MOUNTING AND
OPERATING INSTRUCTIONS

EB 3131-1 EN

Translation of original instructions

Type 46-7 Flow and Differential Pressure Regulator with additional pressure control actuator

Self-operated Regulators

Edition June 2023

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 (aftersalesservice@samsongroup.com).

Documents relating to the device, such as the mounting and operating instructions, are available on our website at ***www.samsongroup.com > 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

Note

Additional information

Tip

Recommended action

1 Safety instructions and measures

Intended use

The Type 46-7 Flow and Differential Pressure Regulator with additional pressure control actuator is designed for the flow rate and differential pressure control of liquids up to 150 °C. The additional pressure control actuator closes the valve when the return flow pressure is too high. The Type 46-7 is mainly used in district heating supply networks and industrial plants. The regulator and actuator are designed to operate under exactly defined conditions (e.g. operating pressure, process medium, temperature). Therefore, operators must ensure that the regulator and actuator 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 devices in applications or conditions other than those 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

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 must 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.

Personal protective equipment

We recommend checking the hazards posed by the process medium being used (e.g. ▶ GESTIS (CLP) hazardous substances 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. Follow the instructions given by the plant operator.

➔ 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. Plant operators and operating personnel must observe all hazard statements, warnings and caution notes in these mounting and operating instructions.
Hazards 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 substances database).

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

These mounting and operating instructions deal with the standard version of the device. Components of the device that differ to those used for the standard version described in this document can be exchanged with other certain SAMSON components. The residual hazards of these components are described in the associated mounting and operating instructions (see section 'Referenced documentation').

Responsibilities of the operator

Operators are responsible for proper use 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, operators must ensure that operating personnel or third parties are not exposed to any danger.

Operators are 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 procedures 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, operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

Referenced standards, directives and regulations

The regulators comply with the requirements of the European Pressure Equipment Directive 2014/68/EU. Devices with a CE marking have a declaration of conformity, which includes information about the applied conformity assessment procedure. This declaration of conformity is included in the Appendix of these instructions (see Chapter 11).

Non-electric valve versions whose bodies are not lined with an insulating material coating do not have their own potential ignition source according to the hazard assessment stipulated in Clause 5.2 of ISO 80079-36, even in the rare incident of an operating fault. Therefore, such valve versions do not fall within the scope of Directive 2014/34/EU.

➔ For connection to the equipotential bonding system, observe the requirements specified in Clause 6.4 of EN 60079-14 (VDE 0165-1).

Referenced documentation

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

– Mounting and operating instructions for

e.g.	**Type 1 N or 1 NI Strainer**	▶ EB 1010
e.g.	**Type 2 N or 2 NI Strainer**	▶ EB 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.

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

- ➔ Observe the maximum permissible pressure for regulator and plant.
- ➔ Before starting any work on the device, depressurize all plant sections affected as well as the valve.
- ➔ Drain the process medium from the plant sections affected as well as from the valve.
- ➔ If necessary, a suitable overpressure protection must be installed on site in the plant section.
- ➔ Wear personal protective equipment.

1.2 Notes on possible personal injury

⚠ WARNING

Crush hazard arising from moving parts.

The regulator contains moving parts (actuator and plug stem), which can injure hands or fingers if inserted into the valve.

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

⚠ WARNING

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

While working on the valve, residual medium can flow out of the valve and, depending on its properties, cause personal injury, e.g. (chemical) burns.

➔ If possible, drain the process medium from the plant sections affected and from the valve.

➔ Wear protective clothing, safety gloves and eye protection.

Risk of personal injury due to pressurized components and as a result of process medium being discharged.

Incorrect opening of pressure equipment or mounting parts may lead to the process medium escaping to the atmosphere.

➔ Do not unscrew the control line while the regulator is pressurized.

Risk of hearing loss or deafness due to loud noise.

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

➔ Wear hearing protection when working near the valve. Follow the instructions given by the plant operator.

⚠ WARNING

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 warm up to the ambient temperature.

➔ Wear protective clothing and safety gloves.

Damage to health relating to the REACH regulation.

If a SAMSON device contains a substance listed as a substance of very high concern on the candidate list of the REACH regulation, this is indicated on the SAMSON delivery note.

➔ Information on safe use of the part affected ▶ www.samsongroup.com/en/about-samson/material-compliance/reach-regulation/.

1.3 Notes on possible property damage

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.

Risk of valve damage due to unsuitable medium properties.

The valve is designed for process media with defined properties.

➔ Only use process media specified for sizing the valve.

NOTICE

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 actuator stem guide or set point adjuster.

➔ 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.

Regulator damage due to condensed glycol.

In principle, the materials are also resistant to high concentrations of glycol. Nevertheless, glycol reacts when it comes into contact with metals and causes acids to form. We cannot prevent this reaction.

➔ Use suitable inhibitors. The plant operator is responsible for the selection and use of suitable inhibitors.

➔ Risk of regulator damage due to incorrectly attached slings.

➔ Do not attach load-bearing slings to the regulator.

➔ 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 surfaces.

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

➔ 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 the process medium being contaminated through the use of unsuitable lubricants and/or contaminated tools and components.

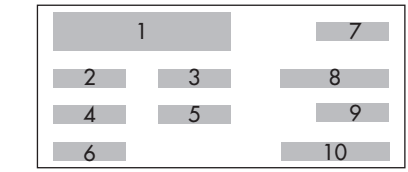
➔ Keep the regulator and the tools used free from solvents and grease.

➔ Make sure that only suitable lubricants are used.

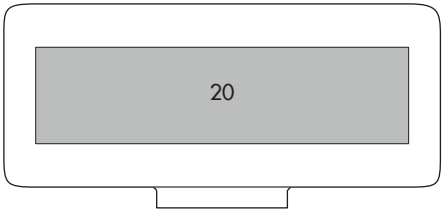
2 Markings on the device

Several nameplates are affixed to the device. The nameplates shown were up to date at the time of publication of this document. The nameplates on the device may differ from the ones shown. The nameplates are used to identify the separate regulator components.

2.1 Nameplates



Nameplate of Type 46-7



Nameplate on the pressure control actuator

1	Material number
2	Model number
3	Date of manufacture
4	K_{VS} coefficient
5	Pressure rating PN
6	Differential pressure set point range in bar
7	Type designation
8	Flow rate set point range in m³/h
9	Maximum permissible temperature in °C
10	Max. permissible differential pressure Δp in bar
20	Set point range (pressure) in bar

Fig. 1: *Nameplates*

2.2 Material identification number

Specifying the material number, you can contact SAMSON to find out which material is used. The material number is specified on the nameplate (item 1). For more details on the nameplate, see Fig. 1.

3 Design and principle of operation

The combined regulators mainly consist of the valve (1), closing actuator (6) with two operating diaphragms (6.1, 6.3) and an adjustable restriction (9), on which an additional pressure control actuator (15) with diaphragm chamber E is mounted. Its purpose is to close the restriction (9) when the return flow pressure is too high to prevent damage to the consumers.

