

Differential Pressure and Temperature Regulator with Flow Limitation Type 2479/2430 K



Fig. 1 · Type 2479/2430 K, DN 32 to 50

Mounting and Operating Instructions

EB 3132-3 EN

Edition December 2011



Contents	Page
1 Design and principle of operation	4
2 Installation	4
2.1 Mounting position	4
2.2 Control line	7
2.3 Strainer	7
2.4 Additional installation instructions	7
2.5 Installing the temperature sensor	8
2.5.1 Capillary tube	8
2.6 Mounting the valve and thermostat	8
3 Operation.	8
3.1 Start-up	8
3.2 Flow set point adjustment	9
3.3 Temperature set point adjustment	10
4 Maintenance – Replacing parts.	14
4.1 Cleaning or replacing the plug	14
4.2 Replacing the diaphragm.	15
5 Troubleshooting	16
6 Nameplate	17
7 Customer service.	17
8 Dimensions and weights	18

Definitions of the signal words used in these instructions

CAUTION!

indicates a hazardous situation which, if not avoided, may result in injury.

Note: *Supplementary explanations, information and tips*

NOTICE

indicates a property damage message.



General safety instructions

- ▶ The regulator is to be mounted, started up or serviced by fully trained and qualified personnel only, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger.
All safety instructions and warnings in these mounting and operating instructions, particularly those concerning installation, start-up and maintenance, must be observed.
- ▶ The regulator fulfils the requirements of the European Pressure Equipment Directive 97/23/EC. Valves with a CE marking have a declaration of conformity that includes information about the applied conformity assessment procedure.
The declaration of conformity is available on request.
- ▶ For appropriate operation, make sure that the regulator is only used in areas where the operating pressure and temperatures do not exceed the operating values specified in the order that the valve sizing data are based on.
- ▶ The manufacturer does not assume any responsibility for damage caused by external forces or any other external influence!
- ▶ Any hazards that could be caused in the regulator by the process medium, the operating pressure or by moving parts are to be prevented by means of the appropriate measures.
- ▶ Proper shipping and storage are assumed.

Note: Non-electric valve versions which do not have a valve body lined with an **insulating coating** do not have their own potential ignition source according to the ignition risk assessment stipulated in EN 13463-1: 2009, section 5.2, even in the rare incident of an operating fault. Therefore, they **do not** fall within the scope of Directive 94/9/EC.

1 Design and principle of operation

The regulator consists of the Type 2479 Valve with restriction (orifice), seat and plug, the actuator with operating diaphragm as well as the thermostat with set point adjuster, capillary tube and temperature sensor.

The regulator is designed to keep the differential pressure and temperature constant to the adjusted set point. The flow rate can be limited over the restriction (1.2) in the valve body.

The valve closes when the controlled variable increases.

Versions for safety equipment are additionally equipped with a Type 2403 Safety Thermostat to function as safety temperature monitors (FR/TR/STM). They can also be equipped with a Type 2439 K Safety Thermostat to function as safety temperature limiters (FR/TR/STL).

For further details, refer to the Mounting and Operating Instructions:

EB 2183 EN for Type 2403 and

EB 2185 EN for Type 2439 K.

The medium flows through the valve in the direction indicated by the arrow on the body. The flow rate is determined by the area released between the adjustable restriction (1.2) and the valve plug (3).

The high pressure upstream of the restriction (flow pipe) is transmitted through the attached control line (1.1) to the high-pressure side of the actuator. The low pressure created downstream of the restriction (orifice) acts on the low-pressure side of the operating diaphragm (6.1) through a hole in the plug.

The differential pressure created by the restriction is converted into a positioning force at the operating diaphragm. This force is used to move the valve plug depending on the force of the positioning spring (5).

The medium temperature creates a pressure in the temperature sensor, which is transmitted through the capillary tube (24) to the operating bellows (23) where it is converted into a positioning force. This force moves the coupling rod (8) and the valve plug (3) with it, depending on the force of the spring (21) pretensioned by the set point adjuster (22).

The largest signal is used to actuate the valve.

2 Installation

The regulator is normally installed in the low-pressure pipe, e.g. the return flow pipe of a plant.

The regulator **must** be installed in the return flow pipe when used in a district heating plant.

NOTICE

Protect the regulator against frost when controlling freezing media.

Prior to removing the regulator, make sure the relevant section of the plant has been depressurized and drained.

2.1 Mounting position

Install the regulator in a horizontal pipeline.

