

Self-operated Pressure Regulators



Type 41-23 Universal Pressure Reducing Valve



Translation of original instructions

Mounting and Operating Instructions

EB 2512 EN

Edition August 2016



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.

- 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 (aftersaleservice@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 (www.samson.de) > Product documentation. You can enter the document number or type number in the [Find:] field to look for a document.

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

Note

Additional information

Tip

Recommended action

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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 are delivered separately and must be assembled according to the instructions in this document.

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 regulator is designed to operate under exactly defined conditions (e.g. process medium, temperature, max. differential pressure, etc.). Therefore, operators must ensure that the regulator is only used in applications that meet the specifications used for sizing the regulator at the ordering stage. In case operators intend to use the regulator 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 regulator is not suitable for the following applications:

- Use outside the limits defined during sizing and by the technical data

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.

Personal protective equipment

We recommend wearing the following personal protective equipment when handling the Type 41-23 Regulator:

- Protective clothing, gloves, and eyewear in applications with hot, cold, and/or corrosive media.
- Protective gloves when mounting or removing the regulator
- ➔ Check with the plant operator for details on further protective equipment.

Revisions and other modifications

Revisions, conversions or other modifications to 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.

Safety features

The Type 41-23 Regulator does not have any special safety equipment. When relieved of pressure, the valve is opened by the force of the set point springs.

Warning against residual hazards

To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused by moving parts (set point springs) by taking appropriate precautions. They must observe all hazard statements, warning and caution notes in these mounting and operating instructions, especially for installation, start-up, and service work.

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. The mounting and operating instructions must be archived for later use. The operator must ensure that the operating personnel is instructed in proper operation and that operating personnel or third persons are not exposed to any danger.

Responsibilities of operating personnel

Operating personnel must read and understand these mounting and operating instructions as well as the referenced documents and observe the hazard statements, warning and caution notes specified in them. 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. Devices with a CE marking have an EU declaration of conformity, which includes information about the applied conformity assessment procedure. The declaration of conformity is included at the end of these instructions.

Referenced documentation

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

- Mounting and operating instructions for additional components (strainer, shut-off valves, pressure gauges, etc.).

1.1 Notes on possible severe personal injury

DANGER

Risk of bursting in the regulator.

Regulators and pipelines are pressure equipment. Improper opening can lead to components bursting.

- Before starting any work on the regulator, depressurize all plant sections concerned as well as the valve.
- Drain the process medium from all the plant sections concerned as well as the valve.
- Wear personal protective equipment.

1.2 Notes on possible personal injury

WARNING

Crush hazard arising from moving parts.

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

- Do not insert hands or fingers into the set point springs while the regulator is in operation.

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, see ► <http://www.samson.de/reach-en.html>.

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

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

- If possible, before starting work on the device, drain the process medium from all the plant sections concerned and the valve.
- Wear protective clothing, safety gloves, and eyewear.

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

Depending on the process medium, valve 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.

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.

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

The sealants or lubricants to be used depend on the actuator material. Unsuitable sealants or lubricants may corrode and damage the actuator surface.

- Only use sealants and lubricants approved by SAMSON.

! NOTICE

Risk of valve damage due to contamination (e.g. solid particles) in the pipeline.

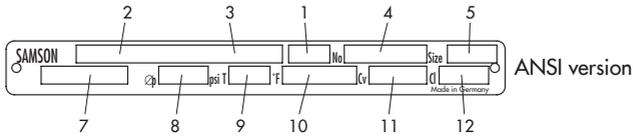
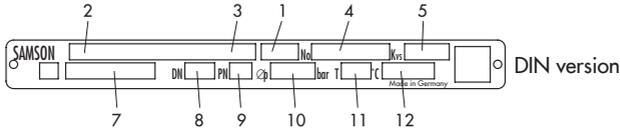
The plant operator is responsible for cleaning the pipelines in the plant.

- Flush the pipelines before start-up.
- Observe the maximum permissible pressure for valve and plant.

2 Nameplate

Nameplates are attached to the valve and the actuator.

Valve nameplate



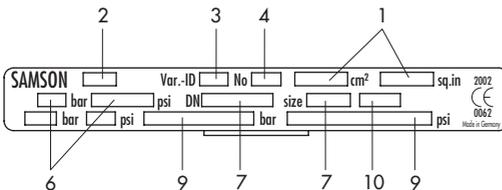
DIN version

- 1 Valve type
- 2 Model number with index
- 3 Configuration ID
- 4 Order number or date
- 5 K_{VS} coefficient
- 7 Spring force
- 8 Valve size
- 9 Nominal pressure
- 10 Perm. differential pressure
- 11 Perm. temperature
- 12 Body material

ANSI version

- 5 Valve size
- 7 Spring force
- 8 Perm. differential pressure
- 9 Perm. temperature [°F]
- 10 Body material
- 11 C_v coefficient (K_{VS} x 1.17)
- 12 ANSI Class (pressure rating)

Actuator nameplate



DIN/ANSI version

- 1 Actuator area (DIN/ANSI)
- 2 Type
- 3 Configuration ID
- 4 ID number
- 6 Max. perm. pressure (p_{exceed}) at the actuator, based on the max. adjustable set point (DIN/ANSI) · See Table 3
- 7 Valve size (DIN/ANSI)
- 9 Set point range (DIN/ANSI)
- 10 Diaphragm material

3 Design and principle of operation

→ Refer to Fig. 1

The Type 41-23 Pressure Reducing Valve consists of a Type 2412 Closing Valve and a Type 2413 Actuator. The valve and actuator are delivered separately and must be assembled according to the instructions in section 5.1.1.