The regulator is used to limit the differential pressure and flow rate to the set points adjusted at the actuator. The valve closes when the differential pressure or flow rate increases. The additional pressure actuator closes the valve when the return flow pressure is too high.

The medium flows through the valve in the direction indicated by the arrow. The areas released by the restriction (9) and the plug (3) determine the flow rate. The installed spring (5) determines the differential pressure across the restriction of 0.2 bar.

To control the flow rate, the low pressure downstream of the restriction is transmitted through a hole in the plug to the top diaphragm chamber A. The high pressure of $\dot{V}$ is transmitted through the attached control line to the diaphragm chamber B and C, which are connected to each other.

To control the differential pressure, the high pressure of Δp must be transmitted through the external control line (13), which is attached on the site of installation, to the bottom diaphragm chamber D. The low pressure of Δp is equal to the high pressure of the $\dot{V}$ and is transmitted over the control line (11) to the diaphragm chambers B and C, which are connected to each other.

To safeguard the return flow pipe, the return flow pressure downstream of the valve is transmitted over the attached control line (15.2) to diaphragm chamber E of the additional pressure control actuator (15) and compared with the adjusted pressure set point. If the resulting pressure force is higher than the set point force adjusted at the set point adjuster (15.1), the restriction closes, causing the valve to close as well.

1	Valve body	9	Restriction (flow rate)
2	Seat	9.1	Set point screw (flow rate, A/F 4)
3	Guide nipple with plug section	10	Set point adjuster (differential pressure)
4	Plug stem	11	Control line (+) $\dot{V}$
5	Valve spring	13	External control line (+) Δp
6	Actuator	15	Pressure control actuator
6.1	First operating diaphragm	15.1	Set point adjuster (pressure)
6.2	First actuator stem	15.2	Control line (pressure)
6.3	Second operating diaphragm	15.3	G ⅛ blanking plug
6.4	Second actuator stem	15.4	Set point spring (pressure)
8	Set point spring (differential pressure)	A to E = Diaphragm chambers	

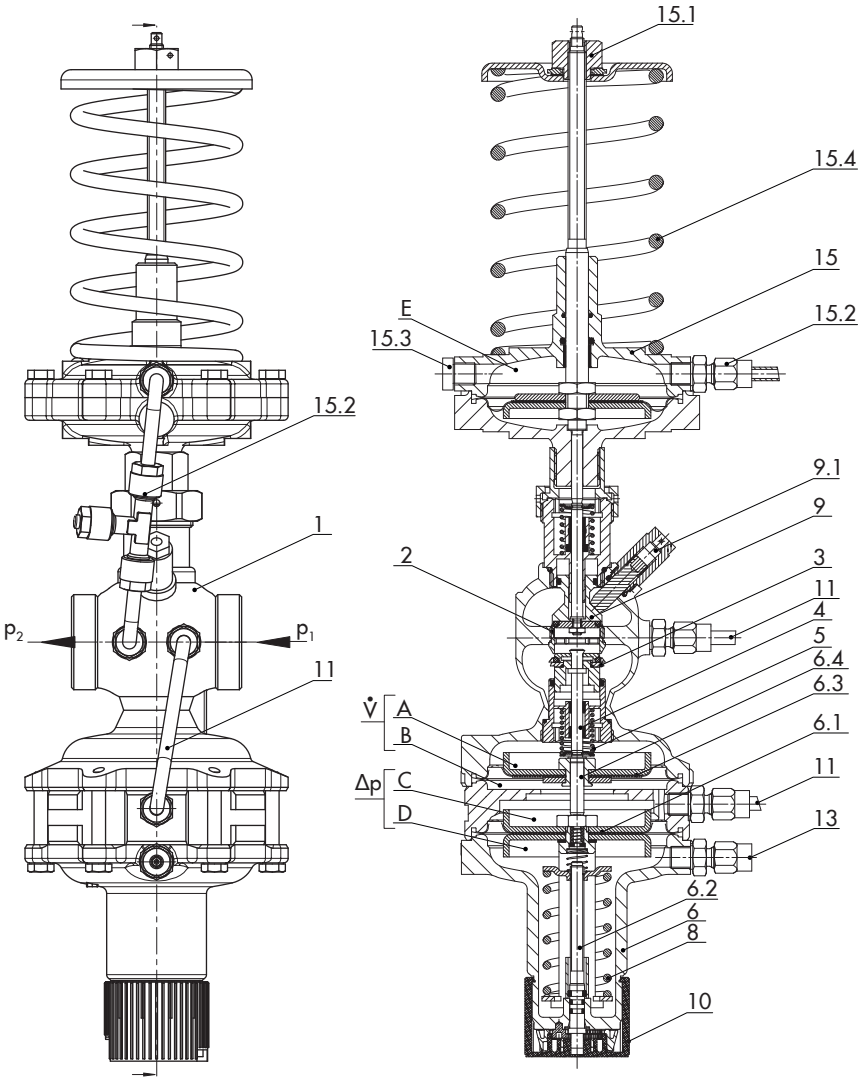
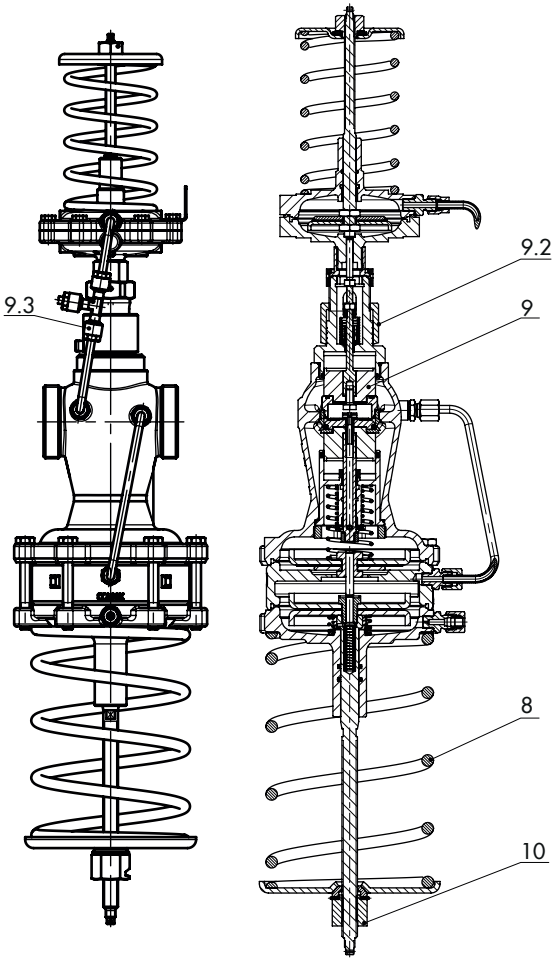


Fig. 2: *Flow and differential pressure regulator with additional pressure control actuator · DN 15 and 25*



8	Set point spring (differential pressure)
9	Restriction
9.2	Knurled nut (flow rate, A/F 5)
9.3	Nipple with retaining screw and lead-seal hole
10	Set point adjuster (differential pressure)

Fig. 3: *Flow and differential pressure regulator with additional pressure control actuator · DN 40*

3.1 Technical data

Process medium and scope of application

Flow rate and differential pressure control with pressure control in district heating supply networks and industrial plants · Valves DN 15, 25 and 40 · Pressure rating PN 16 and 25 · Suitable for liquids up to 150 °C

The valve closes when the flow rate, differential pressure or pressure rises.