Tightening torques		
	DN	Nm
Coupling nut (10)	15 to 50	20
Plug section (3)	15 to 25	70
Body screws (7)	15 to 25	8

- 1 Valve body
- 1.1 Connection nut with gasket and welding end
- 1.2 Restriction (orifice)
- 3 Plug section with guide nipple
- 6 Actuator
- 6.1 Operating diaphragm
- 6.2 Diaphragm plate
- 6.3 Overload protection
- 7 Body screws
- 8 Coupling rod
- 10 Coupling nut
- 11 Control line
- 12 Set point screw
- 20 Control thermostat
- 22 Set point adjuster for temperature
- 24 Capillary tube
- 25 Temperature sensor

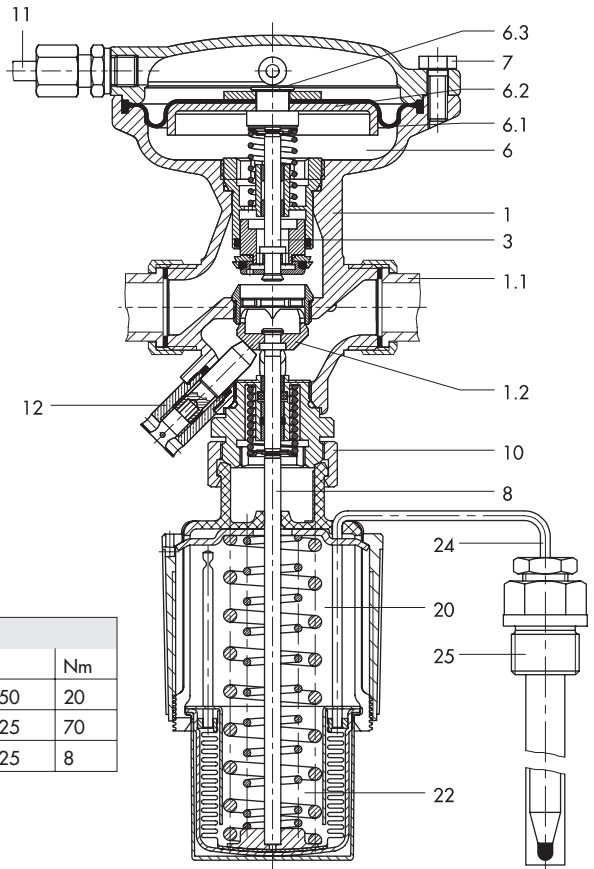
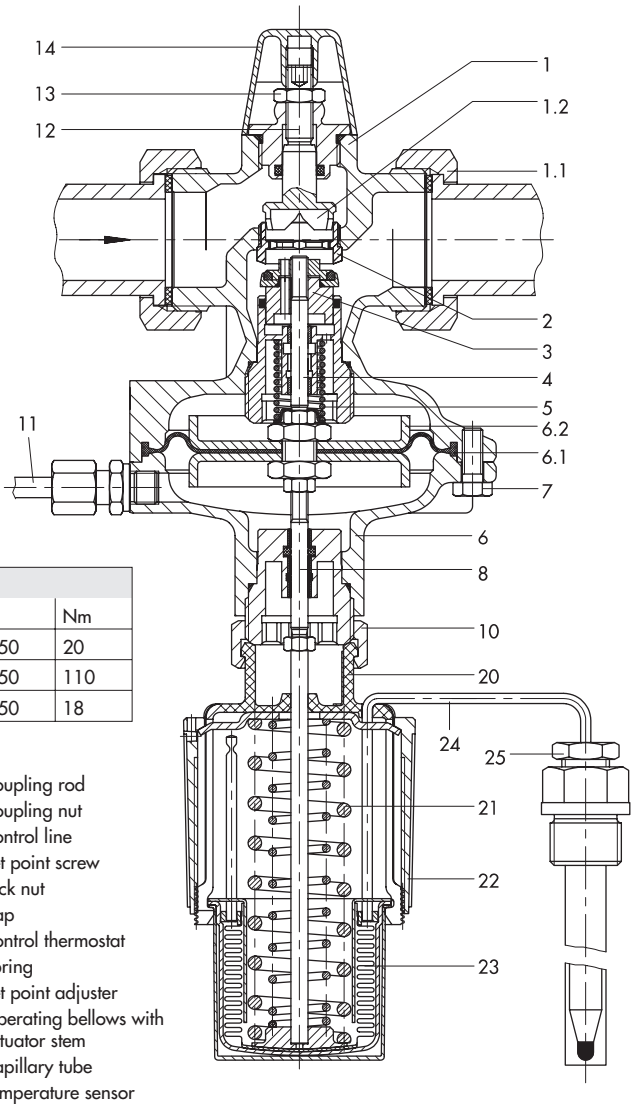


Fig. 2 - Functional diagram of Type 2479/2430 K, DN 15 to 25



Tightening torques		
	DN	Nm
Coupling nut (10)	15 to 50	20
Plug section (3)	32 to 50	110
Body screws (7)	32 to 50	18

