Self-operated Regulators

Flow Regulator
Type 42-36

Type 42-36

Mounting and Operating Instructions

EB 3015 EN

Edition October 2012

Contents

Definitions of the signal words used in these instructions

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

NOTICE
indicates a property damage message.

Note: *Supplementary explanations, information and tips*

General safety instructions

- *The regulators must be installed, started up and 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.*
- *The regulator complies with the requirements of the European Pressure Equipment Directive 97/23/EC. The declaration of conformity issued for a valve bearing the CE marking includes information on the applied conformity assessment procedure.*
  The declaration of conformity can be provided on request.
- *For appropriate operation, make sure that the regulator is only used in applications where the operating pressure and temperatures do not exceed the operating values based on the sizing data submitted in the order.*
- *The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.*
- *Any hazards which could be caused in the regulator by the process medium or operating pressure are to be prevented by means of appropriate measures.*
- *Proper shipping and appropriate 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.*
For connection to the equipotential bonding system, observe the requirements specified in section 6.3 of EN 60079-14: 2009 (VDE 0165 Part 1).

1 Design and principle of operation

The flow regulator is designed to maintain the flow rate in the pipeline at the set point adjusted at the restriction (orifice).

The regulator consists of a Type 2423 Valve with a seat, plug and a flow set point adjuster as well as a Type 2426 Closing Actuator with an operating diaphragm.

The valve and actuator are delivered as separate units and must be connected with a coupling nut on site.

Type 42-36 DoT

This version allows the additional control or limitation of the temperature by attaching a double adapter with a thermostat.

See the Mounting and Operating Instructions: **EB 3019 EN** for the double adapter and **EB 2231 EN** for Type 2231, Type 2232, Type 2233, Type 2234 and Type 2235 Control Thermostat.

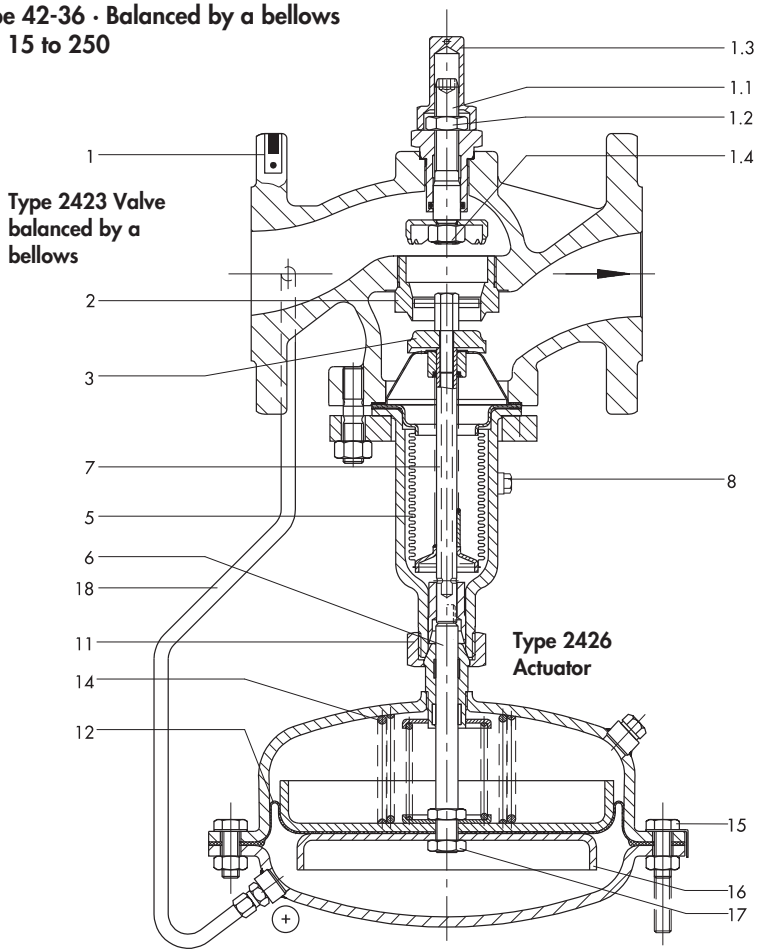
The medium flows through the valve in the direction indicated by the arrow. The flow rate is determined by the free area between the restriction (1.4) and the valve plug (3).