Regulator for installation in the low-pressure pipe, e.g. plant return flow pipe of a district heating substation.

Min. differential pressure Δp_{min}

The minimum required differential pressure Δp_{min} across the valve is calculated as follows:

$$\Delta p_{min} = \Delta p_{restriction} + \left(\frac{\dot{V}}{K_{VS}} \right)^2$$

Δp_{min} Minimum differential pressure across the valve in bar

$\Delta p_{restriction}$ Differential pressure created at the restriction for measuring the flow rate

$\dot{V}$ Adjusted flow rate in m^3/h

K_{VS} Valve flow coefficient in m^3/h

Dimensions and weights

The lengths and heights in the dimensional drawings are shown on pages 17 and 18.

Dimensions in mm · Weights in kg

i Note

The dimensions and weights of valves with flanged bodies (DN 40) are the same as valves with screwed-on flanges.

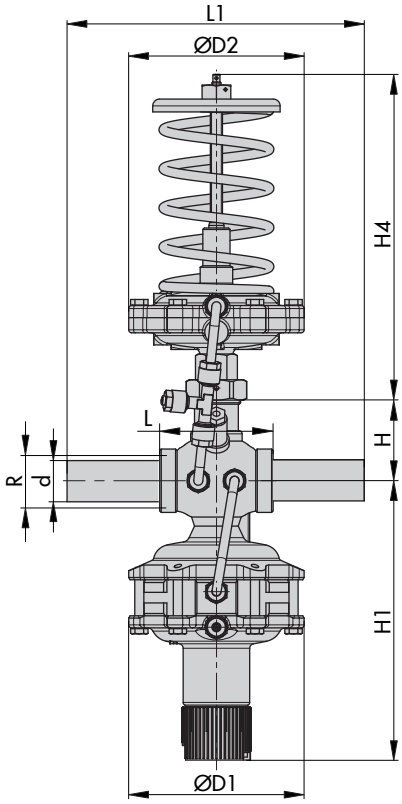
Table 1: *Technical data*

Nominal size		DN 15	DN 25	DN 40
K_{VS} coefficient		4	8	16
x_{FZ} value		0.6	0.55	0.55
Pressure rating		PN 16/25	PN 16/25	PN 25
Max. permissible differential pressure Δp across the valve	PN 16	10 bar	10 bar	–
	PN 25	20 bar	20 bar	16 bar
Max. permissible temperature	PN 16	130 °C	130 °C	–
	PN 25	150 °C	150 °C	150 °C
Pressure above adjusted differential pressure set point at which internal excess pressure limiter responds		0.5 bar		
Conformity		CE		
Pressure set point ranges				
Pressure set point, continuously adjustable		1 to 2.5 bar		
Differential pressure set point ranges				
Differential pressure set point, continuously adjustable		0.2 to 0.6 bar 0.2 to 1.0 bar 0.5 to 2 bar		0.2 to 0.5 bar 0.2 to 1.0 bar 0.5 to 2 bar

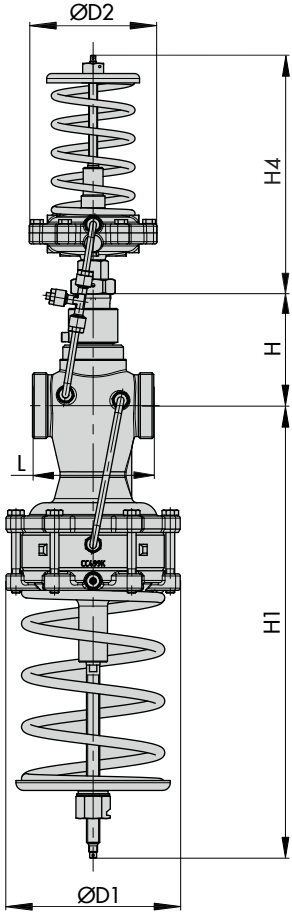
Table 2: *Regulator without connecting parts*

Nominal size	DN 15	DN 25	DN 40
Pipe Ø d	21.3	32.7	48
Connection R	G ¾	G 1¼	G 2
Width across flats (A/F)	30	46	65
Length L	65	75	110
H	62	62	110
H1	185	185	420
H4	214	214	214
ØD1	116		160
ØD2	116 (40 cm² actuator)		

Dimensional drawings



DN 15 and 25



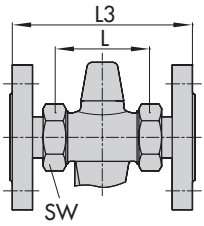
DN 40

Table 3: *Regulator with connecting parts*

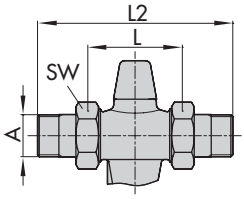
Nominal size	DN 15	DN 25	DN 40
With welding ends			
L1	210	244	294
Weight, approx. kg	2.6	2.8	12
	2.2	2.4	6.2
With threaded ends			
L2	129	159	206
Male thread A	G ½	G 1	G 1½
Weight, approx. kg	2.6	2.8	12
	2.2	2.4	6.2
With flanges [1] [2] or with flanged body (DN 40)			
L3	130	160	200
Weight, approx. kg	4.0	5.3	16.0
	3.6	4.9	10.2

[1] PN 16/25
[2] Flanges are already mounted on valves in DN 40.

Dimensional drawings



Connection nuts with flanges



Connection nuts with threaded ends

4 Measures for preparation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received with 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

Note

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

4.2 Transporting and lifting

Due to the low service weight, lifting equipment is not required to lift and transport the regulator (e.g. to install it into the pipeline).

Transport instructions

– Protect the device against external influences (e.g. impact).
– Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
– Protect the device against moisture and dirt.
– Observe the permissible ambient temperatures (see Chapter 3.1).

4.3 Storage

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 longer storage times.

Note

We recommend to regularly check the device and the prevailing storage conditions during long storage periods.

Storage instructions

– Protect the device against external influences (e.g. impact).
– Do not damage the corrosion protection (paint, surface coatings). Repair any damage immediately.
– Protect the device 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.
– Observe the permissible ambient temperatures (see Chapter 3.1).
– Do not place any objects on the device.

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 for elastomers.
– Store elastomers away from lubricants, chemicals, solutions and fuels.

Tip

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

4.4 Preparation for installation

Proceed as follows:

➔ Flush the pipelines.

Note

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

➔ Check the valve to make sure that it is clean.
➔ Check the valve for damage.
➔ Check to make sure that the type designation, nominal size, material, pressure rating and temperature range of the valve match the plant conditions (nominal size and pressure rating of the pipeline, medium temperature etc.).
➔ Check any mounted pressure gauges to make sure they function.