- | | |
|--|---|
| 1 Valve body | 8 Coupling rod |
| 1.1 Connection nut with gasket and welding end | 10 Coupling nut |
| 1.2 Restriction (orifice) | 11 Control line |
| 2 Seat | 12 Set point screw |
| 3 Plug section with guide nipple | 13 Lock nut |
| 4 Plug stem | 14 Cap |
| 5 Positioning spring | 20 Control thermostat |
| 6 Actuator | 21 Spring |
| 6.1 Operating diaphragm | 22 Set point adjuster |
| 6.2 Diaphragm plate | 23 Operating bellows with actuator stem |
| 7 Body screws | 24 Capillary tube |
| | 25 Temperature sensor |

Fig. 3 · Functional diagram of Type 2479/2430 K, DN 32 to 50

DN 15 to 25

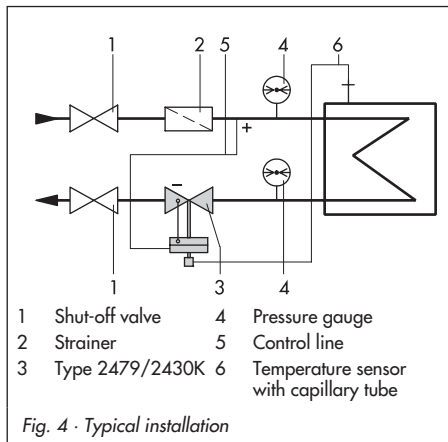
- ▶ Install the regulator with either the actuator or thermostat facing downwards. For medium temperatures above 110 °C, the thermostat **must** be installed facing downwards.
- ▶ The regulator can also be installed in vertical pipelines. The actuator or thermostat must be installed sideways in this case.
- ▶ The medium must flow through the valve in the direction indicated by the arrow on the body.

DN 32 to 50

- ▶ Install the regulator with the thermostat facing downwards.
- ▶ The medium must flow through the valve in the direction indicated by the arrow on the body.

2.2 Control line

A control line with 6 mm diameter must be adapted and attached at the place of installation. Make sure the line is free of dirt.



Route the control line as indicated in the installation drawing (Fig. 4).

2.3 Strainer

Install a strainer upstream of the regulator (Fig. 4).

- ▶ Install the strainer so that the medium flows through it in the direction indicated by the arrow on the strainer body.
- ▶ The filter element must be suspended downwards (when installed in horizontal pipelines).
- ▶ In upright pipelines where the medium flows upwards, install the strainer with the drain flange of the filter element facing upwards. In this case, the dirt particles are only retained, but not collected.
- ▶ Remember to leave enough space to remove it.

2.4 Additional installation instructions

We recommend to 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.

To monitor the pressures in the plant, install a pressure gauge both upstream and downstream of the regulator.

To check the adjusted temperature set point, we recommend to install a thermometer near the sensor immersed in the process medium.

2.5 Installing the temperature sensor

Refer to Mounting and Operating Instructions EB 2430 EN for details on the Type 2430 K Thermostat.

Refer to EB 2430-3 EN for details on the Type 2430 K Thermostat (vapor pressure).

The temperature sensor of the Type 2430 K Thermostat may be installed in any desired position. Make sure its entire length is immersed in the process medium.

Choose a place of installation where neither overheating nor considerable idle times occur.

Weld in a sleeve with G ½ or G ¾ female thread at the place of installation.

Seal the screw gland or thermowell into the welded-in sleeve. Insert the sensor and fasten it with the clamping screw.

NOTICE

If the sensor is used together with a thermowell, only use original SAMSON thermowells.

To prevent damage caused by corrosion, make sure to use the same kinds of materials when installing a sensor or thermowell. For example, avoid using a thermowell or temperature sensor made of non-ferrous metal in a stainless steel heat exchanger. In this case, the sensor is to be used together with a stainless steel thermowell.

2.5.1 Capillary tube

Route the capillary tube such that no mechanical damage can occur. The smallest permissible bending radius is 50 mm.

Roll up the excess tube to form a ring; never bend or shorten it.

Make sure the capillary tube is not exposed to excessive temperature fluctuations.

2.6 Mounting the valve and thermostat

Place the thermostat on the connection of the actuator and tighten it using the coupling nut (10) and a tightening torque of 20 Nm.

3 Operation

3.1 Start-up

NOTICE

Mount the valve and control thermostat before start up.

Allow the plant to fill up slowly on start-up.

Make sure that the restriction (1.2) for flow rate adjustment is open before the regulator is started up or before any pressure is applied.

When pressure-testing the pipelines with the regulator installed, the test pressure must not exceed **1.5 times the nominal pressure**.

The differential pressure set point of Type 2479/2430 K is fixed to $\Delta p = 0.2$ bar with a continuously adjustable flow limitation.

3.2 Flow set point adjustment

All consumers must be open (to provide minimum plant resistance). If a bypass is installed, it must be closed.