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 across the valve. The downstream pressure p_2 is transmitted over the compensation chamber (18) and 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.

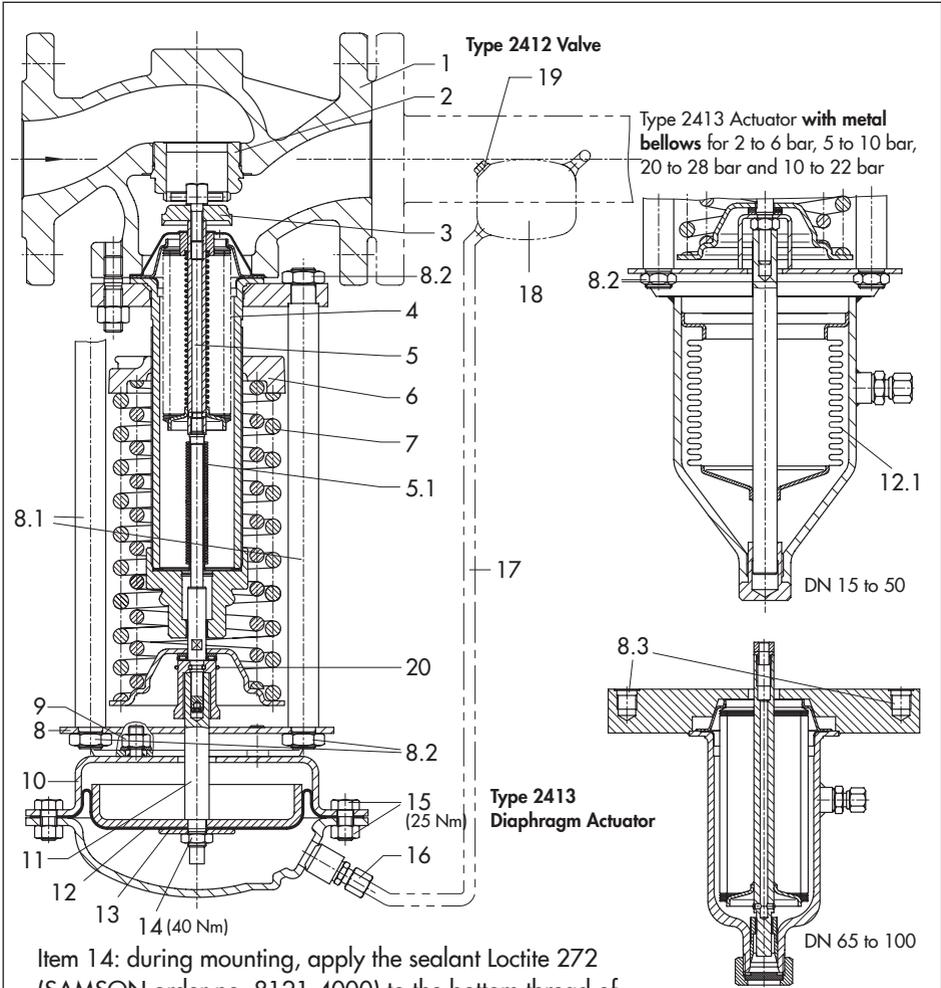
Depending on the valve and actuator used, the regulator can be upgraded to create a

pressure reducing valve for low flow rates, a steam pressure reducing valve or a pressure reducing valve with increased safety.

Legend for Fig. 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 |
| 8 | Crossbeam |
| 8.1 | Stud bolt |
| 8.2 | Nuts for stud bolts |
| 8.3 | Tapped holes |
| 9 | Fastening nuts |
| 10 | Diaphragm actuator |
| 11 | Actuator stem |
| 12 | Operating diaphragm |
| 12.1 | Operating bellows |
| 13 | Diaphragm plate |
| 14 | Nut |
| 15 | Nuts and bolts |
| 16 | Control line connection G 1/4 (for steam including screw joint with restriction) |
| 17 | Control line installed on site (control line kit available for tapping the pressure directly at the valve body, see T 2595) |
| 18 | Compensation chamber ¹⁾ |
| 19 | Filler plug |
| 20 | Anti-rotation clip |

¹⁾ See Table 1 on page 13.



Item 14: during mounting, apply the sealant Loctite 272 (SAMSON order no. 8121-4000) to the bottom thread of the actuator stem.

NOTICE

Not for the version for oxygen or complying with FDA.

Fig. 1: Functional diagram

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

Actuator area A in cm ²	Item number · Compensation chamber	
	DN 15 to 50	DN 65 to 250
640	1190-8789	1190-8790
320	1190-8788	1190-8789
160/80/40	1190-8788	

3.1 Process medium and scope of application

Pressure regulators for set points from **0.05 to 28 bar** · Valves in sizes **DN 15 to 100** · Nominal pressure **PN 16 to 40** · Suitable for **liquids, gases, and vapors** up to **350 °C**

The data applicable to the device are written on the nameplate of valve and actuator.

The valve **closes** when the downstream pressure **rises** above the adjusted set point.

⚠ DANGER

Risk of bursting in the regulator due to excessively high pressure.

The Type 41-23 Pressure Reducing Valve is not a safety valve. If necessary, a suitable over-pressure protection must be installed on site in the plant section.

