 5 bar</td>
<td></td>
</tr>
<tr>
<td>2.8 bar</td>
<td>x=83 mm</td>
</tr>
<tr>
<td>3.5 bar</td>
<td>x=92 mm</td>
</tr>
<tr>
<td>4.3 bar</td>
<td>x=100 mm</td>
</tr>
<tr>
<td>0.8 to 2.5 bar</td>
<td></td>
</tr>
<tr>
<td>1.2 bar</td>
<td>x=79 mm</td>
</tr>
<tr>
<td>1.7 bar</td>
<td>x=89 mm</td>
</tr>
<tr>
<td>2.1 bar</td>
<td>x=99 mm</td>
</tr>
<tr>
<td>0.2 to 1.2 bar</td>
<td></td>
</tr>
<tr>
<td>0.45 bar</td>
<td>x=71 mm</td>
</tr>
<tr>
<td>0.70 bar</td>
<td>x=83 mm</td>
</tr>
<tr>
<td>1.0 bar</td>
<td>x=95 mm</td>
</tr>
<tr>
<td>0.1 to 0.6 bar</td>
<td></td>
</tr>
<tr>
<td>0.23 bar</td>
<td>x=71 mm</td>
</tr>
<tr>
<td>0.35 bar</td>
<td>x=83 mm</td>
</tr>
<tr>
<td>0.48 bar</td>
<td>x=95 mm</td>
</tr>
<tr>
<td>0.05 to 0.25 bar</td>
<td></td>
</tr>
<tr>
<td>0.10 bar</td>
<td>x=70 mm</td>
</tr>
<tr>
<td>0.15 bar</td>
<td>x=71 mm</td>
</tr>
<tr>
<td>0.20 bar</td>
<td>x=71 mm</td>
</tr>
</tbody>
</table>
# 8 Malfunctions

## 8.1 Troubleshooting

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible reasons</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Downstream pressure exceeds the adjusted set point.</strong></td>
<td>Insufficient pressure pulses on the operating diaphragm</td>
<td>➔ Connect the control line on site for regulators with external control line. ➔ Clean the control line and screw fittings.</td>
</tr>
<tr>
<td></td>
<td>Foreign particles blocking the plug</td>
<td>➔ Remove foreign particles. ➔ When parts are damaged, contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td></td>
<td>Seat and plug are worn or leak.</td>
<td>➔ When parts are damaged, contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td></td>
<td>Control line blocked</td>
<td>➔ Clean the control line and screw fittings.</td>
</tr>
<tr>
<td></td>
<td>Pressure tapped at the wrong place (regulator with external control line)</td>
<td>➔ Reconnect the control line at another point. ➔ Do not connect the control line at pipe bends or necks.</td>
</tr>
<tr>
<td></td>
<td>Regulator or $K_{Vs}/C_v$ coefficient too large</td>
<td>➔ Check the sizing. ➔ Change $K_{Vs}/C_v$ coefficient, if necessary or install a different sized regulator. ➔ Contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td></td>
<td>Compensation chamber in the wrong position or too small (with steam)</td>
<td>➔ Reconnect compensation chamber at a different place or replace it (see Annex).</td>
</tr>
<tr>
<td></td>
<td>Defective operating diaphragm</td>
<td>➔ Replace damaged diaphragm.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible reasons</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Downstream pressure hunts</strong></td>
<td>Regulator or $K_{Vs}/C_v$ coefficient too large</td>
<td>➔ Check the sizing. ➔ Change $K_{Vs}/C_v$ coefficient, if necessary or install a different sized regulator. ➔ Contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td></td>
<td>Pressure tapped at the wrong place (regulator with external control line)</td>
<td>➔ Reconnect the control line at another point. ➔ Do not connect the control line at pipe bends or necks.</td>
</tr>
<tr>
<td></td>
<td>The restriction in the control line for pressure tapping is too large or missing.</td>
<td>➔ Install a restriction. ➔ Install a smaller restriction.</td>
</tr>
</tbody>
</table>
### Malfunctions

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible reasons</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow control response</td>
<td>Restriction in the screw joint of the actuator dirty or too small</td>
<td>➔ Clean screw joint or install larger screw joint.</td>
</tr>
<tr>
<td></td>
<td>Dirt in the control line</td>
<td>➔ Clean the control line.</td>
</tr>
<tr>
<td></td>
<td>Regulator installed against the flow</td>
<td>➔ Install the regulator so that the direction of flow matches the direction indicated by the arrow on the body.</td>
</tr>
<tr>
<td></td>
<td>Regulator or $K_{vs}/C_v$ coefficient too small</td>
<td>➔ Check the sizing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➔ Change $K_{vs}/C_v$ coefficient, if necessary or install a different sized regulator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➔ Contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td>Downstream pressure drops below the adjusted set point.</td>
<td>Pressure tapped at the wrong place (regulator with external control line)</td>
<td>➔ Reconnect the control line at another point.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➔ Do not connect the control line at pipe bends or necks.</td>
</tr>
<tr>
<td></td>
<td>Foreign particles blocking the plug</td>
<td>➔ Remove foreign particles.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➔ When parts are damaged, contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td></td>
<td>Compensation chamber in the wrong position or too small (with steam)</td>
<td>➔ Reconnect compensation chamber at a different place or replace it (see Annex).</td>
</tr>
<tr>
<td></td>
<td>Control line blocked</td>
<td>➔ Clean the control line and screw fittings.</td>
</tr>
<tr>
<td></td>
<td>Strainer blocked</td>
<td>➔ Clean strainer.</td>
</tr>
<tr>
<td>Jerky control response</td>
<td>Increased friction, e.g. due to foreign particles between seat and plug</td>
<td>➔ Remove foreign particles.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➔ When parts are damaged, contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td>Loud noises</td>
<td>High flow velocity, cavitation</td>
<td>➔ Check the sizing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➔ Install larger regulator, if necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>➔ Install flow divider with gases and steam.</td>
</tr>
<tr>
<td>Leakage at the actuator</td>
<td>Defective operating diaphragm/bellows</td>
<td>➔ Replace damaged diaphragm/bellows.</td>
</tr>
<tr>
<td>Leakage at the bellows seal</td>
<td>Defective bellows seal</td>
<td>➔ When parts are damaged, contact SAMSON’s After-sales Service.</td>
</tr>
<tr>
<td>Red mark appears at the diaphragm rupture indicator (actuator with two diaphragms).</td>
<td>Defective operating diaphragm</td>
<td>➔ Replace damaged operating diaphragn.</td>
</tr>
</tbody>
</table>
Malfunctions