The valve plug is unaffected by pressure changes in the medium since the upstream and downstream pressures are balanced by the balancing bellows (5) or the balancing diaphragm (5.1) (DN 125 to 250/valve balanced by a diaphragm).

The principle of operation of the regulators with valves balanced by a bellows or diaphragm only differ concerning the pressure balancing. The valves balanced by a diaphragm have a balancing diaphragm (5.1) instead of a bellows (5). The downstream pressure p_2 acts on the inside and the upstream pressure p_1 on the outside of the diaphragm or bellows. As a result, the forces acting on the valve plug are balanced out.

The high pressure upstream of the restriction (1.4) is transmitted through the control line (18) to the lower diaphragm chamber. The low pressure downstream of the restriction (1.4) passes through the hollow plug stem (7) and the diaphragm stem (6) into the top diaphragm chamber of the actuator. The differential pressure produced at the restriction is converted into a positioning force at the operating diaphragm (12) and is used to move the valve plug according to the force of the differential pressure springs (14). If the flow rate increases, for example, the differential pressure at the restriction also increases. The actuator and plug stems move in the closing direction and the flow rate is reduced until the flow rate set point adjusted at the restriction (1.4) is reached. If the flow rate decreases, the reverse takes place.

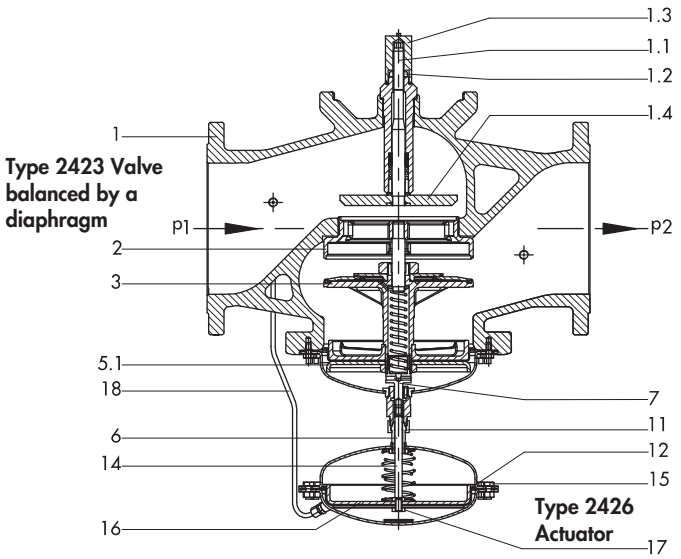
Type 42-36 · Balanced by a bellows
DN 15 to 250



1 Valve body
1.1 Flow set point adjuster
1.2 Lock nut
1.3 Cap
1.4 Restriction
2 Seat
3 Plug
5 Balancing bellows
6 Diaphragm stem
7 Plug stem
8 Venting (DN 125 and higher)
11 Coupling nut
12 Operating diaphragm
14 Differential pressure spring(s)
15 Screws
16 Diaphragm plate
17 Nut
18 High-pressure control line

*Fig. 1 · Sectional drawing of regulator with valve balanced by a **bellows***

Type 42-36 · Balanced by a diaphragm · DN 125 to 250



1 Valve body
1.1 Flow set point adjuster
1.2 Lock nut
1.3 Cap
1.4 Restriction
2 Seat
3 Plug
5.1 Balancing diaphragm
6 Diaphragm stem
7 Plug stem
11 Coupling nut
12 Operating diaphragm
14 Differential pressure spring(s)
15 Screws
16 Diaphragm plate
17 Nut
18 High-pressure control line

Fig. 2 · Sectional drawing of regulator with valve balanced by a ***diaphragm***

2 Installation

Install the regulator in the low-pressure line (return flow) or in the high-pressure line (flow) of the plant. Refer to installation schematics in Fig. 4.

On selecting the position of installation, make sure that the regulator can still be easily accessed after completion of the plant.

NOTICE

The regulator must be installed free of stress. If necessary, support the piping near the connections. However, do not attach supports to the valve or actuator.

Note: *Install a strainer (e.g. SAMSON Type 2 N/2 NI) upstream of the regulator to prevent sealing particles, welding spatter or other impurities carried along by the process medium from impairing the proper functioning of the valve, especially tight shut-off.*

2.1 Mounting position

See Fig. 3 for permissible mounting positions.