To adjust or change the set point for flow limitation, proceed as follows:

- ▶ Adjust the temperature at the set point adjuster of the thermostat to the highest temperature (setting must be above the actual temperature in the plant to ensure that the thermostat does not move the plug stem).

DN 15 to 25:

- ▶ Use an Allen key (4 mm) to turn the side set point screw (12).
- ▶ Turn the screw clockwise (↻) to close the restriction (orifice), causing the flow rate to decrease.
- ▶ Turn the screw counterclockwise (↺) to open the restriction (orifice), causing the flow rate to increase.

Note: *The restriction (orifice) is closed in the delivered state.*

DN 32 to 50:

- ▶ Unscrew the cap (14) and undo the lock nut (13).
- ▶ Turn the screw (12) clockwise (↻) to close the restriction (orifice), causing the flow rate to decrease.
- ▶ Turn the screw (12) counterclockwise (↺) to open the restriction (orifice), causing the flow rate to increase.
- ▶ Tighten lock nut and fasten the cap back on.

The diagrams in Figs. 5, 6 and 7 serve as a guide for flow rate adjustment.

In the **special version with scaled cap**, the set point can be adjusted directly (one scale marking equals one turn of the set point screw).

Adjust the flow rate using a reference device (e.g. a calorimetric meter) and lead seal it, if required.

Note: *To determine the flow rate limitation to be adjusted, add the differential pressure created at the restriction (orifice) to the known pressure loss across the plant. By experience, this differential pressure value is assumed to be approx. 0.2 bar.*

The flow rate curves in the diagrams (Figs. 5, 6 and 7) all apply to this value.

Example: Flow rate adjustment

Type 46-6 Regulator, DN 15, flow rate range $K_{VS} = 0.25$ to $0.64 \text{ m}^3/\text{h}$ is intended to limit the flow rate to $0.63 \text{ m}^3/\text{h}$. The pressure loss across the plant is 0.4 bar .

To which value must the flow rate set point be limited? And how many turns of the set point screw are required at the restriction (orifice)?

Solution:

(points A to E in Fig. 5)

Start with the pressure loss Δp across the plant that must be known.

The pressure loss Δp across the plant is assumed to be 0.4 bar in this example which corresponds to point A in the diagram.

Add the differential pressure created at the restriction (orifice) assumed to be 0.2 bar . Starting at point A, draw a horizontal line with this value to the right, resulting in point B.

Point B is located on the straight line belonging to the differential pressure of 0.6 bar to be adjusted.

Starting at point B, draw a vertical line down to the desired flow rate limitation curve ($0.63 \text{ m}^3/\text{h}$), i.e. point C.

Starting at point C, draw a horizontal line to the curve corresponding to the nominal size; this line ends at point D.

The perpendicular above point D results in point E, which indicates the required number of turns of the set point screw. Starting with a closed restriction (orifice), turn the screw counterclockwise nearly seven times (markings) to open the restriction (orifice) and achieve the desired flow rate limitation.

3.3 Temperature set point adjustment

Adjust the set point at the black plastic ring (set point adjuster 22) observing the reference thermometer.

- ▶ Turn the adjuster clockwise (↻) to reduce the temperature.
- ▶ Turn the adjuster counterclockwise (↺) to increase the temperature.

The adjusted temperature set point can be lead-sealed at the hole in the set point adjuster.