Malfunctions

Contact SAMSON’s After-sales Service for malfunctions not listed in the table.

The malfunctions listed in section 8.1 are caused by mechanical faults and incorrect regulator sizing. In the simplest case, the functioning can be restored following the recommended action. Special tools may be required to remedy the fault.

Exceptional operating and installation conditions may lead to changed situations that may affect the control response and lead to malfunctions. For troubleshooting, the conditions, such as installation, process medium, temperature and pressure conditions, must be taken into account.

Note

8.2 Emergency action

The plant operator is responsible for emergency action to be taken in the plant.

We recommend removing the regulator from the pipeline before repairing it.

In the event of a regulator malfunction:

1. Close the shut-off valves upstream and downstream of the regulator to stop the process medium from flowing through the regulator.

2. Perform troubleshooting (see section 8.1).

3. Rectify those malfunctions that can be remedied based on the instructions provided here. Contact our after-sales service in all other cases.

Putting the valve back into operation after a malfunction

See the 'Start-up' section.

Tip

SAMSON’s After-sales Service department can support you in drawing up an inspection and test plan for your plant.
9 Servicing

The regulator does not require any maintenance. Nevertheless, it is subject to natural wear, particularly at the seat, plug and operating diaphragm/bellows. Depending on the operating conditions, check the regulator at regular intervals to avoid possible malfunctions. Operators are responsible for drawing up an inspection and test plan. Details on faults and how to remedy them can be found in the 'Malfunctions' section.

The work described in this section is only to be performed by personnel qualified for the assignment accordingly.

We recommend removing the regulator from the pipeline before performing any maintenance or service work.

---

⚠️ WARNING

Risk of burn injuries due to hot or cold components and pipeline.

Regulator components and the pipeline may become very hot or cold. Risk of burn injuries.

➔ Allow components and pipelines to cool down or heat up.

➔ Wear protective clothing and safety gloves.

---

⚠️ WARNING

Risk of personal injury due to residual process medium in the regulator.

While working on the regulator, residual process medium can escape and, depending on its properties, may lead to personal injury, e.g. (chemical) burns.

➔ Wear protective clothing, safety gloves and eye protection.

---

⚠️ NOTICE

Risk of regulator damage due to excessively high or low tightening torques.

Observe the specified torques on tightening regulator components. Excessively tightened torques lead to parts wearing out quicker. Parts that are too loose may cause leakage.

➔ Observe the specified tightening torques (see Annex).

---

⚠️ NOTICE

Risk of regulator damage due to the use of unsuitable tools.

➔ Only use tools approved by SAMSON (see Annex).

---

⚠️ NOTICE

Risk of regulator damage due to the use of unsuitable lubricants.

➔ Only use lubricants approved by SAMSON (see Annex).
The regulator was checked by SAMSON before it left the factory.

− Certain test results (seat leakage and leak test) certified by SAMSON lose their validity when the regulator is opened.
− The product warranty becomes void if service or repair work not described in these instructions is performed without prior agreement by SAMSON’s After-sales Service.
− Only use original spare parts by SAMSON, which comply with the original specifications.

Legend for Fig. 9-1

1 Valve body
2 Seat
3 Plug
4 Balancing bellows
5 Plug stem
5.1 Bellows
6 Set point adjuster
7 Set point springs
7.1 Spring plate
8 Crossbeam
8.1 Pillar (view drawn turned by 90°)
8.2 Nuts for pillars
8.3 Tapped holes
9 Fastening nuts
10 Diaphragm actuator/bellows actuator
11 Actuator stem
12 Operating diaphragm
12.1 Operating bellows
13 Diaphragm plate
14 Diaphragm plate nut
15 Nuts and bolts
16 Control line connection G ¼ (with screw joint with restriction when used with steam)
17 Control line (to be provided on site) (available as control line kit for direct pressure tapping at the body T 2595)
18 Compensation chamber
19 Filler plug
20 Travel stop cap with cotter pin
Type 2412 Valve

Bellows actuator
for DN 15 to 50

Bellows actuator
for DN 65 to 100

Type 2413 Diaphragm Actuator

Type 2413 Bellows Actuator for 2 to 6, 5 to 10, 10 to 22 and 20 to 28 bar

Fig. 9-1: Functional diagram for regulators, DN 32 to 100 with balancing bellows
9.1 Preparing the valve for service work

1. Lay out the necessary material and tools to have them ready for the service work.
2. Put the regulator out of operation (see the 'Decommissioning' section).