Standard mounting position · Install valve without actuator in a horizontal pipeline with the connection for the actuator facing downwards. Make sure the medium flows through the valve in the direction indicated by the arrow. Then connect the actuator to the valve using the coupling nut (11).

NOTICE
Protect the regulator when it is used to control freezing process media.
On shutting down the plant in areas not free from frost, depressurize and empty the regulator and remove it from the pipeline.

2.2 Control line, equalizing tank and needle valve

Control line · After mounting the actuator, fasten the supplied high-pressure control line to the regulator as shown in Figs. 1 and 2.

Control line kit · A control line kit for tapping pressure directly at the valve body is available as an accessory from SAMSON. Refer to Data Sheet T 3095 EN.

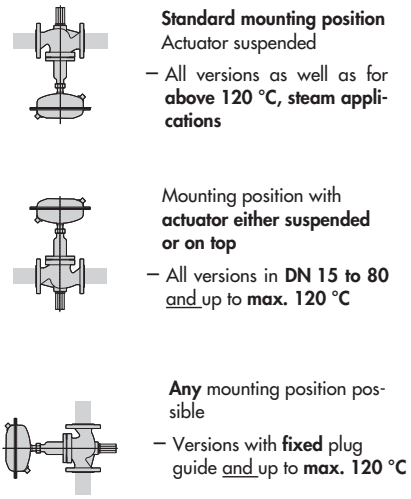
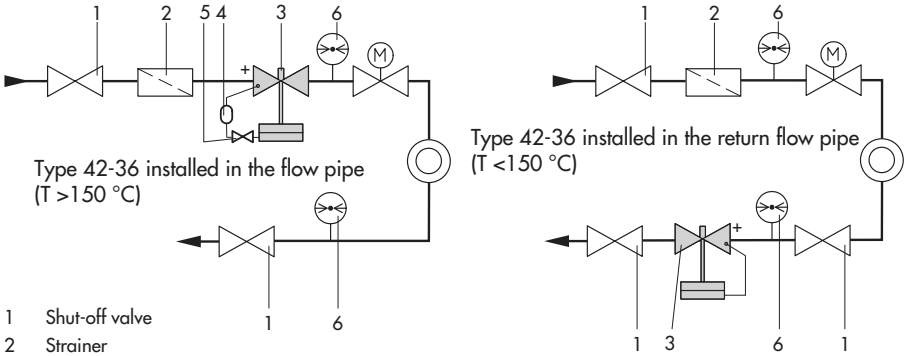


Fig. 3 · Permissible mounting positions

Equalizing tank · An equalizing tank is required for liquids above 150 °C and for steam. For the control line, install the equalizing tank directly downstream of the pressure tapping point at the valve. The mounting position of the equalizing tank is indicated by an adhesive label on the tank itself as well as by an arrow and the word "top" stamped onto the top of the tank. Adhere to the mounting position and distances prescribed, otherwise the safe functioning of the regulator cannot be guaranteed.

Needle valve · If the regulator tends to hunt, we recommend installing a SAMSON needle valve in the control line routed on site at the actuator connection.



1 Shut-off valve
2 Strainer
3 Flow regulator
4 Equalizing tank (optional)
5 Needle valve
6 Pressure gauge

The minimum required plant pressure drop Δp_{min} across the valve is calculated from:

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

Δp in bar
$\dot{V}$ in m^3/h
K_{VS} in m^3/h

Fig. 4 · Typical installation of Type 42-36, installed in the flow and return flow pipes

Note: *Needle valves, equalizing tanks and compression-type screw fittings can be supplied as required. These accessories are listed in the Data Sheet T 3095 EN.*

2.3 Strainer

A strainer installed in the flow pipe prevents foreign matter and dirt particles in the medium from entering the regulator. The SAMSON product range includes the Type 2 N/2 NI Strainer (refer to Data Sheet T 1015 EN).

Install the strainer upstream of the regulator. Make sure the direction of medium flow corresponds with the direction indicated by the arrow on the strainer. The filter element must be suspended downwards or be located at the side for applications with steam. Remember to leave enough space to remove it.

2.4 Shut-off valve

We recommend installing a hand-operated shut-off valve (Fig. 4) both upstream of the strainer and at the outlet of the return flow pipe to be able to shut down the plant for

cleaning and maintenance, and when the plant is not used for longer periods of time.