5 Mounting and start-up

5.1 Mounting orientation

Standard mounting position

➔ Install the regulator in a horizontal pipeline with the set point adjuster (10) facing downward (see Fig. 2 and Fig. 3).

Installation conditions

– Make sure that the regulator remains freely accessible after the plant has been completed.
– Install a strainer upstream of the regulator (see Chapter 5.2).
– The direction of flow must match the direction indicated by the arrow on the body.
– Connect external control lines at the side of the main pipe (see Fig. 6)
– Install the regulator free of stress.

NOTICE

Possible malfunction and damage due to adverse weather conditions (temperature, humidity).

– Do not install the device outdoors or in rooms prone to frost.
– Protect the regulator against frost if it is used to control freezing media.
– Either heat the regulator or remove it from the plant and completely drain the residual medium.

Pipeline routing

The inlet and outlet lengths vary depending on several variables and process conditions and are intended as recommendations. Contact SAMSON if the lengths are significantly shorter than the recommended lengths.

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

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

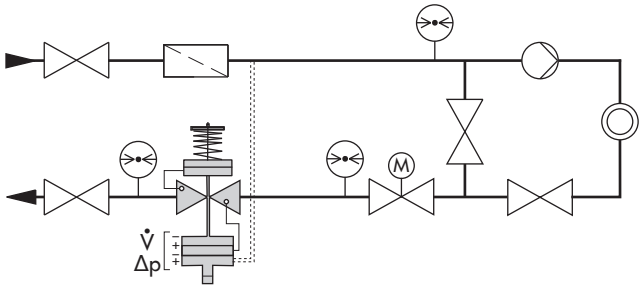
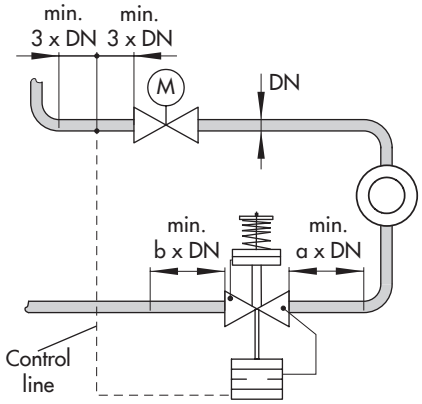


Fig. 4: *Installation example*



State of process medium	Valve conditions	Inlet length a	Outlet length b
Liquid	w < 2 m/s	2	4

Fig. 5: *Control line connection and how the pipeline is routed*

5.2 Additional fittings

Strainer

A strainer installed upstream in the flow pipe holds back any dirt or other foreign particles carried along by the medium. For example, the SAMSON Type 1 NI Strainer is suitable (▶ T 1010).

– Install the strainer upstream of the regulator.
– The direction of flow must correspond to the arrow on the valve body.
– The filter element must be installed to hang downward.
– Allow sufficient space to remove the filter.

Shut-off valve

Install a hand-operated shut-off valve both upstream of the strainer and at the outlet of the return flow pipe (see Fig. 4). This allows the plant to be shut down for cleaning and maintenance, and when the plant is not used for longer periods of time.

Pressure gauge

Install a pressure gauge at a suitable point to monitor the pressures prevailing in the plant (see Fig. 4).

Control line

Depending on the regulator version, a control line (standard: 6x1 mm pipe diameter) must be adapted and mounted on site. Make sure that the control line is free of dirt.

We recommend installing the control line for tapping pressure from the pipeline at a distance of at least three times the nominal size (DN) away from any pipe fittings (e.g. manifolds, bends, branches or other valves), that may cause turbulence in the flow.

How the lines are routed generally depends on the installation site. Preferably connect the control line to the side of the main pipe.

➔ Do not change the pipe diameter of the main pipeline with an eccentric reducer.

➔ Refer to installation schematics (Fig. 4) for line routing.

5.3 Putting the regulator into operation

➔ Do not start up the regulator until all parts have been mounted.

➔ Make sure the control lines are open and correctly connected.

➔ Make sure that the restriction (9) is open while filling the plant. To open it, turn the set point adjuster of the pressure control actuator (15.1) counterclockwise (↺) (see Chapter 6.1.3).

➔ Open the shut-off valves slowly over a time period of several minutes starting from the upstream pressure side. Afterwards, open all the valves on the consumer side (downstream of the regulator).

NOTICE

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

Slowly open the shut-off valve in the pipeline during start-up.

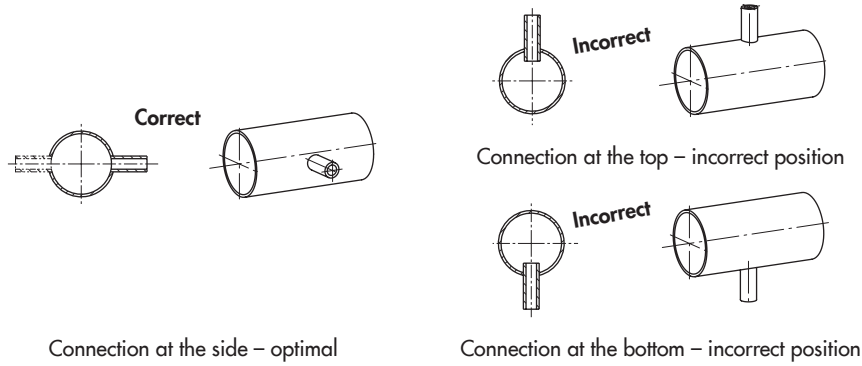


Fig. 6: *Control line connection*

Pressure testing the plant

All plant components must be designed for the test pressure. If necessary, remove the regulator from the pipeline or remove the control line of the pressure actuator at the valve and seal the open connection with a blanking plug (see Table 4).

NOTICE

Risk of damage to the diaphragm actuator due to impermissible excess pressure.

The test pressure must not exceed the pressure rating at the actuator (6) by 1.5 times on testing the pressure of the plant when the regulator is already installed.

Table 4: *Accessories*

Accessories	Item no.
Blanking plug	8323-0030
Seal	8412-0771

Rinsing the plant

1. After filling the plant, first completely open the consumer
2. Adjust the maximum flow rate at the regulator (see Chapter 6.1.1).
3. Adjust the maximum differential pressure at the regulator (see Chapter 6.1.2).
4. Adjust the maximum pressure at the pressure control actuator (see Chapter 6.1.3).
5. Rinse out the pipeline at full flow rate for several minutes.
6. Check the strainer (e.g. measure the pressure drop) and clean it, if necessary.