We recommend removing the regulator from the pipeline before performing any service work (see the 'Removing the valve from the pipeline' section).

The following service work can be performed after preparation is completed:
- Replacing the actuator (see section 9.3.1)
- Replacing the set point springs (see section 9.3.2)
- Replacing the seat and plug (see section 9.3.3)
- Replacing the operating diaphragm (see section 9.3.4)

9.2 Installing the regulator after service work

Put the regulator back into operation (see the 'Start-up' section). Make sure requirements and conditions for start-up are met.

9.3 Service work

Before performing any service work, preparations must be made to the regulator (see section 9.1).

After all service work is completed, check the regulator before start-up (see 'Testing the regulator' in the 'Installation' section).
9.3.1 Replacing the actuator

⇒ Refer to Fig. 9-1

Removing the actuator

1. Put the regulator out of operation (see the 'Decommissioning' section).
2. Unscrew the control line (17).
3. Completely relieve the tension from the set point springs (7) by turning the set point adjuster (6) counterclockwise (5).

WARNING

Stored energy in the set point springs can cause components to move in an uncontrolled manner resulting in injury to hands or fingers.

4. Unlock the cotter pin (20) on the travel stop cap.
5. **Diaphragm actuator DN 15 to 100**
   Unscrew the nuts (9) from the actuator and remove the actuator.

   - **Bellows actuator DN 15 to 50**
     Unscrew the nuts (8.2) from the actuator and remove the actuator.

   - **Bellows actuator DN 65 to 100**
     Unscrew the nuts (8.2) on the pillars (8.1).
     Unscrew the pillars (8.1) out of the threaded holes (8.3) of the actuator flange and remove the actuator.

Mounting the actuator

1. **Diaphragm actuator DN 15 to 100**
   Insert the actuator stem (11) through the hole in the crossbeam (8) into the travel stop cap with cotter pin (20) and fasten the actuator with the nuts (9). Observe the tightening torques specified in the Annex.

   - **Bellows actuator DN 15 to 50**
     Insert the actuator stem (11) into the travel stop cap with cotter pin (20).
     Align actuator on the pillars (8.1) and fasten it with the nuts (8.2). Observe the tightening torques specified in the Annex.

   - **Bellows actuator DN 65 to 100**
     Screw the pillars (8.1) into the threaded holes (8.3) of the actuator flange as far as they will go.
     Insert the actuator stem (11) into the travel stop cap with cotter pin (20).
     Fasten the pillars (8.1) with the nuts (8.2) onto the valve flange. Observe the tightening torques specified in the Annex.

2. Lock the cotter pin (20) on the travel stop cap.
4. Put the regulator into operation (see the 'Operation' section).
9.3.2 Replacing the set point springs

Refer to Fig. 9-1

Removing the set point springs

1. Put the regulator out of operation (see the 'Decommissioning' section).
2. Completely relieve the tension from the set point springs (7) by turning the set point adjuster (6) counterclockwise (>).

WARNING

Stored energy in the set point springs can cause components to move in an uncontrolled manner resulting in injury to hands or fingers.

3. Unscrew the control line (17).
4. Remove the device from the pipeline.
5. Unlock the cotter pin (20) on the travel stop cap.
6. Remove the actuator (10) from the valve (see section 9.3.1).
7. Unscrew the nuts (8.2) on the crossbeam. Remove the crossbeam (8).
8. Remove the travel stop cap with cotter pin (20) and spring plate (7.1).
9. Lift off the set point springs (7).

Mounting the set point springs

1. Place the set point springs (7) on the set point adjuster (6).
2. Place on the spring plate (7.1) and the travel stop cap with cotter pin (20). Place the crossbeam (8) on the pillars (8.1) and fasten with the nuts (8.2). Observe the tightening torques specified in the Annex.
3. Mount the actuator (10) (see section 9.3.1). Observe the tightening torques specified in the Annex.
4. Lock the cotter pin (20) on the travel stop cap.
5. Install the regulator into the pipeline.
7. Put the regulator into operation (see the 'Operation' section).

Note

Change the nameplate and configuration ID after changing the set point range.
9.3.3 Replacing the seat and plug

To replace seat and plug, contact SAMSON’s After-sales Service.
Further information is available in the the Annex.

9.3.4 Replacing the operating diaphragm

**NOTICE**

*Do not exchange the operating diaphragm in an FDA-compliant regulator version.*
SAMSON’s After-sales Service can support you to perform such service work.

**Tip**

The associated order number is written on the actual operating diaphragm.

**WARNING**

*Stored energy in the set point springs can cause components to move in an uncontrolled manner resulting in injury to hands or fingers.*

1. Put the regulator out of operation (see the 'Decommissioning' section).
2. Completely relieve the tension from the set point springs (7) by turning the set point adjuster (6) counterclockwise (↺).
3. Unscrew the control line (17).
4. Unscrew the nuts (9) and remove the actuator.
5. Clamp the actuator stem (11) into a suitable fixture. Mark the side of the actuator to avoid reassembling it the wrong way.
6. Unscrew nuts and bolts (15) from the actuator. Remove the actuator case with control line connection (16).
7. Unscrew the diaphragm plate nut (14) and remove the operating diaphragm (12) from the diaphragm plate (13).
Servicing

Mounting the operating diaphragm

1. Place a new operating diaphragm (12) onto the diaphragm plate (13) (ensuring the pressurized side is facing in the correct direction) and tighten the diaphragm plate nut (14). Observe the tightening torques specified in the Annex.

2. Place on the actuator case with control line connection (16). Check the correct position of the control line connection nipple (marking).