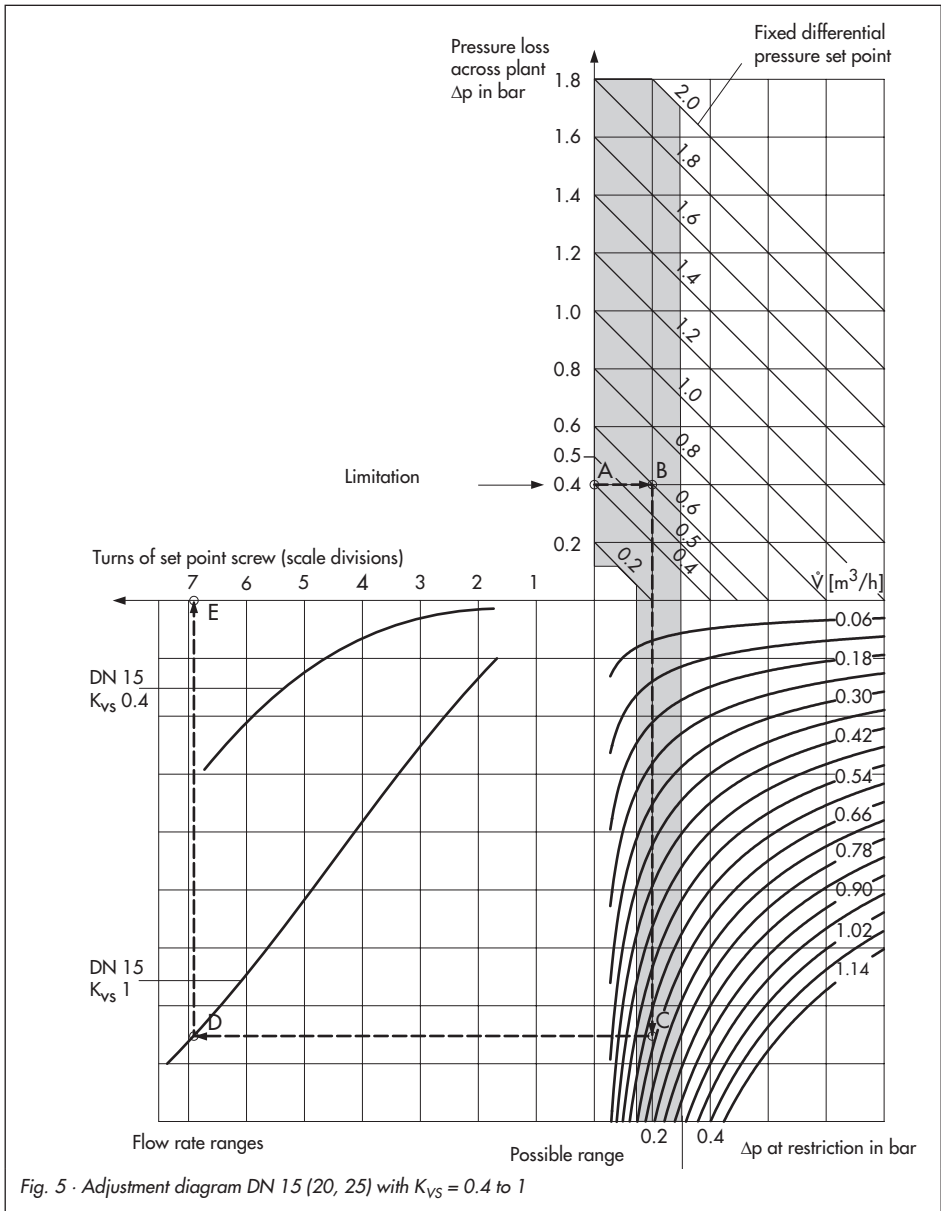


Fig. 5 · Adjustment diagram DN 15 (20, 25) with $K_{VS} = 0.4$ to 1

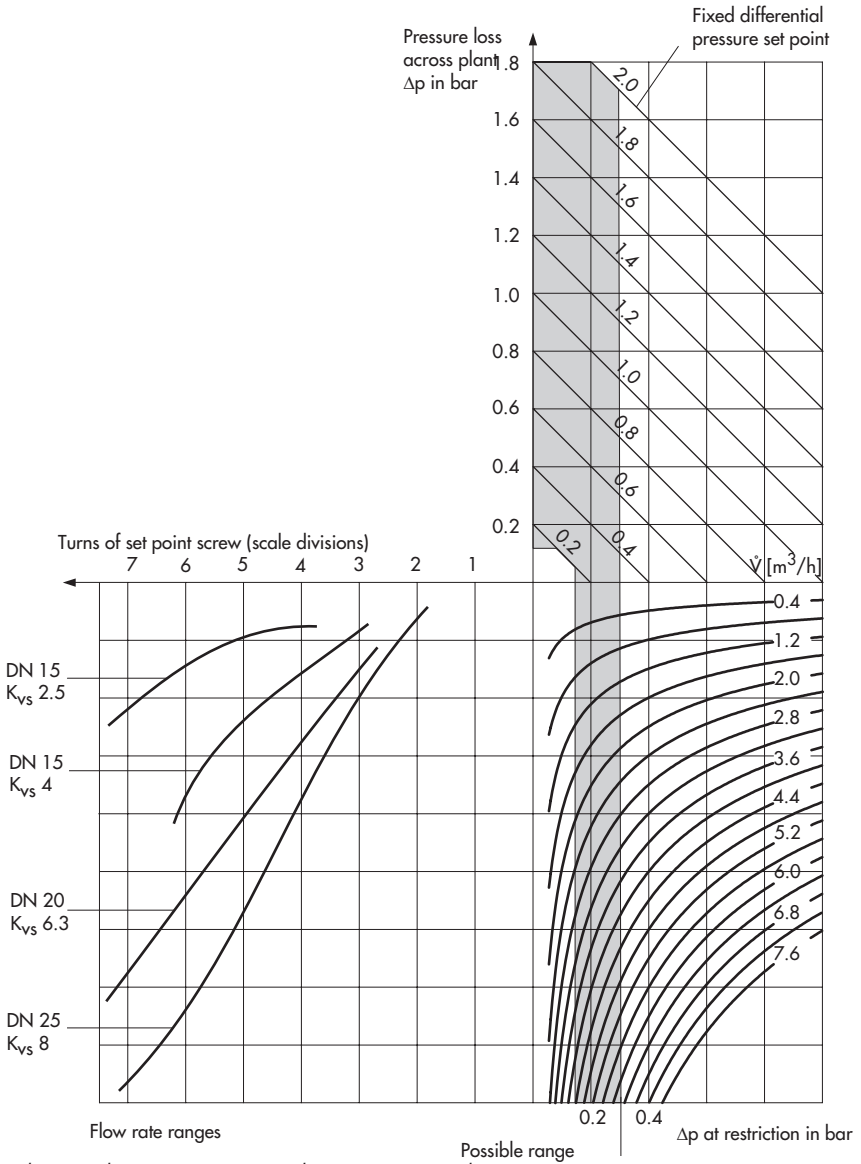
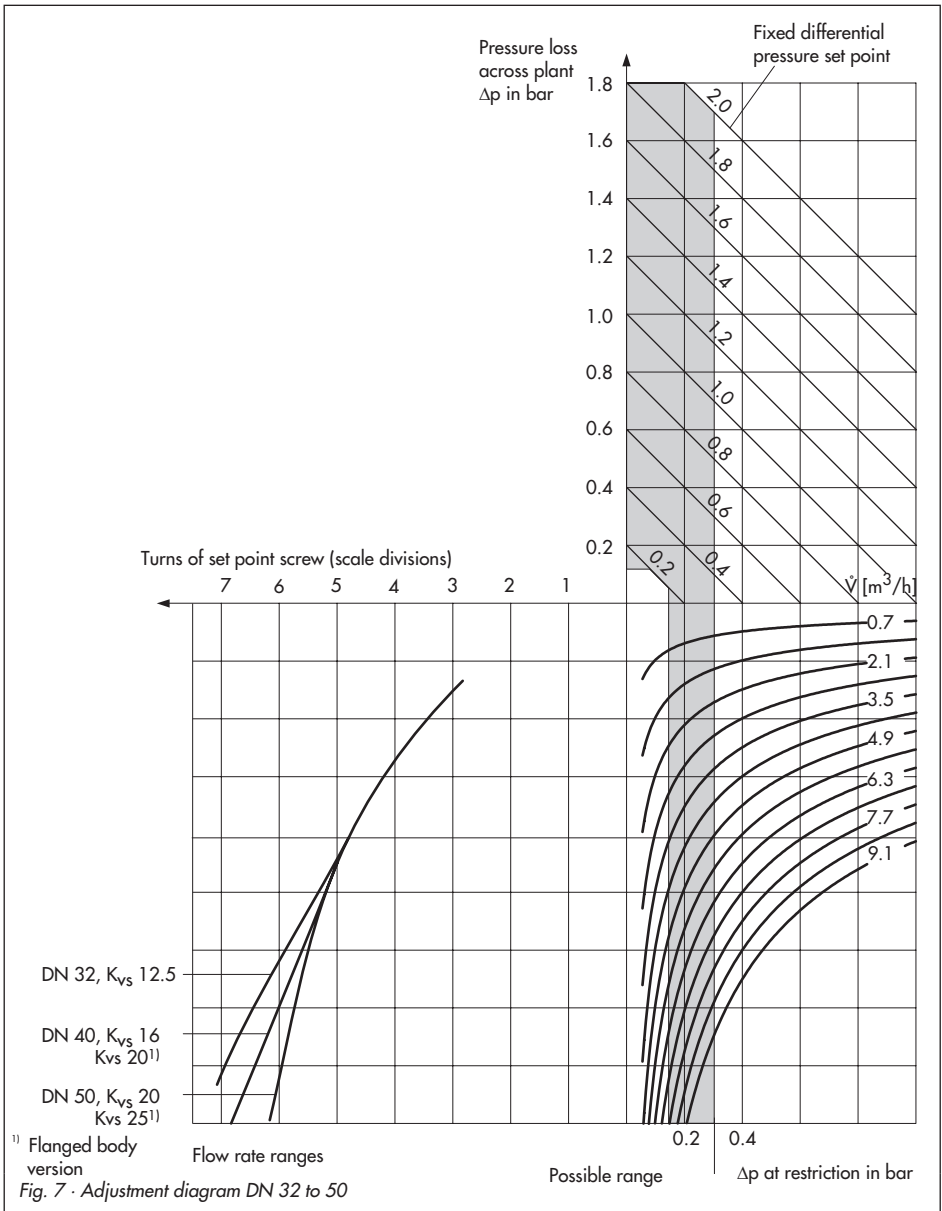


Fig. 6 · Adjustment diagram DN 15 to 25 with $K_{VS} = 2.5, 4, 6$ and 8



4 Maintenance – Replacing parts

The regulator is maintenance free. Nevertheless, it is subject to natural wear, particularly at the seat, plug and operating diaphragm.