6 Operation

6.1 Adjusting the set points

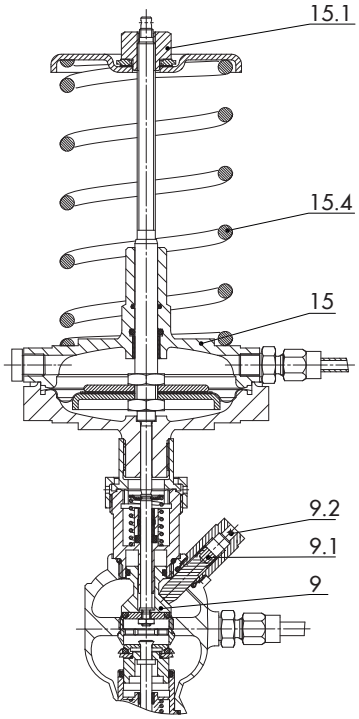
6.1.1 Flow control

➔ Adjust the maximum differential pressure at the regulator (see Chapter 6.1.2).

➔ Completely open the control and shut-off valves or a bypass valve in the plant.

DN 15 and 25

1. Slowly close the downstream shut-off valve.
2. Adjust the pressure control actuator (15) to approx. 1 bar by tensioning the set point spring (15.4) or relieving the tension on it.
   - ➔ Turn the set point adjuster (15.1) clockwise (↻) to increase the pressure set point.
   - ➔ Turn the set point adjuster (15.1) counterclockwise (↺) to reduce the pressure set point.
3. Turn the set point screw (9.1) clockwise (↻) as far as it will go.
4. Refer to Fig. 9 to find out how many turns are required to set the flow rate.
5. Turn the set point screw (9.1) by the required number of turns.
   - ➔ Turn it counterclockwise (↺) to open the restriction. The flow rate rises.
6. Slowly open the downstream shut-off valve.



9	Restriction
9.1	Set point screw (flow rate, Allen key A/F 4)
9.2	Lead-seal hole
15	Pressure control actuator
15.1	Set point adjuster (pressure, A/F 19)
15.4	Set point spring (pressure)

Fig. 7: *Flow control · DN 15 and 25*

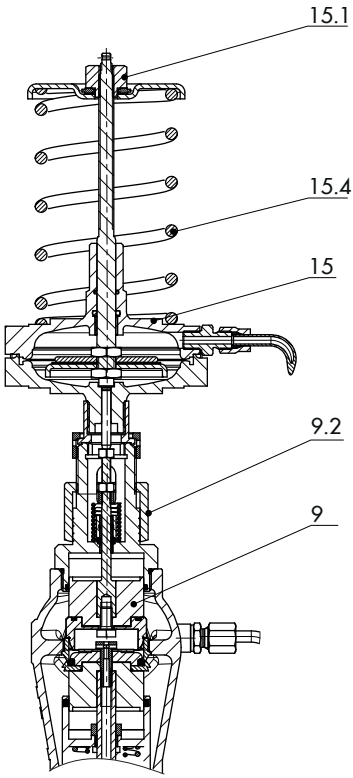
7. Guide the wire through the lead-seal hole (9.2) and lead-seal it to fix the adjusted flow rate.

DN 40

1. To place the restriction (9) in the end position, turn the knurled nut (9.2) clockwise (↻) as far as it will go.
2. Fully load the set point spring (15.4) at the pressure control actuator (15). To proceed, turn the set point adjuster (15.1) clockwise (↻) as far as it will go.
3. Refer to Fig. 9 to find out how many turns are required to set the flow rate.
4. Turn the knurled nut (9.2) by the required number of turns. Turn it counterclockwise (↺) to open the restriction. The flow rate rises.
5. Tighten the retaining screw (9.3) with a suitable tool (Allen key, A/F 5) to fix the adjusted flow rate. Pull the wire through the lead-seal hole and lead-seal it.

Tip

For exact adjustment, verify adjusted value with a heat or flow meter.



9	Restriction
9.2	Knurled nut
15	Pressure control actuator
15.1	Set point adjuster (pressure)
15.4	Set point spring (pressure)

Fig. 8: *Flow control · DN 40*

Table 5: *Flow rate set point range for water in m³/h*

Nominal size DN	**15**	**25**	**40**
K_{VS} coefficient	4	8	16
Set point range with $\Delta p_{restriction}$ of 0.2 bar	0.6 to 1.2 m³/h	0.8 to 3.5 m³/h	3 to 6.6 m³/h

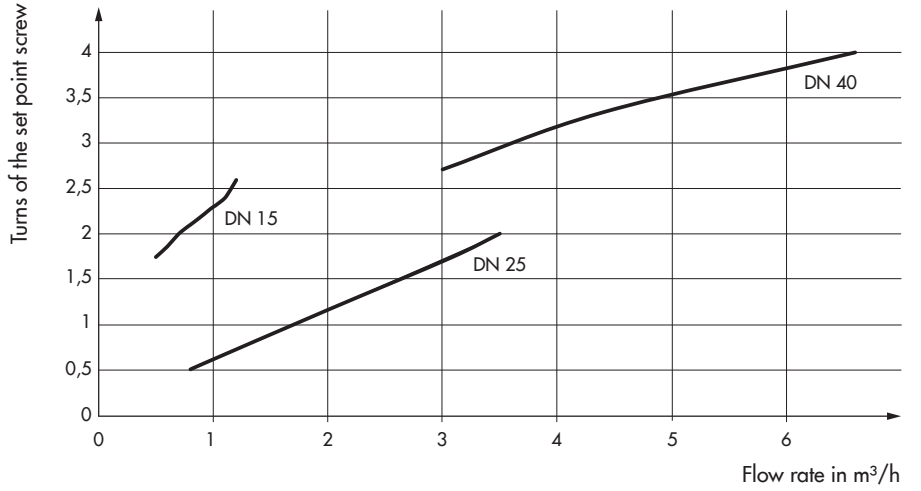


Fig. 9: *Set point adjustment for flow rate: differential pressure across the restriction $\Delta p_{restriction}$ = 0.2 bar*

6.1.2 Differential pressure control

1. Close the shut-off valves or the bypass to reduce the maximum flow rate to approx. 5 to 10 %.

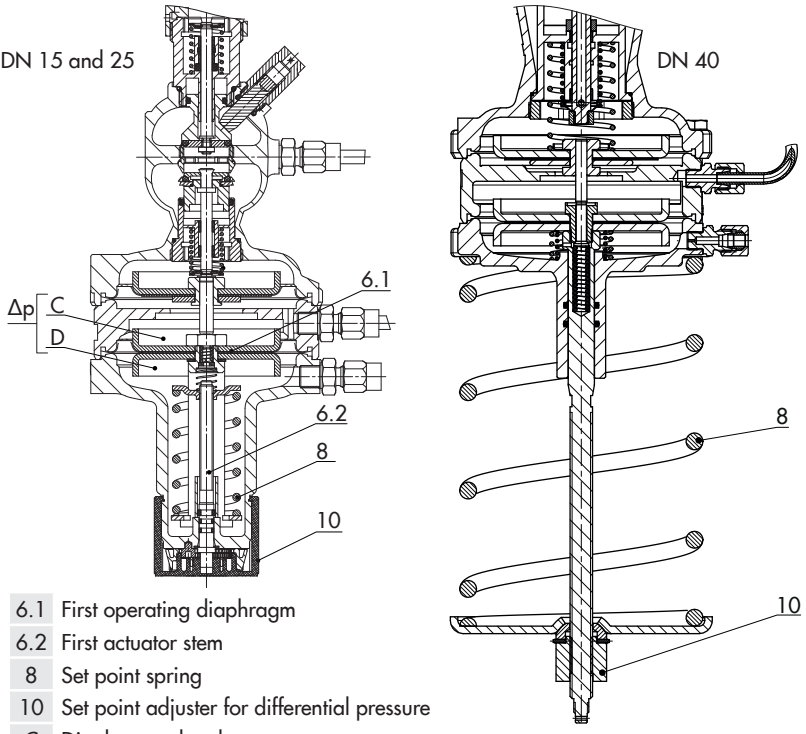
   If you are using a motorized valve, close it to approx. 10 % of its travel.