3.2 Technical data

Table 2: Technical data · All pressures in bar (gauge)

Valve	Type 2412		
Nominal pressure	PN 16, 25 or 40		
Nominal size	DN 15 to 50	DN 65 to 80	DN 100
Max. permissible differential pressure Δp	25 bar	20 bar	16 bar
Max. permissible temperature	See pressure-temperature diagram in ► T 2500		
Valve plug	Metal seal: max. 350 °C · PTFE soft seal: max. 220 °C · EPDM or FPM soft seal: max. 150 °C · NBR soft seal: max. 80 °C		
Leakage class according to IEC 60534-4	Metal seal: leakage class I (≤ 0.05 % of K_{VS} coefficient) Soft seal: leakage class IV (≤ 0.01 % of K_{VS} coefficient)		
Compliance	CE ENEC		

Nameplate

Diaphragm actuator	Type 2413	
Set point ranges	0.05 to 0.25 bar · 0.1 to 0.6 bar · 0.2 to 1.2 bar · 0.8 to 2.5 bar ²⁾ 2 to 5 bar · 4.5 to 10 bar · 8 to 16 bar	
Max. permissible temperature	Gases 350 °C, however, max. 80 °C at the actuator · Liquids 150 °C, with compensation chamber max. 350 °C · Steam with compensation chamber max. 350 °C	
Bellows actuator	Type 2413	
Actuator area	33 cm ²	62 cm ²
Set point ranges	10 to 22 bar 20 to 28 bar	2 to 6 bar ¹⁾ 5 to 10 bar
Set point spring	8000 N	

1) Set point spring 4400 N

2) Version with actuator with two diaphragms: 1 to 2.5 bar

Table 3: Max. permissible pressure at the actuator

Set point range · Actuator with rolling diaphragm						
0.05 to 0.25 bar	0.1 to 0.6 bar	0.2 to 1.2 bar	0.8 to 2.5 bar	2 to 5 bar	4.5 to 10 bar	8 to 16 bar
Max. permissible pressure (p_{exceed}) above the set point adjusted at the actuator						
0.6 bar	0.6 bar	1.3 bar	2.5 bar	5 bar	10 bar	10 bar
Set point range · Bellows actuator						
2 to 6 bar	5 to 10 bar	10 to 22 bar	20 to 28 bar			
Max. permissible pressure (p_{exceed}) above the set point adjusted at the actuator						
6.5 bar	6.5 bar	8 bar	2 bar			

i 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**

i Note**Conversion from chromate coating to iridescent passivation**

We at SAMSON are converting the surface treatment of passivated steel parts in our production. As a result, you may receive a device assembled from parts that have been subjected to different surface treatment methods. This means that the surfaces of some parts show different reflections. Parts can have an iridescent yellow or silver color. This has no effect on corrosion protection.

For further information go to ► www.samson.de/chrome-en.html

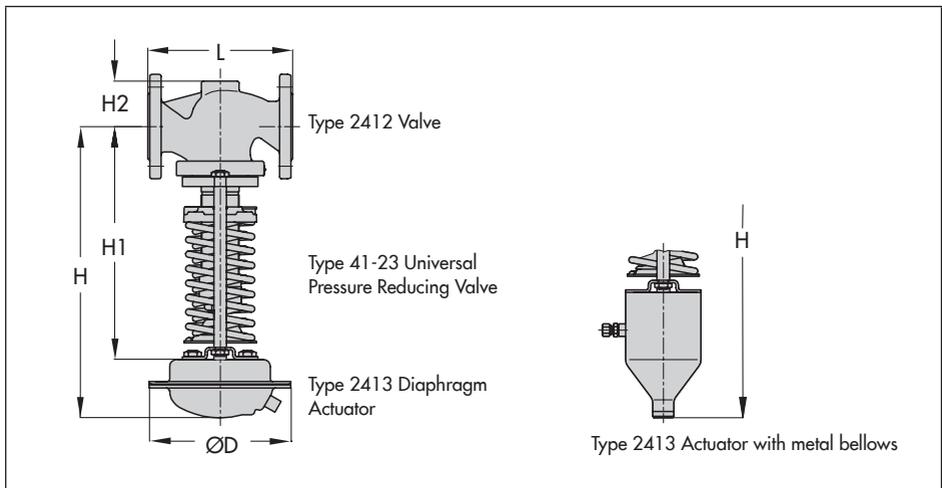
3.3 Dimensions

Table 4: Dimensions in mm and weights

Pressure reducing valve		Type 41-23								
Valve size	DN	15	20	25	32	40	50	65	80	100
Length L		130	150	160	180	200	230	290	310	350
Height H1		335			390			510		525
Height H2	Forged steel	53	–	70	–	92	98	–	128	–
	Other materials	44			72			98		118
Standard version with rolling diaphragm										
0.05 to 0.25 bar	Height H	445			500			620		635
	Actuator	ØD = 380 mm, A = 640 cm ²								
0.1 to 0.6 bar	Height H	445			500			620		635
	Actuator	ØD = 380 mm, A = 640 cm ²								
0.2 to 1.2 bar	Height H	430			480			600		620
	Actuator	ØD = 285 mm, A = 320 cm ²								
0.8 to 2.5 bar	Height H	430			485			605		620
	Actuator	ØD = 225 mm, A = 160 cm ²								
2 to 5 bar	Height H	410			465			585		600
	Actuator	ØD = 170 mm, A = 80 cm ²								
4.5 to 10 bar	Height H	410			465			585		600
	Actuator	ØD = 170 mm, A = 40 cm ²								
8 to 16 bar	Height H	410			465			585		600
	Actuator	ØD = 170 mm, A = 40 cm ²								
Weight for version with rolling diaphragm										
0.05 to 0.6 bar	Weight, based on cast iron ¹⁾ , approx. kg	22.5	23.5	29.5	31.5	35	51	58	67	
0.2 to 2.5 bar		16	18	23.5	25.5	29	45	52	61	
2 to 16 bar		12	13	18.5	21	24	40	47	56	
Special version with bellows actuator										
2 to 6 bar	Height H	550			605			725		740
	Actuator	A = 62 cm ²								
5 to 10 bar	Height H	550			605			725		740
	Actuator	A = 62 cm ²								
10 to 22 bar	Height H	535			590			710		725
	Actuator	A = 33 cm ²								
20 to 28 bar	Height H	535			590			710		725
	Actuator	A = 33 cm ²								
Weight for version with bellows actuator										
A = 33 cm ²	based on cast iron	16.5	17.9	18	23.5	25.5	29	48	56	66
A = 62 cm ²	¹⁾ , approx. kg	20.9	21.5	22	27.5	29.5	33	54	65	75