3. Insert nuts and bolts (15) and tighten gradually in a crisscross pattern. Observe the tightening torques specified in the Annex.

4. Insert the actuator into the travel stop cap with cotter pin (20) and tighten the fastening nuts (9). Observe the tightening torques specified in the Annex.

5. Screw on the control line (17). Observe the tightening torques specified in the Annex.

6. Put the regulator into operation (see the 'Operation' section).

9.4 Ordering spare parts and operating supplies

Contact your nearest SAMSON subsidiary or SAMSON’s After-sales Service for information on spare parts, lubricants and tools.

Spare parts
See Annex for details on spare parts.

Lubricant
Contact SAMSON’s After-sales Service for more information on lubricants.

Tools
Contact SAMSON’s After-sales Service for more information on tools.
10 Decommissioning

The work described in this section is only to be performed by personnel qualified for the assignment accordingly.

⚠️ DANGER
Risk of bursting due to incorrect opening of pressurized equipment or components.
Regulators and pipelines are pressure equipment that may burst when handled incorrectly. Flying projectile fragments or the release of compressed medium can cause serious injury or even death.

Before working on the regulator:
- Depressurize all plant sections affected and the regulator.
- Disconnect the control line.
- Drain the process medium from all the plant sections affected as well as the valve.

⚠️ WARNING
Risk of burn injuries due to hot or cold components and pipeline.
Regulator components and the pipeline may become very hot or cold. Risk of burn injuries.
- Allow components and pipelines to cool down or heat up.
- Wear protective clothing and safety gloves.

⚠️ WARNING
Risk of personal injury due to pressurized components and process medium escaping under pressure.
- Do not loosen the control line while the valve is pressurized.

⚠️ WARNING
Risk of hearing loss or deafness due to loud noise.
Noise emission (e.g. cavitation or flashing) may occur during operation caused by the process medium and the operating conditions.
- Wear hearing protection when working near the regulator.

⚠️ WARNING
Crush hazard arising from moving parts.
- Do not insert hands or fingers between the set point springs while the regulator is in operation.
- Do not insert hands or fingers between the pillars and set point springs while the regulator is in operation.
- Do not insert hands or fingers between the spring plate and crossbeam while the regulator is in operation.
- Before starting any work on the regulator, depressurize plant sections as well as the regulator.
Decommissioning

**WARNING**

*Risk of personal injury due to residual process medium in the regulator.*

While working on the regulator, residual process medium can escape and, depending on its properties, may lead to personal injury, e.g. (chemical) burns.

⇒ Wear protective clothing, safety gloves and eye protection.

To decommission the regulator for service work or disassembly, proceed as follows:

1. Close the shut-off valve (1) on the upstream side of the regulator.
2. Close the shut-off valve (6) on the downstream side of the regulator.
3. Completely drain the pipelines and valve.
4. Depressurize the plant.
5. Shut off or disconnect any external control line.
6. If necessary, allow the pipeline and regulator components to cool down or heat up.
11 Removal

The work described in this section is only to be performed by personnel qualified for the assignment accordingly.

⚠️ WARNING
Risk of burn injuries due to hot or cold components and pipeline.
Regulator components and the pipeline may become very hot or cold. Risk of burn injuries.
→ Allow components and pipelines to cool down or heat up.
→ Wear protective clothing and safety gloves.

⚠️ WARNING
Risk of personal injury due to residual process medium in the regulator.
While working on the regulator, residual process medium can escape and, depending on its properties, may lead to personal injury, e.g. (chemical) burns.
→ Wear protective clothing, safety gloves and eye protection.

Before removing the valve, make sure the following conditions are met:
– The control valve is put out of operation (see the 'Decommissioning' section).

11.1 Removing the valve from the pipeline

1. Support the regulator to hold it in place when separated from the pipeline (see the 'Shipment and on-site transport' section).
2. Undo any externally mounted control line.
3. Unbolt the flange joint.
4. Remove the regulator from the pipeline (see the 'Shipment and on-site transport' section).

11.2 Removing the actuator from the valve

See 'Servicing' section.
12 Repairs

If the regulator does not function properly according to how it was originally sized or does not function at all, it is defective and must be repaired or exchanged.

⚠️ NOTICE

Risk of regulator damage due to incorrect repair work.

- Do not perform any repair work on your own.
- Contact SAMSON's After-sales Service for repair work.

12.1 Returning devices to SAMSON

Defective devices can be returned to SAMSON for repair.

Proceed as follows to return devices:

1. Exceptions apply concerning some special device models

2. Send an e-mail ➤ retouren@samsongroup.com to register the return shipment including the following information:
   - Type
   - Article no.
   - Configuration ID
   - Original order
   - Completed Declaration on Contamination, which can be downloaded from our website at

   After checking your registration, we will send you a return merchandise authorization (RMA).

3. Attach the RMA (together with the Declaration on Decontamination) to the outside of your shipment so that the documents are clearly visible.

4. Send the shipment to the address given on the RMA.

ℹ️ Note

Further information on returned devices and how they are handled can be found at
13 Disposal

➔ Observe local, national and international refuse regulations.