Depending on the operating conditions, the regulator needs to be checked at regular intervals to avoid possible malfunctions.

Details on malfunctions and the recommended action can be found in the **Table 1 · Troubleshooting**.

CAUTION!

On performing any work on the regulator, make sure the relevant section of the pipeline is depressurized and, depending on the process medium, drained as well.

We recommend to remove the valve from the pipeline.

For high temperatures, allow the regulator to cool down to ambient temperature before starting any work on it.

Interrupt or shut off the control line to avoid any hazards which could be caused by moving parts.

As valves are not free of cavities, remember that residual process medium might still be contained in the valve.

4.1 Cleaning or replacing the plug

1. Unscrew the thermostat and control line. Remove the regulator from the pipeline.

2. Unscrew the body screws (7) and remove the lower diaphragm case including the diaphragm (6.1) and diaphragm plate (6.2).
3. For sizes DN 15 to 25, unscrew the plug section with guide nipple (3) using a socket wrench (order no. 1280-3001) and pull it out.

For sizes DN 32 to 50, unscrew the stopper and pull out the plug section.

This wrench can also be made from, for example, a GEDORE screwdriver bit (IN 19-19) by boring a hole with 17 mm diameter and a depth of 17 mm into the 19 mm hexagonal bit as illustrated in Fig. 8.

4. Thoroughly clean the seat and plug section.
5. Check that the control line is not blocked.

If the plug is damaged, replace the entire plug section.

Reassemble the regulator in reverse order

Observe the tightening torques specified in the table in Figs. 2 and 3.

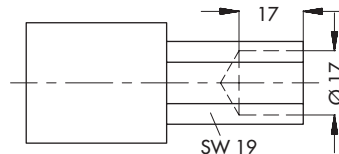


Fig. 8 · Wrench

4.2 Replacing the diaphragm

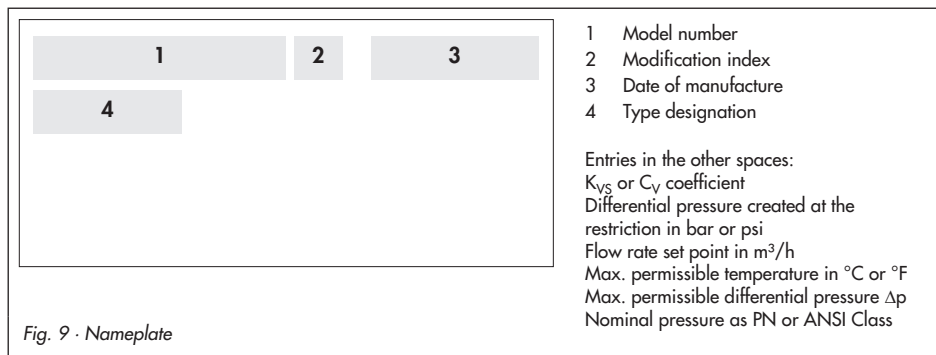
1. Unscrew the thermostat and control line (11).
2. Unscrew the body screws (7) and remove the lower diaphragm case including the diaphragm and diaphragm plate.
3. Depending on the nominal size of the valve, unscrew the diaphragm plate from the diaphragm and replace the diaphragm. Alternatively, replace the diaphragm together with the diaphragm plates.
4. Reassemble the regulator in reverse order.

Observe the tightening torques specified in the table in Figs. 2 and 3.

5 Troubleshooting

Malfunction	Possible cause	Recommended action
Flow rate Flow rate set point exceeded	Leakage between seat and plug	Remove the regulator from the pipeline. Clean the seat and plug. If necessary, replace the plug (section 4.1). Otherwise, return the regulator to SAMSON for repair.
	Operating diaphragm defective	Replace the diaphragm (section 4.2) or return the regulator to SAMSON for repair.
	Control line blocked	Remove the control line and clean it.
	Valve too large for control task	Recalculate the K_{VS} coefficient and contact SAMSON.
Flow rate set point not reached	Set point range incorrectly selected	Check the set point range and contact SAMSON.
	Safety device (e.g. pressure limiter) triggered	Check the plant. Unlock the safety device.
	Insufficient differential pressure across the plant	Compare the existing differential pressure across the plant with the plant drag. Min. differential pressure = differential pressure created at the restriction + $(V/K_{VS})^2$
	Strainer blocked	Drain the strainer's filter and clean it.
Valve incorrectly installed	Install the regulator with the direction of flow matching the arrow on the valve body.	
Temperature Temperature set point at the sensor exceeded or not reached	Leakage between seat and plug	Remove the regulator from the pipeline. Clean the seat and plug. If necessary, replace the plug (section 4.1). Otherwise, return the regulator to SAMSON for repair.
	Sensor installed in the wrong location	Check that the sensor is fully immersed in the process medium. Check that it is not installed in a place where idle times or heat accumulation occur.
	Safety device (e.g. safety temperature limiter or monitor) triggered	Check the plant. Unlock the safety device.
Temperature set point at the sensor exceeded	Insufficient energy available for heating or cooling	Draw up an energy balance.
	Thermostat defective	Return the thermostat to SAMSON for repair.
Control loop hunts	Valve too large for control task	Recalculate the K_{VS} coefficient and contact SAMSON.
	Time constant too large for control loop	Fill the thermowell with conductive paste, remove the thermowell and use a sensor with a smaller time constant.