¹⁾ +10 % for cast steel

4 Measures to be taken before installation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received against the delivery note.
2. Check the shipment for transportation damage. Report any damage to SAMSON and the forwarding agent (refer to delivery note).

4.1 Unpacking

NOTICE

Risk of regulator damage due to foreign particles entering the valve.

The protective caps fitted on the valve's inlet and outlet prevent foreign particles from entering the valve and damaging it.

Do not remove the protective caps until immediately before installing the valve into the pipeline.

Note

Do not remove the packaging until immediately before installing the valve into the pipeline.

Proceed as follows to lift and install the valve:

1. Remove the packaging from the valve.
2. Dispose of the packaging in accordance with the valid regulations.

4.2 Transporting and lifting

Note

Personnel must be trained to secure, transport, and lift the regulator properly.

DANGER

Hazard due to suspended loads falling. Stay clear of suspended or moving loads.

WARNING

Risk of lifting equipment tipping 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 regulator.
- Refer to section 3.3 for weights.

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.

4.3 Transportation and storage

4.3.1 Transporting

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 regulator against moisture and dirt.

4.3.2 Lifting

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

Lifting instructions

- Attach slings at the valve body and secure it against slipping.

NOTICE

Risk of regulator damage due to incorrectly attached slings.

- Do not attach any lifting equipment, slings or rigging equipment to mounting parts, such as actuator or control line.
 - When lifting the regulator, make sure that the slings attached to the valve body bear the entire load.
-

4.3.3 Storage

NOTICE

Risk of regulator damage due to improper storage.

- Observe 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).
- 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 (-4 to $+149$ °F).
- Do not place any objects on the regulator.

Special storage instructions for elastomers

Elastomer, e.g. actuator diaphragm

- To keep elastomers in shape and to prevent cracking, do not bend them or hang them up.
- We recommend a storage temperature of 15 °C (59 °F) for elastomers.
- Store elastomers away from lubricants, chemicals, solutions, and fuels.



SAMSON's After-sales Service department can provide more detailed storage instructions on request.

5 Installation

5.1 Preparation for installation

Proceed as follows:

i Note

The plant operator is responsible for cleaning the pipelines in the plant.

- Check the valve to make sure it is clean and not damaged.
- Flush and clean the pipeline thoroughly **before** installing the regulator.

i 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) or filter upstream of the pressure reducing valve.

- Check to make sure that the type designation, valve size, material, pressure rating, and temperature range of the valve match the plant conditions (size and pressure rating of the pipeline, medium temperature etc.).
- For steam applications, make sure that the pipelines are dry. Moisture will damage the inside of the valve.
- Check any mounted pressure gauges to make sure they function.

5.1.1 Assembly

See Fig. 1 on page 12.

Assembling valve and actuator

Valve and actuator can be assembled before or after the valve has been installed in the pipeline.

- Push the **diaphragm actuator** (10) with actuator stem (11) through the hole in the crossbeam (8) onto the spigots of the bellows (5.1). Align it and fasten with nuts (width across flats 16, 9) onto the valve flange (approx. 25 Nm).
- For **metal bellows actuators in DN 15 to 50**, remove the crossbeam (8) from the valve.
- Push the actuator stem (11) onto the spigots of the bellows (5.1). Align the pillars (8.1) and fasten with nuts (width across flats 24, 8.2) to the actuator (max. 60 Nm).
- For **metal bellows actuators in DN 65 to 100**, remove the crossbeam (8) from the valve and unscrew the pillars (8.1). Screw the pillars into the threaded holes (8.3) of the actuator flange as far as they will go. Push the actuator with actuator stem (11) onto the spigots of the bellows (5.1). Fasten the pillars with nuts (width across flats 24, 8.2) onto the valve flange (max. 60 Nm).

5.2 Checking the installation conditions

Pipeline routing and mounting position

- The regulators are intended for installation in horizontal pipelines.
- On installing the regulator, make sure the direction of flow corresponds with the arrow on the valve body.
- 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 valve run vertically upwards, an automatic water drainage (e.g. SAMSON Type 13 E Steam Trap) is required.
- Install the regulator free of stress. If necessary, support the pipeline near to the connecting flanges.
- Standard mounting position: actuator housing with set point spring facing downward (see Fig. 2).
- Install the regulator allowing sufficient space to remove the actuator and valve or to perform service and repair work on them.