2.5 Pressure gauge

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

3 Operation

3.1 Start-up

CAUTION!
First start up the regulator after mounting all the components, e.g. valve, actuator and control line.
Make sure the control line (and needle valve) is open and correctly connected before start-up.
For media temperatures above 150 °C (steam), fill the equalizing tank with the process medium (water) before start-up.

Note: *On filling the plant, make sure the restriction (1.4) is open by turning the flow set point adjuster (1.1) counterclockwise as far as it will go.*

- Open all the valves on the consumer side. Slowly open the shut-off valves starting on the return flow pipe first. In case of valves balanced by a bellows in DN 125 or larger, vent the bellows housing at the stopper (8) located at the side of the bellows housing.

Rinsing the plant · After filling the plant, first completely open the consumers. Open the restriction. Rinse out the pipeline at full flow rate for several minutes. Check the installed strainer (e.g. by measuring the pressure drop) afterwards. Clean the strainer, if necessary.

NOTICE
*When **testing the pressure** of the plant when the regulator is already installed, the pressure must not exceed the nominal pressure of the valve by 1.5 times nor the maximum permissible differential pressure in the actuator.*

3.2 Set point adjustment

The control valves and shut-off valves as well as all consumers or a bypass valve, if applicable, must be opened to allow the maximum flow rate to be reached.

Turn the flow set point adjuster (1.1) until the required flow rate is reached, by reading, for example, the flow rate reading off a heat meter (refer to **Table 1 · Flow rate set point ranges**).

Note: *Always start the adjustment based on a closed restriction!*

- Turn clockwise to close the restriction. This reduces the flow rate.
- Turn counterclockwise to open the restriction. This raises the flow rate.

You can also use the adjustment diagrams for water in Figs. 5 to 7 to help you make the flow rate adjustment.

In these diagrams, the flow rates are listed by how many turns of the flow set point adjuster are required depending on the differential pressure at the restriction 0.2 bar or 0.5 bar.

Note: *The differential pressure at the restriction $\Delta p_{restriction}$ is fixed at either* ***0.2 bar*** *or* ***0.5 bar*** *(see nameplate).*

- Unscrew cap (1.3) and undo lock nut (1.2). Turn the flow set point adjuster (1.1) clockwise as far as it will go.
- Find the flow set point in the diagram and determine how many turns are required.
- Turn the flow set point adjuster (1.1) counterclockwise (based on a closed restriction) until the selected set point is adjusted.
- Check the flow rate at the heat meter and correct, if necessary.
- When the required flow rate is reached, lock the flow set point adjuster (1.1) in position with the lock nut (1.2) and screw cap (1.3) back on.
  Lead-seal cap, if necessary.

Table 1 · Flow rate set point ranges $\dot{V}$ for water

Type 2423 · Balanced by a bellows

Nominal size DN	**15**	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
Differential pressure at the restriction $\Delta p_{restriction}$ = 0.2 bar	Flow rate set point ranges **V** for water in **m³/h**												
	0.05 to 2	0.15 to 3	0.25 to 3.5	0.4 to 7	0.6 to 11	0.9 to 16	2 to 28	3.5 to 35	6.5 to 63	11 to 80	18 to 120	20 to 180	26 to 220
Differential pressure at the restriction $\Delta p_{restriction}$ = 0.5 bar	0.15 to 3	0.25 to 4.5	0.4 to 5.3	0.6 to 9.5	0.9 to 16	2 to 24	3.5 to 40	6.5 to 55	11 to 90	18 to 120	20 to 180	26 to 260	30 to 300
Max. perm. differential pressure Δp	25 bar						20 bar		16 bar		12 bar	10 bar	

Type 2423 · Balanced by a diaphragm

Nominal size DN	**125**	**150**	**200**	**250**
Differential pressure at the restriction $\Delta p_{restriction}$ = 0.2 bar	Flow rate set point ranges **V** for water in **m³/h**			
	11 to 120	18 to 180	20 to 320	26 to 350
Differential pressure at the restriction $\Delta p_{restriction}$ = 0.5 bar	18 to 180	20 to 260	26 to 450	30 to 520
Max. perm. differential pressure Δp	12 bar		10 bar	