➔ Do not dispose of components, lubricants and hazardous substances together with your household waste.
14 Certificates

The declarations of conformity are included on the next pages:

- Declaration of conformity in compliance with Machinery Directive for Type 41-23 Regulator on page 14-4.
- Declaration of incorporation in compliance with Machinery Directive 2006/42/EC for the Type 2412 Valve with other actuators other than the Type 2413 Actuator on page 14-5.
SAMSON erklärt in alleiniger Verantwortung für folgende Produkte:/For the following products, SAMSON hereby declares
unter its sole responsibility:

Ventile für Druck-, Differenzdruck-, Temperatur- und Volumenstromregler/Valves for pressure,
temperature, flowregulators and differential pressure regulators

Typ 2336, 2373, 2375, 44-1B, 44-2, 44-3, 44-4, 44-5, 45-1, 45-2, 45-3, 45-4, 45-5, (Erz.-Nr. 2720), 45-9, 47-4, 2488, 2489, (2730),
2405, 2406, 2421 (2811), 2412 (2912), 2417 (2817), 2422 (2814), 2423 (2923), 2423E (2923)
die Konformität mit nachfolgender Anforderung/the conformity with the following requirement

Richtlinie des Europäischen Parlaments und des Rates zur Harmonisierung der Rechtsvorschriften
der Mitgliedstaaten über die Bereitstellung von Druckgeräten auf dem Markt.

Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment (see also
Articles 41 and 48).

Angewandtes Konformitätsbewertungsverfahren für Fluide nach Art. 4(1)(c.i) erster Gedankenstrich.
Conformity assessment procedure applied for fluids according to Article 4(1)(c.i), first indent

Modul siehe
Tabelle
See table for module

Nenndruck
Pressure rating

DN
NPS
15
20
25
32
40
50
65
80
100
125
150
200
250
300
400
6
8
10
12
16

PN 16 ohne/without (1) A (2) (3) - - - - - - - - -
PN 25 ohne/without (1) A (2) (3) H -
PN 40 ohne/without (1) H -
PN 100 und PN 160 ohne/without (1) H -
Class 150 ohne/without (1) A (2) (3) H -
Class 300 ohne/without (1) H -
Class 600 und Class 900 ohne/without (1) H -

(1) Das auf dem Stellgerät aufgebrachte CE-Zeichen hat keine Gültigkeit im Sinne der Druckgeräterichtlinie.
The CE marking affixed to the control valve is not valid in the sense of the Pressure Equipment Directive.

(2) Das auf dem Stellgerät aufgebrachte CE-Zeichen gilt ohne Bezeichnung der benannten Stelle (Kenn-Nr. 0062).
The CE marking affixed to the control valve is valid without specifying the notified body (ID number 0062).

(3) Die Identifikationsnummer 0062 von Bureau Veritas S.A. gilt nicht für Modul A.
The identification number 0062 of Bureau Veritas S.A. is not valid for Module A.

Geräte, denen laut Tabelle das Konformitätsbewertungsverfahren Modul H zugrunde liegt, beziehen sich auf die
„Zulassungsbescheinigung eines Qualitätssicherungssystems“ ausgestellt durch die benannte Stelle.
Devices whose conformity has been assessed based on Module H refer to the certificate of approval for the quality management system
issued by the notified body,

Dem Entwurf zu Grunde gelegt sind Verfahren aus:/The design is based on the methods of:
DIN EN 12516-2, DIN EN 12516-3 bzw. /or ASME B16.1, ASME B16.24, ASME B16.34, ASME B16.42
Das Qualitätssicherungssystem des Herstellers wird von folgender benannter Stelle überwacht:
The manufacturer’s quality management system is monitored by the following notified body:

Bureau Veritas S.A. Nr./No. 0062, Newtime, 52 Boulevard du Parc, Ille de la Jatte, 92200 Neuilly sur Seine, France
Hersteller/Manufacturer: SAMSON AG, Weismüllerstraße 3, 60314 Frankfurt am Main, Germany

Klaus Hörschken / Head of Central Department
Zentralabteilungsleiter / Head of Central Department
Entwicklung Ventile und Antriebe / R&D, Valves and Actuators

Dr. Michael Heß / Head of Central Department
Zentralabteilungsleiter / Head of Central Department
Product Management & Technical Sales

EU-KONFORMITÄTSERKLAGUNG
EU DECLARATION OF CONFORMITY

Modul H/Module H, Nr./No. / N° CE-0062-PED-H-SAM 001-16-DEU-rev-A

Frankfurt am Main, 08. Februar 2017

Revision 03

Klaus Hörschken
Zentralabteilungsleiter / Head of Central Department

Dr. Michael Heß
Zentralabteilungsleiter / Head of Central Department

SAMSAM AKTIENGESSELLSCHAFT
Weismüllerstraße 3 60314 Frankfurt am Main

Telefon: 069 4009-0 · Telefax: 069 4009-1507
E-Mail: samson@samson.de

14-2

EU-KONFORMITÄTSERKLÄRUNG
EU DECLARATION OF CONFORMITY

Modul H/Module H, Nr./No. / N° CE-0062-PED-H-SAM 001-16-DEU-rev-A

SAMSON erklärt in alleiniger Verantwortung für folgende Produkte:/For the following products, SAMSON hereby declares
unter its sole responsibility:

Ventile für Druck-, Differenzdruck-, Temperatur- und Volumenstromregler/Valves for pressure,
temperature, flowregulators and differential pressure regulators

Typ 2336, 2373, 2375, 44-1B, 44-2, 44-3, 44-4, 44-5, 44-6, 45-1, 45-2, 45-3, 45-4, 45-5, (Erz.-Nr. 2720), 45-9, 47-4, 2488, 2489, (2730),
2405, 2406, 2421 (2811), 2412 (2912), 2417 (2817), 2422 (2814), 2423 (2923), 2423E (2923)
die Konformität mit nachfolgender Anforderung/the conformity with the following requirement

Richtlinie des Europäischen Parlaments und des Rates zur Harmonisierung der Rechtsvorschriften
der Mitgliedstaaten über die Bereitstellung von Druckgeräten auf dem Markt.

Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment (see also
Articles 41 and 48).

Angewandtes Konformitätsbewertungsverfahren für Fluide nach Art. 4(1)(c.i) erster Gedankenstrich.
Conformity assessment procedure applied for fluids according to Article 4(1)(c.i), first indent

Medel siehe
Tabelle
See table for module

Nenndruck
Pressure rating

DN
NPS
15
20
25
32
40
50
65
80
100
125
150
200
250
300
400
6
8
10
12
16

PN 16 ohne/without (1) A (2) (3) - - - - - - - - -
PN 25 ohne/without (1) A (2) (3) H -
PN 40 ohne/without (1) H -
PN 100 und PN 160 ohne/without (1) H -
Class 150 ohne/without (1) A (2) (3) H -
Class 300 ohne/without (1) H -
Class 600 und Class 900 ohne/without (1) H -

(1) Das auf dem Stellgerät aufgebrachte CE-Zeichen hat keine Gültigkeit im Sinne der Druckgeräterichtlinie.
The CE marking affixed to the control valve is not valid in the sense of the Pressure Equipment Directive.

(2) Das auf dem Stellgerät aufgebrachte CE-Zeichen gilt ohne Bezeichnung der benannten Stelle (Kenn-Nr. 0062).
The CE marking affixed to the control valve is valid without specifying the notified body (ID number 0062).

(3) Die Identifikationsnummer 0062 von Bureau Veritas S.A. gilt nicht für Modul A.
The identification number 0062 of Bureau Veritas S.A. is not valid for Module A.

Geräte, denen laut Tabelle das Konformitätsbewertungsverfahren Modul H zugrunde liegt, beziehen sich auf die
„Zulassungsbescheinigung eines Qualitätssicherungssystems“ ausgestellt durch die benannte Stelle.
Devices whose conformity has been assessed based on Module H refer to the certificate of approval for the quality management system
issued by the notified body,

Dem Entwurf zu Grunde gelegt sind Verfahren aus:/The design is based on the methods of:
DIN EN 12516-2, DIN EN 12516-3 bzw./or ASME B16.1, ASME B16.24, ASME B16.34, ASME B16.42
Das Qualitätssicherungssystem des Herstellers wird von folgender benannter Stelle überwacht:
The manufacturer’s quality management system is monitored by the following notified body:

Bureau Veritas S.A. Nr./No. 0062, Newtime, 52 Boulevard du Parc, Ille de la Jatte, 92200 Neuilly sur Seine, France
Hersteller/Manufacturer: SAMSON AG, Weismüllerstraße 3, 60314 Frankfurt am Main, Germany

Frankfurt am Main, 08. Februar 2017

Klaus Hörschken / Head of Central Department
Zentralabteilungsleiter / Head of Central Department

Dr. Michael Heß / Head of Central Department
Zentralabteilungsleiter / Head of Central Department

SAMSAM AKTIENGESSELLSCHAFT
Weismüllerstraße 3 60314 Frankfurt am Main

Telefon: 069 4009-0 · Telefax: 069 4009-1507
E-Mail: samson@samson.de

14-2
SAMSON erklärt in alleiniger Verantwortung für folgende Produkte://For the following products, SAMSON hereby declares under its sole responsibility:

Ventile für Druck- Differenzdruck-, Volumenstrom- und Temperaturregler/Valves for pressure, differential pressure, volume flow and temperature regulators

2333 (Erz.-Nr./Model No. 2333), 2334 (2334), 2335 (2335), 2336, 2373, 2375, 44-0B, 44-1B, 44-2, 44-3, 44-6B, 44-7, 44-8, 45-1, 45-2, 45-3, 45-4, 45-5, 45-6, 2468, 2478 (2720), 45-9, 46-5, 46-6, 46-7, 46-9, 47-1, 47-4, 47-5, 47-9, 2487, 2488, 2489, 2491, 2494, 2495 (2730), 2405, 2406, 2421 (2811), 2392, 2412 (2812), 2114 (2814), 2417 (2817), 2422 (2814), 2423 (2823)

die Konformität mit nachfolgender Anforderung/the conformity with the following requirement.

Richtlinie des Europäischen Parlaments und des Rates zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung von Druckgeräten auf dem Markt.


Angewandtes Konformitätsbewertungsverfahren für Fluide nach Art. 4(1)(c.ii) und (c.i) zweiter Gedankenstrich.

Conformity assessment procedure applied for fluids according to Article 4(1)(c.ii) and (c.i), second indent

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<thead>
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<th>Nenndruck (Pressure rating)</th>
<th>DN</th>
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<td>A (2)(3)</td>
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<td>Class 600 und Class 900</td>
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</table>

(1) Das auf dem Stellgerät aufgebrachte CE-Zeichen hat keine Gültigkeit im Sinne der Druckgeräterichtlinie.

The CE marking affixed to the control valve is not valid in the sense of the Pressure Equipment Directive.

(2) Das auf dem Stellgerät aufgebrachte CE-Zeichen gilt ohne Bezeichnung der benannten Stelle (Kenn-Nr. 0062).

The CE marking affixed to the control valve is valid without specifying the notified body (ID number 0062).

(3) Die Identifikationsnummer 0062 von Bureau Veritas S.A. gilt nicht für Modul A.

The identification number 0062 of Bureau Veritas S.A. is not valid for Module A.