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.*



Standard mounting position for gases, liquids and steam

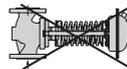
Not for millibar pressure regulator (A = 1200 cm²)



Alternative mounting position for gases and liquids at medium temperature up to 80 °C

Prescribed mounting position for millibar pressure regulators (A = 1200 cm²)

Not for steam.



Not permissible! ¹⁾

- ¹⁾ On request: Permissible for regulators with fixed plug stem guide plus with medium temperature up to 80 °C. Not for steam.

Fig. 2: Mounting position

NOTICE

Do not attach supports directly to the valve or actuator.

5.3 Control line, compensation chamber and needle valve

Control line · A control line must be provided at the site of installation, e.g. a 3/8" pipe for steam or an 8 x 1 or 6 x 1 mm pipe for air/water.

Refer to the examples in Fig. 3 for connection of the control line to the actuator.

Connect the control line to the downstream line (p_2) at least one meter away from the valve outlet. If a manifold is located downstream of the pressure reducing valve, con-

nect the valve to the manifold, even if it is several meters away (see Fig. 3). 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 pressure reducing valve cannot be guaranteed.

Weld the line coming from the pressure tapping point to the 3/8" pipe socket on the chamber. Install the compensation chamber

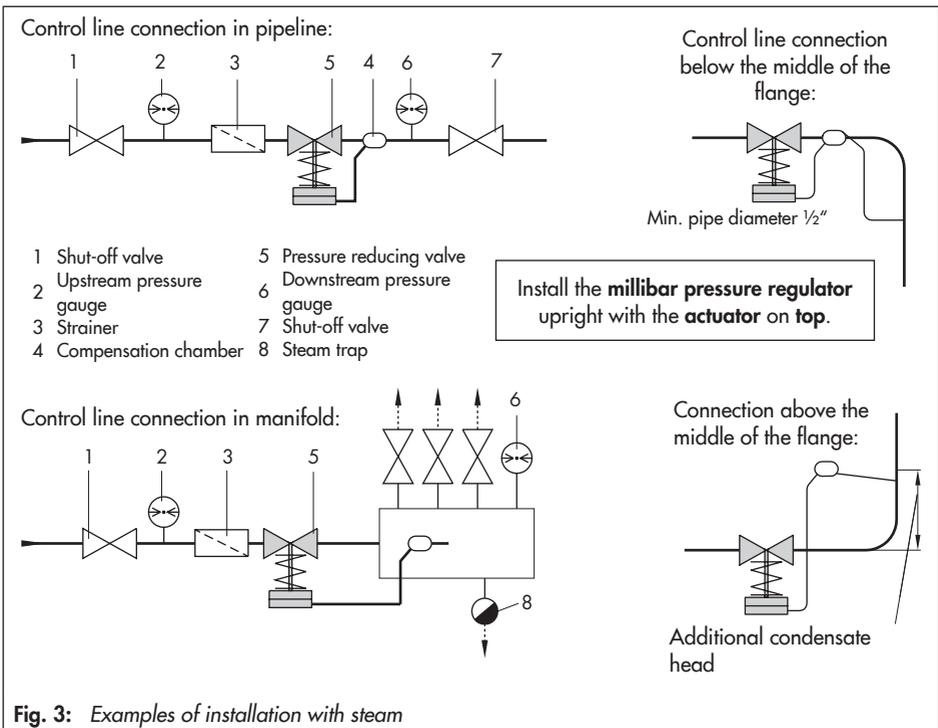


Fig. 3: Examples of installation with steam

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 $\frac{3}{8}$ " pipe with screw fittings.

If the control line connection is located below the middle of the valve outlet flange, arrange the compensation chamber at the same level as the outlet flange. In this case, use a pipe which is at least $\frac{1}{2}$ " 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 outlet, install the compensation chamber at the same level as the downstream pressure tapping point. The additional pressure of the condensate head must be compensated for by adjusting the set point to a higher value.

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.

5.3.1 Additional fittings

Strainer (filter)

- ➔ Install a strainer (e.g. SAMSON Type 2 N/2 NI) upstream of the pressure reducing valve (see Fig. 3).
- Select a strainer (mesh size) suitable for the process medium.
- The direction of flow must correspond to the arrow on the body.

- The filter element must be installed to hang downwards or sideways for applications with steam.
- Remember to leave enough space to remove the filter element.

Bypass and shut-off valves

- Install a hand-operated shut-off valve both upstream of the strainer and downstream of the regulator to be able to shut down the plant for cleaning and maintenance, and when the plant is not used for longer periods of time.
- The bypass ensures that the plant does not need to be shut down for service and repair work on the regulator.

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.

1. Start up the plant and adjust the set point.
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 the 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.

5.4 Installing the regulator

1. Close the shut-off valve in the pipeline while the valve is being installed.
2. Remove the protective caps from the valve ports before installing the regulator.
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. Depending on the field of application, allow the valve to cool down or heat up to reach ambient temperature before start up.
7. Slowly open the shut-off valve in the pipeline after the valve has been installed.

6 Start-up and operation

6.1 Start-up

6.1.1 Pipeline flushing

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

- See Fig. 1 on page 12.
- Unscrew the control line.
- Seal the valve body with G ¼ stoppers.
- Observe the mesh size of the upstream strainer (filter) for the maximum particle size. Use strainers (filters) to suit the process medium.
- Check the strainer (filter) 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 Table 6, page 32.