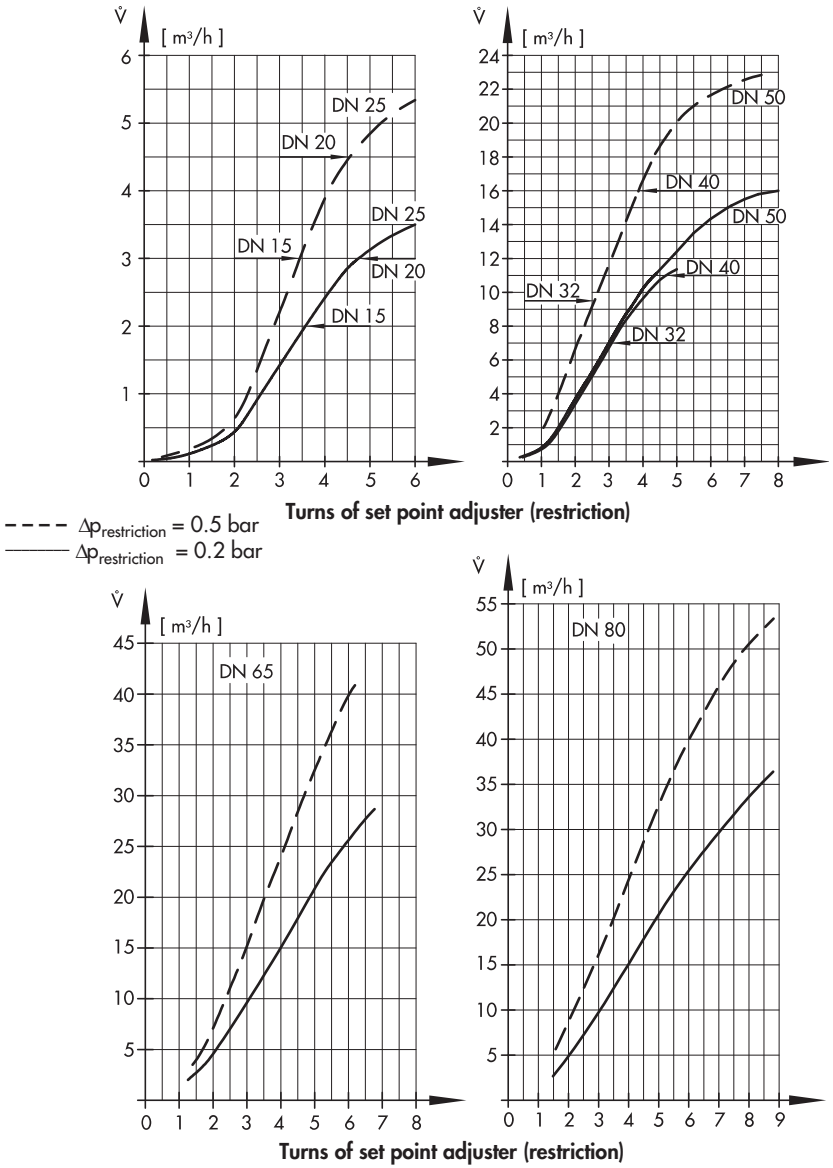
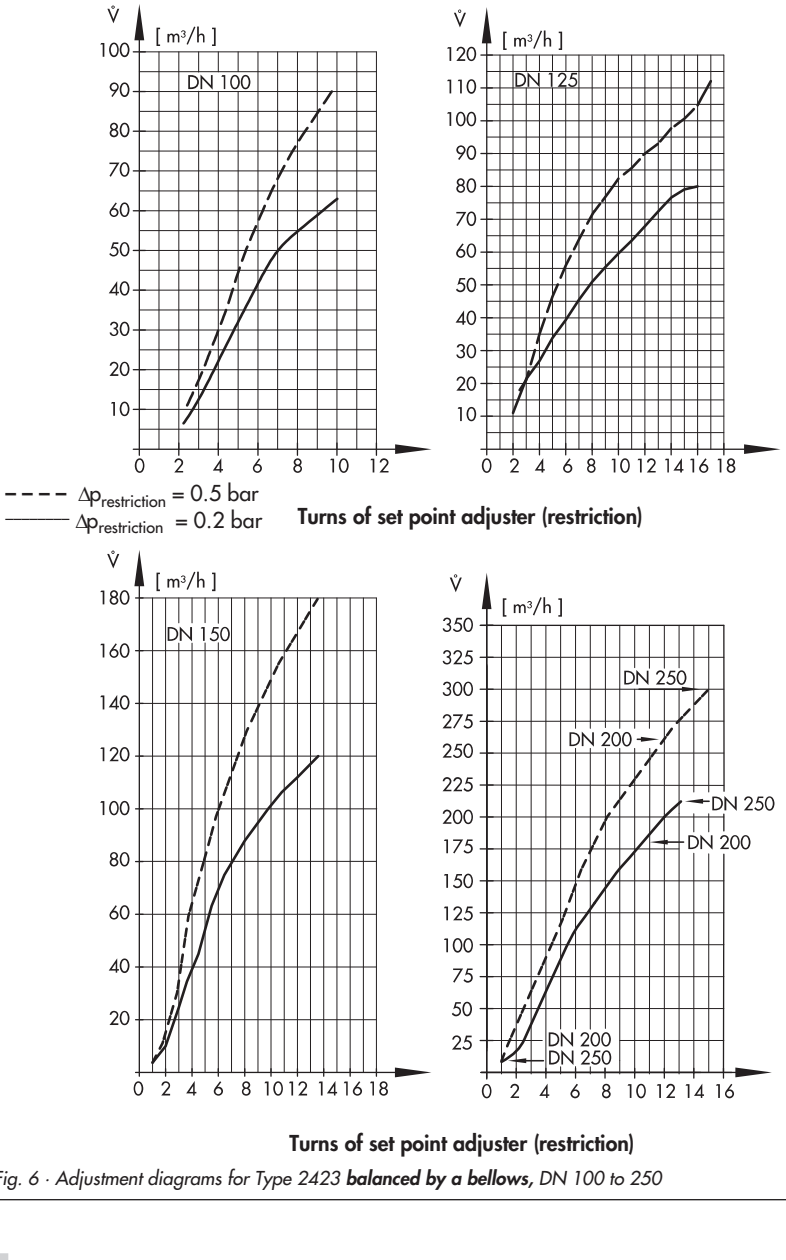