2. Adjust the required differential pressure at the set point adjuster (10).

   Turn clockwise (↻) to load the set point spring (8). The Δp set point increases.

   Turn counterclockwise (↺) to relieve the tension from the set point spring (8). The Δp set point is reduced.

The set point spring is installed in the bottom section of the housing in DN 15 and 25. The set point spring is located externally in the DN 40 version (see Fig. 10). The set point can be continuously adjusted using the set



6.1	First operating diaphragm
6.2	First actuator stem
8	Set point spring
10	Set point adjuster for differential pressure
C	Diaphragm chamber
D	Diaphragm chamber

Fig. 10: *Differential pressure control*

point adjuster according to the value on the scale (see Fig. 11).

i ***Note***

The maximum value on the scale of the set point adjuster is 8. However, the maximum set point is reached earlier (see Fig. 11).

In the DN 15 and 25 version, one turn of the set point adjuster will change the differential pressure by approx. 0.033 bar in the range from 0.2 to 1 bar and by approx. 0.02 bar in the range from 0.2 to 0.6 bar.

In the DN 40 version, one turn of the set point adjuster will change the differential pressure by approx. 0.022 bar in the range from 1.0 to 2.2 bar.

! ***NOTICE***

Risk of regulator malfunction due to incorrect setting.

A scale value below 1 may lead to incorrect control.

Only adjust values above 1 on the scale.

If the setting is incorrect (value on the scale below 1), proceed as follows:

– Depressurize the regulator.

– Turn the set point adjuster counterclockwise (↺) as far as it will go (minimum setting).

– Turn the set point adjuster back clockwise to a value between 1 to 2 on the scale.

The set point can now be adjusted.

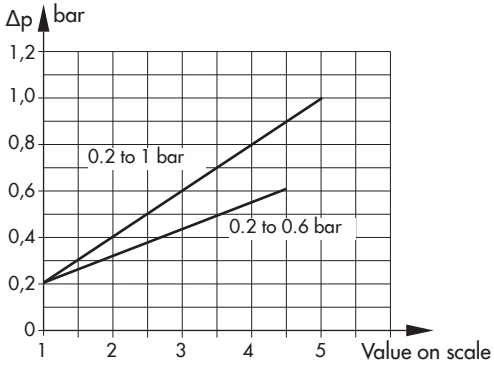


Fig. 11: *Differential pressure set point adjusted according to the value on the scale · DN 15 and 25*

6.1.3 Pressure control

Adjusting the pressure set point at the set point adjuster

➔ Adjust the pressure set point while watching the pressure gauge on the downstream pressure side. To do this, load the set point spring (15.4) at the set point adjuster (15.1) on the pressure control actuator.

Turn clockwise ↻ to increase the pressure set point.

Turn counterclockwise (↺) to reduce the pressure set point.

i ***Note***

The adjusted pressure changes by 0.03 bar after each turn of the set point adjuster with a set point range from 1.0 to 2.2 bar.

Adjusting the pressure set point by changing the spring height H_F

An adjustment of the set point can also be made by changing the adjustable spring height H_F of the set point spring.

i ***Note***

A rough initial set point adjustment is only possible by changing the spring height H_F. Check the pressure at the pressure gauge downstream of the regulator for a precise set point adjustment.

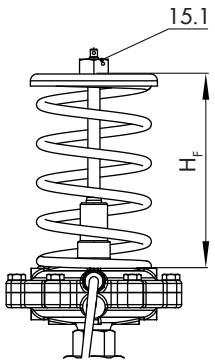


Fig. 12: *Set point adjustment Spring height H_F*

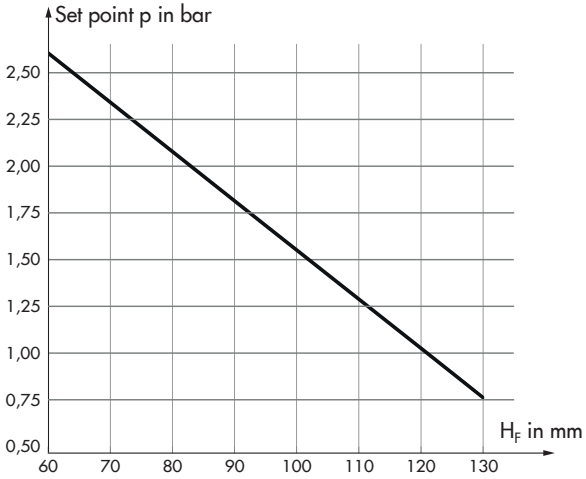


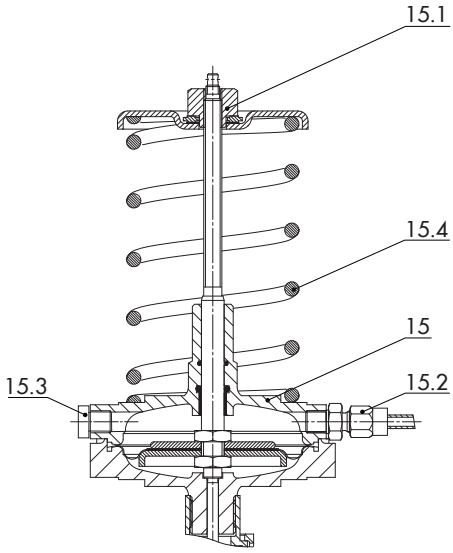
Fig. 13: *Pressure set point adjustment according to the diagram · Spring height H_F*

The adjustment diagram in Fig. 13 applies to the pressure control when the valve is closed (deviation ±0.1 bar).

The associated spring travel is assigned to a certain set point in the range from 1.0 to 2.5 bar.

6.2 Pressure measurement at the regulator

➔ Screw a suitable pressure gauge in place of the blanking plug (G ⅛, 15.3) to directly measure the pressure at the pressure regulator.



15 Pressure control actuator
15.1 Set point adjuster
15.2 Control line
15.3 G ⅛ blanking plug
15.4 Set point spring

Fig. 14: *Pressure control*

7 Servicing

The regulator does not require much maintenance. Nevertheless, it is subject to natural wear, particularly at the seat, plug and operating diaphragm. Depending on the operating conditions, check the regulator at regular intervals to avoid possible malfunctions.