6.1.2 Pressure test

⚠ NOTICE

A pressure above the maximum permissible pressure will damage the actuator. Observe the maximum permissible pressure specifications listed in the technical data (section 3.2).

i Note

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

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

- Detach the control line and seal the openings at the valve body and the pipeline with suitable end plugs. Alternatively, install a shut-off valve in the control line.
- Make sure that the pressure rises simultaneously upstream and downstream of the regulator to avoid damaging the balancing bellows.
- Do not allow the pressure to exceed the 1.5 times the nominal pressure of the valve body.
- The valve 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 blanking plug.

Additional points that apply:

- Start up the regulator after mounting all parts. Make sure the control line is open and correctly connected.
- 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).
- Fill the plant slowly with the process medium. Avoid pressure surges.

Regulation of steam

- Unscrew filler plug (19) on the compensation chamber. Use the included plastic funnel or a jug to pour in water until it starts to overflow. Screw the filler plug back in and tighten it. The pressure reducing valve is now ready for operation. Open the hand-operated shut-off valves slowly to prevent water hammer.

Regulation of liquids

- To start up the pressure reducing valve, open shut-off valves slowly. For temperatures above 150 °C, first fill the compensation chamber with the process medium.

NOTICE

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

Slowly open the shut-off valves.

6.2 Adjusting the set point

- See Fig. 1 on page 12.
- The required downstream pressure is set by turning the set point adjuster (6) using an open-end wrench (up to DN 50 with width across flats SW 19 and for DN 65 and larger with SW 24).

The set point of the stainless steel regulator must be adjusted using the rod included. Turn clockwise to increase the downstream pressure and turn counterclockwise to reduce it.

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 and Fig. 4 until the distance x (see Table 5) is reached.

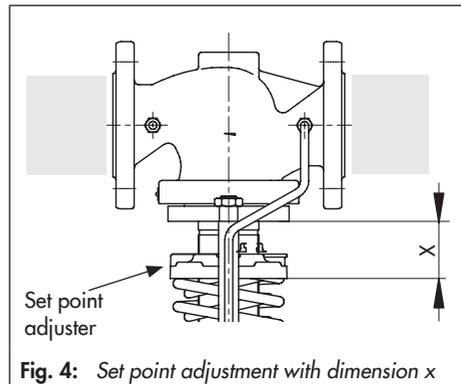


Fig. 4: Set point adjustment with dimension x

Table 5: Set point adjustment · Dimension x

Set point range	Nominal size DN			
	15 to 25	32 to 50	65 to 100	
Set point	10 bar	x=89 mm	x=106 mm	x=133 mm
	12 bar	x=97 mm	x=117 mm	x=150 mm
	14 bar	x=104 mm	x=128 mm	x=168 mm
4.5 to 10 bar				
Set point	5.9 bar	x=85 mm	x=100 mm	x=131 mm
	7.3 bar	x=93 mm	x=112 mm	x=152 mm
	8.6 bar	x=101 mm	x=123 mm	x=172 mm
2 to 5 bar				
Set point	2.8 bar	x=83 mm	x=97 mm	x=126 mm
	3.5 bar	x=92 mm	x=110 mm	x=170 mm
	4.3 bar	x=100 mm	x=122 mm	x=184 mm
0.8 to 2.5 bar				
Set point	1.2 bar	x=79 mm	x=92 mm	x=117 mm
	1.7 bar	x=89 mm	x=106 mm	x=142 mm
	2.1 bar	x=99 mm	x=121 mm	x=167 mm
0.2 to 1.2 bar				
Set point	0.45 bar	x=71 mm	x=81 mm	x=98 mm
	0.70 bar	x=83 mm	x=98 mm	x=127 mm
	1.0 bar	x=95 mm	x=117 mm	x=157 mm
0.1 to 0.6 bar				
Set point	0.23 bar	x=71 mm	x=81 mm	x=98 mm
	0.35 bar	x=83 mm	x=98 mm	x=127 mm
	0.48 bar	x=95 mm	x=115 mm	x=157 mm
0.05 to 0.25 bar				
Set point	0.10 bar	x=70 mm	x=80 mm	x=92 mm
	0.15 bar	x=81 mm	x=95 mm	x=116 mm
	0.20 bar	x=91 mm	x=110 mm	x=139 mm

i Note

Note during initial set point adjustment that only a rough set point adjustment is performed by turning the set point adjustment until the distance x is reached. Check the pressure at the pressure gauge downstream of the regulator for a precise set point adjustment.

7 Operation

Immediately after completing mounting and start-up, the regulator is ready for use.

⚠ WARNING

Crush hazard arising from moving parts. Do not insert hands or fingers into the set point springs while the regulator is in operation.

⚠ 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.

7.1 Decommissioning

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

1. Close the shut-off valves upstream and downstream of the control valve to stop the process medium from flowing through the valve.
2. Depressurize and completely drain the pipelines and valve.
3. If necessary, allow the pipeline and valve components to cool down or heat up.

7.2 Removing the valve from the pipeline

1. Put the regulator out of operation (see section 7.1).
2. Unbolt the flange joint.
3. Remove the valve from the pipeline.

7.3 Disposal

- Observe local, national, and international refuse regulations.
- Do not dispose of components, lubricants, and hazardous substances together with your other household waste.

8 Maintenance

The regulator does not require any maintenance. Nevertheless, it is subject to natural wear, particularly at the seat, plug, and operating diaphragm.

→ See Fig. 1 on page 12.

Details on faults and how to remedy them can be found in Table 6 on page 32.



Tip

SAMSON's After-sales Service department can support you to draw up an inspection plan for your plant.

We recommend removing the valve from the pipeline for service or repair work.