Geräte, denen laut Tabelle das Konformitätsbewertungsverfahren Modul H zugrunde liegt, beziehen sich auf die „Zulassungsbescheinigung eines Qualitätssicherungssystems“ ausgestellt durch die benannte Stelle.

Devices whose conformity has been assessed based on Module H refer to the certificate of approval for the quality management system issued by the notified body.

Dem Entwurf zu Grunde gelegt sind Verfahren aus:/The design is based on the procedures specified in the following standards:

DIN EN 12516-2, DIN EN 12516-3 bzw./or ASME B16.1, ASME B16.24, ASME B16.34, ASME B16.42

Das Qualitätssicherungssystem des Herstellers wird von folgender benannter Stelle überwacht:

The manufacturer’s quality management system is monitored by the following notified body:

Bureau Veritas S.A. Nr./No. 0062, Newtime, 52 Boulevard du Parc, Ile de la Jatte, 92200 Neuilly sur Seine, France

Hersteller/Manufacturer: SAMSON AG, Weismüllerstraße 3, 60314 Frankfurt am Main, Germany

Frankfurt am Main, 08. Februar 2017/08 February 2017

Klaus Hörschken
Zentralabteilungsleiter/Head of Central Department
Entwicklung Ventile und Antriebe/R&D, Valves and Actuators

Dr. Michael Heß
Zentralabteilungsleiter/Head of Central Department
Product Management & Technical Sales

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3  60314 Frankfurt am Main

Tel: 069 4009-0 · Telefax: 069 4009-1507 · E-Mail: samson@samson.de

Revision 03
Declaration of conformity according to Machinery Directive 2006/42/EC

For the following self-operated regulators:
Type 41-23 Universal Pressure Reducing Valve consisting of Type 2412 Valve and Type 2413 Actuator as well as Type 41-73 Universal Excess Pressure Valve consisting of Type 2417 Valve and Type 2413 Actuator

We hereby declare that the machinery mentioned above complies with all applicable requirements stipulated in Machinery Directive 2006/42/EC.

For product descriptions of the valve and actuator, refer to:
- Type 41-23 Universal Pressure Reducing Valve: Mounting and Operating Instructions EB 2512
- Type 41-73 Universal Excess Pressure Valve: Mounting and Operating Instructions EB 2517

Referenced technical standards and/or specifications:
- VCI, VDMA, VGB: "Leitfaden Maschinenrichtlinie (2006/42/EG) – Bedeutung für Armaturen, Mai 2018" [German only]

Comments:
- See mounting and operating instructions for residual hazards.
- Also observe the referenced documents listed in the mounting and operating instructions.

Persons authorized to compile the technical file:

SAMSON AG, Weismüllerstraße 3, 60314 Frankfurt am Main, Germany
Frankfurt am Main, 1 October 2019

Dr. Michael Heß
Director
Product Management and Technical Sales

Peter Scheermesser
Director
Product Upgrades and ETO Valves and Actuators
DECLARATION OF INCORPORATION
TRANSLATION

Declaration of Incorporation in Compliance with Machinery Directive 2006/42/EC

For the following products:
Types 2412 and 2417 Valves with Type 2413 Actuator

We certify that the Types 2412 and 2417 Valves as well as the Type 2413 Actuator are partly completed machinery as defined in the Machinery Directive 2006/42/EC and that the safety requirements stipulated in Annex I, 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4 and 1.3.7 are observed. The relevant technical documentation described in Annex VII, part B has been compiled.

Products we supply must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Machinery Directive 2006/42/EC.

Operators are obliged to install the products observing the accepted industry codes and practices (good engineering practice) as well as the mounting and operating instructions. Operators must take appropriate precautions to prevent hazards that could be caused by the process medium and operating pressure in the valve as well as by the signal pressure and moving parts.

The permissible limits of application and mounting instructions for the products are specified in the associated data sheets as well as the mounting and operating instructions; the documents are available in electronic form on the Internet at www.samson.de.

For product descriptions refer to:
- Type 2412 Valve with Type 2413 Actuator: Mounting and Operating Instructions EB 2512
- Type 2417 Valve with Type 2413 Actuator: Mounting and Operating Instructions EB 2517

Referenced technical standards and/or specifications:
- VCI, VDMA, VGB: Leitfaden Maschinenrichtlinie (2006/42/EG) – Bedeutung für Armaturen, May 2018 [German only]

Comments:
- See mounting and operating instructions for residual hazards.
- Also observe the referenced documents listed in the mounting and operating instructions.

Persons authorized to compile the technical file:

SAMSON AG, Weismüllerstraße 3, 60314 Frankfurt am Main, Germany
Frankfurt am Main, 1 October 2019

Dr. Michael Heß
Director
Product Management and Technical Sales

Peter Scheermesser
Director
Product Upgrades and ETO Valves and Actuators

Revision no. 00

Classification: Public - SAMSON AKTIENGESELLSCHAFT - Weismüllerstraße 3 - 60314 Frankfurt am Main, Germany/Page 1 of 1
15 Annex

15.1 Tightening torques

Table 15-1: Tightening torque

<table>
<thead>
<tr>
<th>Component</th>
<th>Width across flats</th>
<th>Valve size/actuator area</th>
<th>Tightening torque in Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set point adjuster (6)</td>
<td>SW 19</td>
<td>DN 15 to 50</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>SW 24</td>
<td>DN 65 to 100</td>
<td>–</td>
</tr>
<tr>
<td>Nuts for pillars (8.2)</td>
<td>SW 24</td>
<td>DN 15 to 100</td>
<td>60</td>
</tr>
<tr>
<td>Fastening nuts (9)</td>
<td>SW 16</td>
<td>DN 15 to 100</td>
<td>25</td>
</tr>
<tr>
<td>Diaphragm plate nut (14)</td>
<td>SW 12</td>
<td>40 to 640 cm²</td>
<td>40</td>
</tr>
<tr>
<td>Nuts and bolts (15)</td>
<td>–</td>
<td>40 to 640 cm²</td>
<td>25</td>
</tr>
<tr>
<td>Control line connection (16)</td>
<td>–</td>
<td>40 to 640 cm²</td>
<td>22</td>
</tr>
</tbody>
</table>

15.2 Lubricant

SAMSON's After-sales Service can support you concerning lubricants and sealants approved by SAMSON.