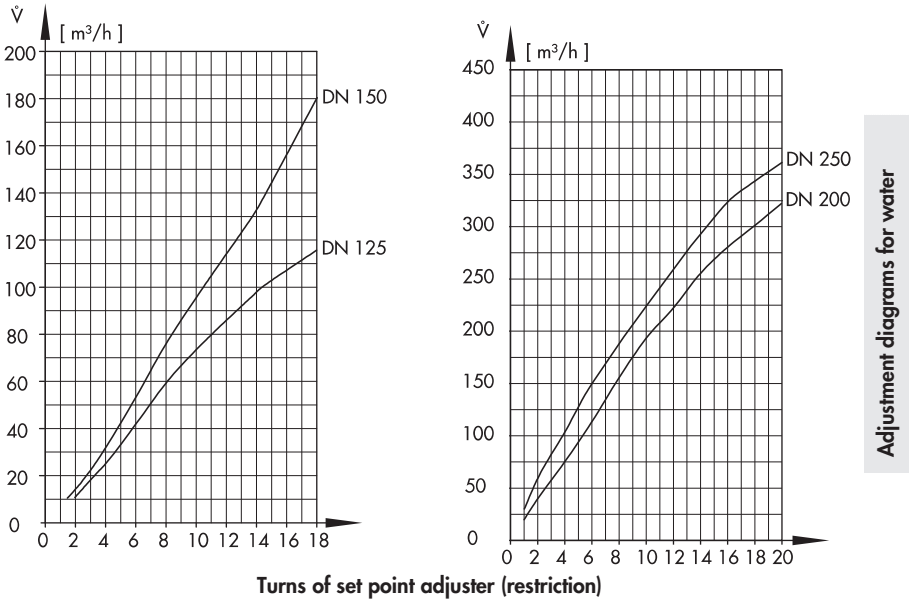