⚠ DANGER

- Risk of bursting in pressure equipment.*
- Before starting any work on the regulator, depressurize all plant sections concerned as well as the valve.
 - Drain the process medium from all the plant sections concerned as well as the valve.
 - Wear personal protective equipment.



⚠ WARNING

Risk of personal injury due to residual process medium in the valve.
Wear protective clothing, safety gloves, and eyewear.



⚠ WARNING

- Risk of burn injuries due to hot or cold components and pipeline.*
- Allow components and pipelines to cool down or heat up.
 - Wear protective clothing and safety gloves.



ⓘ 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 specifications in Fig. 1).

8.1 Replacing the operating diaphragm

If the downstream pressure deviates considerably from the set point, check if the diaphragm is leaking.

If necessary, replace it as follows:

1. Shut down the plant by slowly closing the shut-off valves. Depressurize the relevant section of the pipeline and, if necessary, drain it as well.
2. Unscrew the control line (17) and clean it.
3. Loosen the bolts (15) at the actuator and remove the casing.
4. Unscrew the nut (14) and lift off the diaphragm plate (13).

5. Replace the operating diaphragm (12) with a new one.
6. Proceed in the reverse order to reassemble the regulator. For start-up, proceed as described in section 7.
7. Bolts (15) tightening torque max. 25 Nm.
Nuts (14) tightening torque max. 40 Nm.

During mounting, apply the sealant Loctite 272 (SAMSON order no. 8121-4000) to the bottom thread of the actuator stem (11).

! NOTICE

Not for the version for oxygen or complying with FDA.

! NOTICE

Do not transmit any torque to the bellows (5.1) during assembly or disassembly of the valve. Otherwise, the metal bellows will be damaged.

On disassembling the valve, push the anti-rotation clip (20 in Fig. 1) to "entriegelt" (unlock). Push it back again to "verriegelt" (lock) on reassembly. See also the note on the crossbeam (8).

9 Malfunctions

Depending on the operating conditions, check the regulator at certain intervals to prevent possible failure before it can occur. Operators are responsible for drawing up an inspection plan.

The listed examples of malfunctions are caused by mechanical faults in the regulator as well as incorrect regulator sizing.

In the simplest case, the functioning can be restored following the recommended action.

i Note

Exceptional operating and installation conditions can lead to changed situations that may affect the control response and lead to malfunctions. In such cases, check the installation conditions, process medium, temperature and pressure conditions. A thorough analysis may often require the on-site assistance of SAMSON after-sales service.

The table is not intended to be exhaustive as there are diverse reasons for malfunctions.

i Note

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

Tip

SAMSON's After-sales Service department can support you to draw up an inspection plan for your plant.

Table 6: *Troubleshooting*

Malfuncion	Possible reasons	Recommended action
Pressure exceeds the adjusted set point.	Insufficient pressure pulses on the operating diaphragm.	Clean the control line and the screw joint with restriction.
	Seat and plug worn down by deposits or foreign particles.	Disassemble the regulator and replace damaged parts.
	Pressure tapped at the wrong place.	Reconnect control lines at a different place. Do not tap pressure at pipe bends or necks.
	With steam: compensation chamber in the wrong position or too small.	Reconnect chamber at a different place or replace it (see Table 1 and section 5.3).
	Control response too slow.	Install larger screw joint at the diaphragm actuator.
	Foreign particles blocking the plug	Disassemble the regulator and replace damaged parts.
Pressure drops below the adjusted set point.	Valve installed against the flow; see arrow on body.	Make sure the valve is installed correctly.
	Pressure tapped at the wrong place.	Reconnect control line at a different place.
	Valve or K_{VS} coefficient too small	Check valve sizing. Install larger valve, if necessary.
	Control response too slow.	Install larger screw joint at the diaphragm actuator.
	With steam: compensation chamber in the wrong position or too small.	Reconnect chamber at a different place or replace it (see Table 1 and section 5.3).
	Foreign particles blocking the plug	Disassemble the regulator and replace damaged parts.
Jerky control response.	Increased friction, e.g. due to foreign particles between seat and plug.	Remove foreign particles. Replace damaged parts.
Slow control response.	Restriction in the screw joint of the actuator dirty or too small.	Clean screw joint or install larger screw joint.
	Dirt in the control line.	Clean the control line.
Downstream pressure hunts	Valve too large	Check valve sizing. Select smaller K_{VS} coefficient, if necessary.
	Restriction in the screw joint of the actuator too large.	Install smaller screw joint.
	Pressure tapped at the wrong place.	Select better place for pressure tapping.
Loud noises.	High flow velocity, cavitation.	Check sizing. Install flow divider with gases and steam.

10 After-sales service

Contact SAMSON's After-sales Service department for support when malfunctions or defects arise.

E-mail: aftersalesservice@samson.de

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website (► samson.de), in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

To assist diagnosis and in case of an unclear mounting situation, specify the following details:

- Type and nominal size of the valve
- Model number with index
- 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.)

If a repair is not possible on site, you send the regulator directly to SAMSON.

10.1 Prepare the regulator for return shipment

Defective regulators can be returned to SAMSON for repair.

Proceed as follows to return devices to SAMSON:

1. Put the regulator out of operation (see section 7.1).
2. Decontaminate the regulator (valve with actuator). Remove any residual process medium.
3. Fill in the Declaration on Contamination, which can be downloaded from our website at ► www.samson.de > Services > Check lists for after sales service > Declaration on Contamination.
4. Send the regulator together with the filled-in form to your nearest SAMSON subsidiary. SAMSON subsidiaries are listed on our website at ► www.samson.de > Contact.