15.3 Tools

SAMSON's After-sales Service can support you concerning lubricants and sealants approved by SAMSON.

15.4 Accessories

Table 15-1: Assignment of compensation chamber (18) to regulator, with item no.

<table>
<thead>
<tr>
<th>Type 2413 Actuator Actuator area A</th>
<th>Item number Compensation chamber</th>
</tr>
</thead>
<tbody>
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<td>640 cm²</td>
<td>1190-8789</td>
</tr>
<tr>
<td>320 cm²</td>
<td>1190-8788</td>
</tr>
<tr>
<td>160, 80, 40 cm²</td>
<td>1190-8788</td>
</tr>
</tbody>
</table>
### 15.5 Spare parts

#### Version (September 2012 onwards)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bellows</td>
</tr>
<tr>
<td>2</td>
<td>Bellows assembly</td>
</tr>
<tr>
<td>6</td>
<td>Coupling nut</td>
</tr>
<tr>
<td>12</td>
<td>Balancing screw</td>
</tr>
<tr>
<td>16</td>
<td>Seat</td>
</tr>
<tr>
<td>17</td>
<td>Plug</td>
</tr>
<tr>
<td>17.1</td>
<td>Pre-stage of plug</td>
</tr>
<tr>
<td>17.2</td>
<td>Seal</td>
</tr>
<tr>
<td>20</td>
<td>Body</td>
</tr>
<tr>
<td>21</td>
<td>Guide cap</td>
</tr>
<tr>
<td>25</td>
<td>Guide (DN 32 to 100)</td>
</tr>
<tr>
<td>25, 26</td>
<td>Guide bushing/pipe (DN 15 to 25)</td>
</tr>
<tr>
<td>27</td>
<td>Flanged pipe</td>
</tr>
<tr>
<td>28</td>
<td>Washer</td>
</tr>
<tr>
<td>34</td>
<td>Flange</td>
</tr>
<tr>
<td>40</td>
<td>Set point adjuster</td>
</tr>
<tr>
<td>42</td>
<td>Retaining washer</td>
</tr>
<tr>
<td>44</td>
<td>Pillar</td>
</tr>
<tr>
<td>46</td>
<td>Seal</td>
</tr>
<tr>
<td>51</td>
<td>Stud</td>
</tr>
<tr>
<td>52</td>
<td>Hex nut</td>
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<tr>
<td>60</td>
<td>Flow divider</td>
</tr>
<tr>
<td>70, 71</td>
<td>Spring</td>
</tr>
<tr>
<td>73</td>
<td>Travel stop cap with cotter pin</td>
</tr>
<tr>
<td>74</td>
<td>Spring plate</td>
</tr>
<tr>
<td>75</td>
<td>Seal</td>
</tr>
<tr>
<td>76</td>
<td>Axial needle bearing</td>
</tr>
<tr>
<td>77</td>
<td>Lock washer</td>
</tr>
<tr>
<td>79</td>
<td>Hex nut</td>
</tr>
<tr>
<td>80</td>
<td>Crossbeam</td>
</tr>
<tr>
<td>101, 102</td>
<td>Diaphragm case</td>
</tr>
<tr>
<td>103</td>
<td>Screw plug</td>
</tr>
<tr>
<td>104</td>
<td>Diaphragm stem</td>
</tr>
<tr>
<td>105</td>
<td>Diaphragm plate</td>
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<tr>
<td>106</td>
<td>Diaphragm washer</td>
</tr>
<tr>
<td>108</td>
<td>Operating diaphragm</td>
</tr>
<tr>
<td>111</td>
<td>Hex bolt</td>
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<tr>
<td>112 - 114</td>
<td>Hex nut</td>
</tr>
<tr>
<td>116</td>
<td>Washer</td>
</tr>
</tbody>
</table>

#### Diagrams

- **Standard version (DN 15 to 25)**
- **Version with soft-seated plug**
- **Version with flow divider**
Annex

**Note**
There are no spare parts available for the bellows actuators. The entire actuator must be replaced if it is defective.

### 15.6 After-sales service

Contact SAMSON’s After-sales Service for support concerning service or repair work or when malfunctions or defects arise.

**E-mail address**

You can reach our after-sales service at aftersalesservice@samson.de.

**Addresses of SAMSON AG and its subsidiaries**

The addresses of SAMSON, its subsidiaries, representatives and service facilities worldwide can be found on our website ([www.samson.de](http://www.samson.de)) or in all SAMSON product catalogs.

**Required specifications**

Please submit the following details:

- Device type and nominal size
- Model number and configuration ID
- Upstream and downstream pressure
- Temperature and process medium
- Min. and max. flow rate
- Is a strainer installed?
- Installation drawing showing the exact location of the regulator and all the additionally installed components (shut-off valves, pressure gauge etc.)