Fig. 5 · Adjustment diagrams for Type 2423 ***balanced by a bellows****, DN 15 to 80*



Adjustment diagrams for water

Fig. 6 · Adjustment diagrams for Type 2423 ***balanced by a bellows,*** *DN 100 to 250*



Adjustment diagrams for water

Fig. 7 · Adjustment diagrams for Type 2423 ***balanced by a diaphragm****, DN 125 to 250*

3.3 Decommissioning

Close the shut-off valves starting from the flow pipe side (high-pressure line).

4 Maintenance · Troubleshooting

The flow regulators are maintenance free. Nevertheless, they are 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.

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.
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.
We recommend to remove the valve from the pipeline. Make sure that all the plant sections connected to the control line are also depressurized. If this is not the case, shut off the control line.

Details on malfunctions and the recommended action can be found in the **Table 2 · Troubleshooting**.

Proceed as described in section 4.1 if the operating diaphragm is defective.

4.1 Replacing the diaphragm

If only the diaphragm is defective, the control line can be unscrewed and the actuator separated from the valve after the relevant section of the plant has been drained without having to remove the valve from the pipeline.

1. Undo screws (15) at actuator and remove the top case together with the actuator stem and spring assembly.
2. Unscrew nut (17), while holding the bottom diaphragm stem stationary using a suitable tool.
3. Lift off diaphragm plate (16) and pull out diaphragm.
4. Insert a new diaphragm (12).
5. Proceed in the reverse order to reassemble the actuator.

Start up as described in section 3.1.

Table 2 · Troubleshooting

Malfunction	Possible reasons	Recommended action
Flow rate exceeds the flow rate set point $\dot{V}$	Seat and plug untight	Remove valve from pipeline. Clean seat and plug. Replace plug, if necessary. Otherwise send the regulator to SAMSON for repair.
	Operating diaphragm defective	Replace diaphragm (see section 4.1) or send the regulator to SAMSON for repair.
	Control line blocked	Remove control line and clean it.
	Valve too large for control task	Recalculate K_{VS} coefficient and contact SAMSON for further action.
Flow rate does not reach the flow rate set point $\dot{V}$	Seat and plug untight	Remove valve from pipeline. Clean seat and plug. Replace plug, if necessary. Otherwise send the regulator to SAMSON for repair.
	Wrong set point range selected	Check set point range and contact SAMSON for further action.
	Safety equipment, e.g. pressure limiter, has been triggered	Check plant and unlock safety equipment.
	Insufficient pressure drop across the plant	Compare existing differential pressure in the plant with the plant's drag. Min. differential pressure across the plant $\Delta p = \Delta p_{restriction} + (\dot{V} / K_{VS})^2$.
	Strainer blocked	Drain and clean filter of the strainer
	Direction of flow, valve incorrectly installed	Install the valve so that the direction of flow is the same as indicated by the arrow.
Control loop hunts	Valve too large for control task	Recalculate K_{VS} coefficient. Contact SAMSON.
	Restriction is missing in the screw fitting to connect the control line to the actuator	Install a screw fitting with restriction.

Contact SAMSON if the malfunction cannot be remedied using the above table.

5 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
- Order number and model number
- Upstream and downstream pressure
- Flow rate in m^3/h
- Min. and max. flow rates
- Has a strainer been installed?
- Sketch of the installation with exact position of regulator and all additional installed components (shut-off valves, pressure gauges, etc.).

6 Technical data

Table 3 · Technical data · Type 42-36

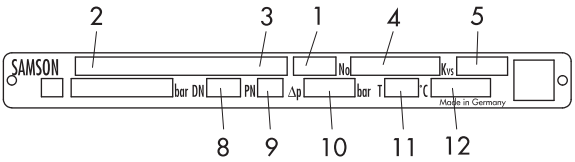
Type 2423 Valve · Balanced by a bellows		
Nominal size		**DN 15** to **250**
Nominal pressure		PN 16, 25 or 40
Max. perm. temperature	Valve body	See pressure-temperature diagram in T 3000 EN
	Actuator	With equalizing tank: Liquids up to 220 °C Without equalizing tank: Liquids up to 150 °C Air and nitrogen up to 150 °C [1]
Set point (diff. pressure at restriction)		0.2 bar · 0.5 bar
See section 8 for assignment of actuator and valve		

Type 2423 Valve · Balanced by a diaphragm		
Nominal size		**DN 125** to **250**
Nominal pressure		PN 16, 25 or 40
Max. perm. temperature	Valve body	See pressure-temperature diagram in T 3000 EN
	Actuator	Water: 150 °C · Air and gases: 80 °C
Set point (diff. pressure at restriction)		0.2 bar · 0.5 bar
See section 8 for assignment of actuator and valve		