6 Nameplate



7 Customer service

Should any malfunctions or any defect occur, SAMSON's After-Sales Service is prepared to help you on site.

You can also send the defective regulator directly to your local SAMSON representative for repair. Addresses of SAMSON subsidiaries, agencies and service centers are listed in the product catalogs and in the Internet at www.samson.de.

To allow SAMSON to find the fault and to have an idea of the installation situation, specify the following details (refer to the nameplate):

- ▶ Type and nominal size of the valve
- ▶ Model number with index
- ▶ Upstream and downstream pressures
- ▶ Temperature and process medium
- ▶ Min. and max. flow rate in m^3/h
- ▶ Has a strainer been installed?
- ▶ Installation drawing

8 Dimensions and weights

Nominal size DN	15	20	25	32	40	50
Pipe diameter d	21.3	26.8	32.7	42	48	60
Connecting size R	G ¾	G 1	G 1¼	G 1¾	G 2	G 2½
Width across flats SW	30	36	46	59	65	82
Length L	65	70	75	100	110	130
Height H	85					
Height H1	280			265	295	
Standard version						
L1 with welding ends	210	234	244	268	294	330
Weight, approx. kg	2.4	2.5	2.7	4.0	6.2	7.0
Version with threaded ends (with male thread)						
Length L2	129	144	159	180	196	228
Male thread A	G ½	G ¾	G 1	G 1¼	G 1½	G 2
Weight, approx. kg	2.2	2.3	2.4	5.9	6.4	6.9
Version with flanges PN 16/25 or version with flanged body (DN 32, 40, 50)						
Length L3	130	150	160	180	200	230
Weight, approx. kg	3.6	4.3	4.9	9.1	10.4	11.9

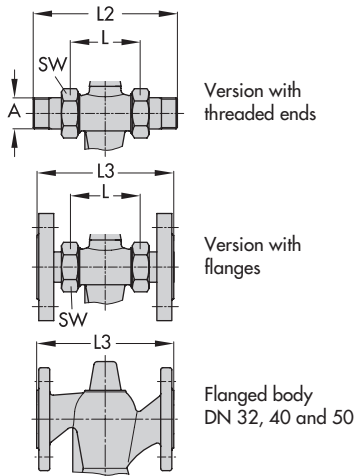
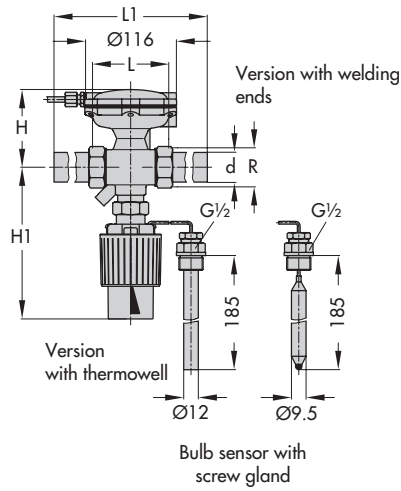


Fig. 10 - Dimensional drawings

DN 15 to 25



DN 32 to 50

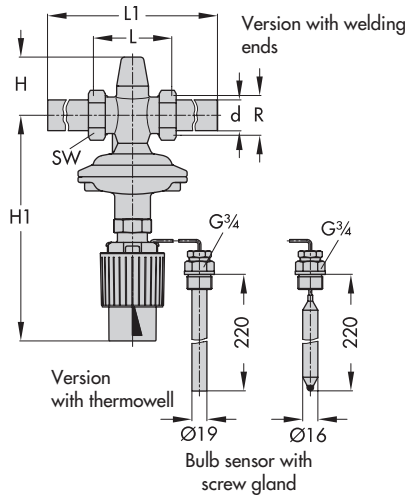


Fig. 11 · Dimensional drawings



SAMSON AG · MESS- UND REGELTECHNIK
Weismüllerstraße 3 · 60314 Frankfurt am Main
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
Internet: <http://www.samson.de>

EB 3132-3 EN

S/Z/2012-01