10.2 Ordering spare parts and operating supplies

Spare parts and operating supplies are available on request.

Contact SAMSON's After-sales Service department if you have any questions on spare parts, lubricants, or tools.



EU-KONFORMITÄTSERKLÄRUNG EU DECLARATION OF CONFORMITY

Modul/Module H / N° CE-PED-H-SAM 001-13-DEU

SAMSON erklärt in alleiniger Verantwortung für folgende Typen / explains in sole responsibility for the following products:

Ventile für Druck- Differenzdruck- und Volumenstromregler / Valves for Pressure, Differential Pressure and Flow 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 (siehe auch Artikel 41 und 48). 2014/68/EU vom 15.05.2014

Directive of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating of the making available on the market of pressure equipment (see also Article 41 and 48). 2014/68/EU of 15.05.2014

Angewandtes Konformitätsbewertungsverfahren für Fluide nach Art. 4 Abs.1 Pkt. c.ii und Pkt. c.i zweiter Gedankenstrich. Modul siehe Tabelle durch certified by Bureau Veritas S. A. (0062)

Conformity assessment procedure applied for fluids according to Article 4, Section 1 Subsection c.ii and Subsection c.i second indent. For type of module, see table

DN Nominal pressure	15 1/2	20 3/4	25 1	32 1 1/4	40 1 1/2	50 2	65 -	80 3	100 4	125 -	150 6	200 8	250 10	300 12	400 16
PN 16	ohne/without (1)						A (2)			H					
PN 25	ohne/without (1)				A (2)			H		-					
PN 40	ohne/without (1)			A (2)		H			-						
PN 100 und PN 160	ohne/without (1)			A (2)			H			-					
Class 150	ohne/without (1)			A (2)			H			-					
Class 300	ohne/without (1)			A (2)			H			-					
Class 600 und Class 900	ohne/without (1)			A (2)			H			-					

(1) Das auf dem Stelgerät aufgebrauchte CE-Zeichen hat keine Gültigkeit im Sinne der Druckgeräterichtlinie
The CE marking affixed to the control device does not refer to the Pressure Equipment Directive.

(2) Das auf dem Stelgerät aufgebrauchte CE-Zeichen gilt ohne Bezeichnung der Notifizierten Stelle (Kennr. 0062)
The CE marking affixed to the control device is valid, but does not refer to the notified body (ID No. is invalid).

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

The module H conformity assessment procedure applied to the valves according to the table is based on the "Certificate of Quality System Approval" 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. / respectively 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 Assurance System is monitored by following Notified Body

Bureau Veritas S.A. nr 0062 67/71, boulevard du Chateau, 92200 Neuilly-sur-Seine, France
Hersteller / Manufacturer: SAMSON AG / Weismüllerstraße 3 / 60314 Frankfurt

Frankfurt am Main, den 19.07.2016

i.v. Klaus Hirschchen
Klaus Hirschchen
Zentralabteilungsleiter / Head of Central Department
Entwicklung Ventile und Antriebe / Development Valves and Actuators

ppp Günther Scherer
Günther Scherer
Zentralabteilungsleiter / Head of Central Department
Total Quality Management / Total Quality Management



EU-KONFORMITÄTSERKLÄRUNG EU DECLARATION OF CONFORMITY

Modul/Module H / N° CE-PED-H-SAM 001-13-DEU

SAMSON erklärt in alleiniger Verantwortung für folgende Typen / explains in sole responsibility for the following products:

Ventile für Druck- Differenzdruck- und Volumenstromregler / Valves for Pressure, Differential Pressure and Flow Regulators

Typ 2336, 2373, 2375, 44-1B, 44-2, 44-3, 44-6B, 45-1, 45-2, 45-3, 45-4, 45-5, 45-6, 2468, 2478 (Erz.-Nr. 2720); 45-9, 47-4, 2487, 2488, 2489, 2491, 2494, 2495 (2730); 2405, 2406; 2421 (2811); 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 (siehe auch Artikel 41 und 48).

2014/68/EU vom 15.05.2014

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

2014/68/EU of 15.05.2014

Angewandtes Konformitätsbewertungsverfahren für Fluide nach Art. 4 Abs.1 Pkt. c.i erster Gedankenstrich.

Modul siehe Tabelle durch certified by Bureau Veritas S. A. (0062)

Conformity assessment procedure applied for fluids according to Article 4, Section 1, Subsection c.i, first indent

For type of module, see table

Nenndruck pressure	Nominal NPS	DN	15	20	25	32	40	50	65	80	100	125	150	200	250	300	400
			½	¾	1	1¼	1½	2	-	3	4	5	6	8	10	12	16
PN 16			ohne (1)			A (2)			-	-	-	-	-	-	-	-	-
PN 25			ohne (1)			A (2)						H					
PN 40			ohne (1)								H						
PN 100 und PN 160			ohne (1)							H							
Class 150			ohne (1)			A (2)						H					
Class 300			ohne (1)								H						
Class 600 und Class 900			ohne (1)							H							

(1) Das auf dem Stellgerät aufgebrachte CE-Zeichen hat keine Gültigkeit im Sinne der Druckgeräterichtlinie
The CE marking affixed to the control device does not refer to the Pressure Equipment Directive.

(2) Das auf dem Stellgerät aufgebrachte CE-Zeichen gilt ohne Bezeichnung der Notifizierten Stelle (Kennr. 0062)
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