Note

The regulator was checked by SAMSON before delivery.

- *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.*

Tip

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

7.1 Preparation for return shipment

Defective devices can be returned to SAMSON for repair. Proceed as follows to return devices to SAMSON:

1. Put the regulator out of operation (see Chapter 9).
2. Decontaminate the valve. Remove any residual process medium.
3. Fill in the Declaration on Contamination. The declaration form can be downloaded from our website at ▶ www.samsongroup.com > Service > After-sales Service > Returning goods.
4. Continue as described on our website at ▶ www.samsongroup.com > Service > After-sales Service > Returning goods.

7.2 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.

8 Malfunctions

The malfunctions listed in Table 6 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 for repair work.

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.

SAMSON's After-sales Service can help during troubleshooting. Further information is available in Chapter 10.1.

We recommend removing the valve from the pipeline.

⚠ DANGER

Risk of bursting in pressure equipment.

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

- *Before starting any work on the device, depressurize all plant sections affected as well as the valve. Disconnect or shut off the external control line.*
- *Drain the process medium from the plant sections affected as well as from the valve.*
- *Wear personal protective equipment.*

⚠ WARNING

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

While working on the valve, residual medium can flow out of the valve and, depending on its properties, cause personal injury, e.g. (chemical) burns.

- *If possible, drain the process medium from the plant sections affected and from the valve.*
- *Wear protective clothing, safety gloves and eye protection.*

⚠ WARNING

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 warm up to the ambient temperature.*
- *Wear protective clothing and safety gloves.*

Table 6: *Troubleshooting*

Malfunction	Possible reasons	Recommended action
Flow rate or differential pressure exceeds adjusted set point	Leak between seat and plug	Remove valve from the pipeline and clean seat and plug. Replace the plug, if necessary. If this is not possible, return regulator to SAMSON for repair.
	Defective operating diaphragm	Replace diaphragm or return regulator to SAMSON for repair.
	Control line with needle valve blocked.	Remove control line and needle valve. Clean them.
	Valve too large for control task (flow rate) or too small (differential pressure)	Recalculate K_{VS} and contact SAMSON for further action.
Flow or differential pressure set point not reached	Incorrect set point range selected.	Check set point range and contact SAMSON for further action.
	Safety device, e.g. pressure limiter, has been triggered.	Check plant. Unlock safety device.
	Plant differential pressure too low.	Compare differential pressure in the plant with the plant's drag.
	Strainer blocked	Drain and clean filter of the strainer.
	Incorrectly installed valve (direction of flow).	Install the valve in such a way that the flow of direction corresponds with the direction indicated by the arrow on the valve body.
Pressure exceeds the pressure set point.	Leak between seat and restriction or restriction is blocked.	Remove valve from the pipeline and clean seat and restriction. Replace the restriction, if necessary. If this is not possible, return regulator to SAMSON for repair.
Control loop hunts.	Valve too large for control task	Recalculate K_{VS} and contact SAMSON for further action.

i ***Note***

Contact SAMSON's After-sales Service for malfunctions not listed in the table and when the malfunction cannot be remedied as described.

9 Decommissioning and removal

⚠ DANGER

Risk of bursting in pressure equipment.

Control valves and pipelines are pressure equipment. Improper opening can lead to bursting of the valve.

– Before starting any work on the valve, depressurize all plant sections affected as well as the valve.

– Drain the process medium from the plant sections affected as well as from the valve.

– Wear personal protective equipment.

⚠ WARNING

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

While working on the valve, residual medium can flow out of the valve and, depending on its properties, cause personal injury, e.g. (chemical) burns.

Wear protective clothing, safety gloves and eye protection.

⚠ WARNING

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

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

– Allow components and pipelines to cool down or warm up to the ambient temperature.

– Wear protective clothing and safety gloves.

9.1 Decommissioning

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

1. Close the shut-off valve on the upstream side of the valve.
2. Close the shut-off valve on the downstream side of the valve.
3. Completely drain the pipelines and valve.
4. Depressurize the plant. Shut off or disconnect the control line.
5. If necessary, allow the pipeline and device to cool down or warm up to the ambient temperature.
6. Remove the valve from the pipeline.

9.2 Disposal

SAMSON is a producer registered at the following European institution ▶ https://www.ewrn.org/national-registers/national-registers.
WEEE reg. no.: DE 62194439/FR 025665

➔ Observe local, national and international refuse regulations.

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

Note

We can provide you with a recycling passport according to PAS 1049 on request. Simply e-mail us at aftersalesservice@samsongroup.com giving details of your company address.

Tip

On request, we can appoint a service provider to dismantle and recycle the product as part of a distributor take-back scheme.

10 Appendix

10.1 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@samsongroup.com.

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.samsongroup.com) or in all SAMSON product catalogs.

To assist diagnosis and in case of an unclear mounting situation, specify the following details (so far as possible). See Chapter 2:

- 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.)

11 Certificates

The declaration of conformity is provided on the next page.

EU DECLARATION OF CONFORMITY
TRANSLATION

Module A

For the following products, SAMSON hereby declares under its sole responsibility:

Devices	Series	Type	Version
Self-operated Regulators	43	2432	DIN EN, body, CC499K and EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1)]
	43	2436	DIN EN, body, CC499K and EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1)]
	43	2437	DIN EN, body, CC499K and EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1)]
	---	2111	DIN EN, body, EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1)]
			DIN EN, body, 1.0619 and 1.4408, DN 40-50, PN 40, fluids G2, L2, L1[1)]
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½-2, Class 300, fluids G2, L2, L1[1)]
Three-way valve	---	2119	DIN EN, body, EN-GJL-250 and 1.0619, DN 65-125, PN 16, fluids G2, L2, L1[1)]
			DIN EN, body, 1.0619, DN 50-80, PN 25, fluids G2, L2, L1[1)]
			DIN EN, body, 1.0619 and 1.4408, DN 40-50, PN 40, fluids G2, L2, L1[1)]
			ANSI, body, A216 WCC and A351 CF8M, NPS 2½-4, Class 150, fluids G2, L2, L1[1)]
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½, Class 300, fluids G2, L2, L1[1)]
Control valve	---	3222	DIN EN, body, EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1)]
			DIN EN, body, CC499K, DN 32-40, PN 25, all fluids
Three-way valve	---	3226	DIN EN, body, CC499K, DN 50, PN 25, fluids G2, L2[2)]
Three-way valve	---	3260	DIN EN, body, EN-GJL-250, DN 65-200, PN 16, fluids G2, L2[2)]
Globe valve Three-way valve	V2001	3531 3535	DIN EN, body, EN-GJS-400-18-LT, DN 50-80, PN 25, fluids G2, L2, L1[1)]
			DIN EN, body, 1.0619 and 1.4408, DN 32-40, PN 25, all fluids
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½-2, Class 150, all fluids
Control valve	---	3214	DIN EN, body, EN-GJL-250, DN 65-125, PN 16, fluids G2, L2, L1[1)]
			DIN EN, body, EN-GJS-400-18-LT, DN 50-80, PN 25, fluids G2, L2, L1[1)]
			ANSI, body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1)]
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½-2, Class 150, all fluids
Self-operated Regulators	42	2423	DIN EN, body, EN-GJL-250 and EN-GJS-400-18-LT, DN 65-125, PN 16, fluids G2, L2, L1[1)]
			DIN EN, body, EN-GJS-418-LT, DN 50-80, PN 25, fluids G2, L2, L1[1)]
			DIN EN, body, 1.0619 and 1.4408, DN 32-50, PN 16, all fluids
			DIN EN, body, 1.0619 and 1.4408, DN 32-40, PN 25, all fluids
			ANSI, body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1)]
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½-2, Class 150, all fluids
	42	2422	DIN EN, body, EN-GJL-250 and EN-GJS-400-18-LT, DN 65-125, PN 16, fluids G2, L2, L1[1)]
			DIN EN, body, EN-GJS-400-18-LT, DN 50-80, PN 25, fluids G2, L2, L1[1)]
			DIN EN, body, 1.0619, 1.4408 and 1.6220+QT, DN 32-50, PN 16, all fluids
			ANSI, body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1)]
			ANSI, body, A216 WCC, A351 CF8M and A352 LCC, NPS 1½-2, Class 150, all fluids
Strainers	1N/1NI	2601	DIN EN, body, CB752S, G 2 (DN50), PN25, fluids G2, L2[2)]
Strainers	2N/2NI	2602	DIN EN, body, EN-GJL-250, DN 200-250, PN 10, fluids G2, L2, L1[1)]
			DIN EN, body, EN-GJL-250, DN 65-125, PN 16, fluids G2, L2, L1[1)]
			DIN EN, body, EN-GJS-400-18-LT, DN 100-125, PN 16, fluids G2, L2, L1[1)]
			DIN EN, body, EN-GJS-400-18-LT, DN 50-80, PN 25, fluids G2, L2, L1[1)]
			DIN EN, body, 1.4408, DN 32-50, PN 16, all fluids
Self-operated Regulators	---	2373/2375	ANSI, body, A995 4A and A995 5A, NPS 1½-2, Class 150, all fluids
	44	2440 (44-0B) 2441 (44-1B) 2446 (44-6B)	DIN EN, body, EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1)]
		2442 (44-2) 2443 (44-3) 2444 (44-4) 2447 (44-7) 2448 (44-8) 2449 (44-9)	DIN EN, body, EN-GJS-400-18-LT and CC499K, DN 50, PN 25, fluids G2, L2, L1[1)]

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Devices	Series	Type	Version
Self-operated Regulators	45	2451 (45-1) 2452 (45-2) 2453 (45-3) 2454 (45-4) 2456 (45-6) 2459 (45-9)	DIN EN, body, EN-GJS-400-18-LT and CC499K, DN 50, PN 25, fluids G2, L2, L1[1]
	46	2465 (46-5) 2466 (46-6) 2467 (46-7) 2469 (46-9)	DIN EN, body, EN-GJS-400-18-LT and CC499K, DN 50, PN 25, fluids G2, L2, L1[1]
	47	2471 (47-1) 2474 (47-4) 2475 (47-5) 2479 (47-9)	DIN EN, body, EN-GJS-400-18-LT and CC499K, DN 50, PN 25, fluids G2, L2, L1[1]
	48	2488 2489	DIN EN, body, EN-GJS-400-18-LT and CC499K, DN 50, PN 25, fluids G2, L2, L1[1]
	40	2405	DIN EN, body, EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1]
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½-2, Class 150, all fluids
		2406	DIN EN, body, EN-GJL-250, DN 65-125, PN 16, fluids G2, L2, L1[1]
			DIN EN, body, EN-GJS-400-18-LT, DN 50, PN 25, fluids G2, L2, L1[1]
			ANSI, body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1]
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½-2, Class 150, all fluids
	41	2412 2417	DIN EN, body, EN-GJL-250, DN 65-100, PN 16, fluids G2, L2, L1[1]
			DIN EN, body, EN-GJS-400-18-LT, DN 50-80, PN 25, fluids G2, L2, L1[1]
			ANSI body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1]
			ANSI, body, A216 WCC and A351 CF8M, NPS 1½-2, Class 150, all fluids
	42	2421 RS	DIN EN, body, 1.0619, 1.4408, 1.4571 and 1.4401/1.4404, DN 32-50, PN 16, all fluids
			DIN EN, body, 1.0619, 1.4408, 1.4571 and 1.4401/1.4404, DN 32-40, PN 25, all fluids
			ANSI, body, A216 WCC, A351 CF8M and A182 F316/A182 F316L, NPS 1½-2, Class 150, all fluids
	---	2331 2337	DIN EN, body, EN-GJL-250, DN 65-200, PN 16, fluids G2, L2[2]
			DIN EN, body, EN-GJS-400-18-LT, DN 65-150, PN 16, fluids G2, L2[2]
			DIN EN, body, EN-GJS-400-18-LT, DN 65-125, PN 25, fluids G2, L2[2]
			DIN EN, body 1.0619, DN 65-200, PN 16, fluids G2, L2[2]
			DIN EN, body 1.0619, DN 65-100, PN 40, fluids G2, L2[2]
	---	2333 2335	DIN EN, body, EN-GJL-250, DN 65-125, PN 16, fluids G2, L2, L1[1]
			DIN EN, body, EN-GJS-400-18-LT, DN 65-80, PN 25, fluids G2, L2, L1[1]
			ANSI body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1]
	---	2334	DIN EN, body, EN-GJL-250, DN 65-125, PN 16, fluids G2, L2, L1[1]
			DIN EN, body, EN-GJS-400-18-LT, DN 65-125, PN 16, fluids G2, L2, L1[1]
			DIN EN, body, EN-GJS-400-18-LT, DN 65-80, PN 25, fluids G2, L2, L1[1]
			ANSI, body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1]
	---	2404-1	DIN EN, body, EN-GJL-250, DN 65-125, PN16, fluids G2, L2, L1[1]
			ANSI body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1]
			ANSI, body, A216 WCC und A351 CF8M, NPS 1½-2, Class 150, all fluids
	---	2404-2	DIN EN, body, EN-GJL-250, DN 65-125, PN 16, fluids G2, L2, L1[1]
			ANSI, body, A126 B, NPS 3-4, Class 125, fluids G2, L2, L1[1]

[1] Gases according to Article 4(1)(c.i), second indent
Liquids according to Article 4(1)(c.ii)

[2] Gases according to Article 4(1)(c.i), second indent
Liquids according to Article 4(1)(c.ii), second indent

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EU DECLARATION OF CONFORMITY
TRANSLATION

That the products mentioned above comply with the requirements of the following standards:

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	**2014/68/EU**	**of 15. May 2014**
Applied conformity assessment procedure for fluids according to Article 4(1)	**Module A**	

Technical standards applied: DIN EN 12516-2, DIN EN 12516-3, ASME B16.34

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Frankfurt am Main, 26. August 2022

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