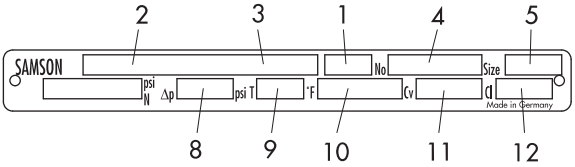
[1] Special version: valve with FPM orifice stem sealing and actuator with FPM diaphragm

7 Nameplates

Valve nameplates



DIN version



ANSI version

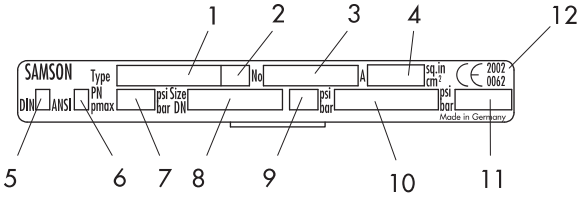
Valve

1 Valve type
2 Model number
3 Model number index
4 Order number or order date
5 K_{VS} coefficient
8 Nominal size
9 Nominal pressure
10 Perm. differential pressure in bar
11 Perm. temperature in °C
12 Body material

ANSI version

5 Valve size
8 Perm. differential pressure in psi
9 Perm. temperature in °F
10 Body material
11 Cv coefficient (K_{VS} x 1.17)
12 ANSI Class (pressure rating)

Actuator nameplate



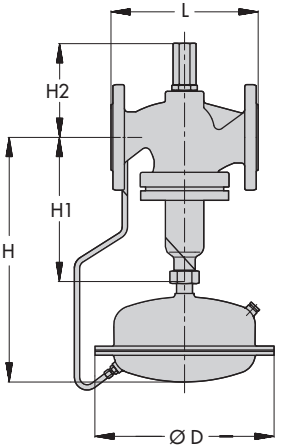
Actuator

1 Model number
2 Model number index
3 Order number or order date
4 Effective diaphragm area
5 Labeling acc. to DIN
6 Labeling acc. to ANSI
7 Max. perm. pressure
8 Nominal size
9 Differential pressure at restriction
10 Set point range
11 Diaphragm material
12 Year of production

Fig. 8 · Nameplates

8 Dimensions and weights

Type 42-36 · Type 2423 Valve balanced by a bellows



Type 42-36, DN 15 to 250

Type 42-36 · Valve balanced by a bellows · Dimensions in mm and weights in kg

Nominal size DN		15	20	25	32	40	50	65	80	100	125	150	200	250
Length L		130	150	160	180	200	230	290	310	350	400	480	600	730
Height H1		225						300		355	460	590	730	
Height H2	Other materials	115			135			195		220	265	295	400	
	1.4571	113	–	130	–	155	161	–						
Height H		390						465		520	625	765	895	
Actuator		∅ D = 225 mm · A = 160 cm² [2]									∅ D = 285 mm A = 320 cm² [3]			
Weight for PN 16[1] in kg		12	12.5	13.5	20	20.5	23	39	44	59	121	171	425	485

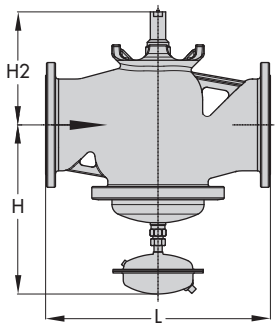
1) For valve in PN 25/PN 40: +10 %

2) Optionally also with actuator 320 cm² (DN 65 to 100).We recommend actuator 320 cm² for regulators with double adapter (see T 3019 EN) in sizes DN 65 to DN 100.

3) Optionally also with actuator 640 cm²

Fig. 9 · Dimensions and weights, Type 42-36 with Type 2423 Valve balanced by a bellows

Type 42-36 · Type 2423 Valve balanced by a diaphragm



Type 42-36, DN 125 to 250

Type 42-36 · Balanced by a diaphragm · Dimensions in mm and weights in kg

Nominal size	DN 125	DN 150	DN 200	DN 250
Length L	400	480	600	730
Height H1	450	475	545	
Height H2	295	325	345	375
Weight for PN 16[1] in kg				
Type 2423 Valve	65	85	250	270
Type 2426 Actuator	20	20	30	30

[1] For valve in PN 25/PN 40: +10 %

Fig. 10 · Dimensions and weights, Type 42-36 with Type 2423 Valve balanced by a diaphragm

Conversion from chromate coating to iridescent passivation

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

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