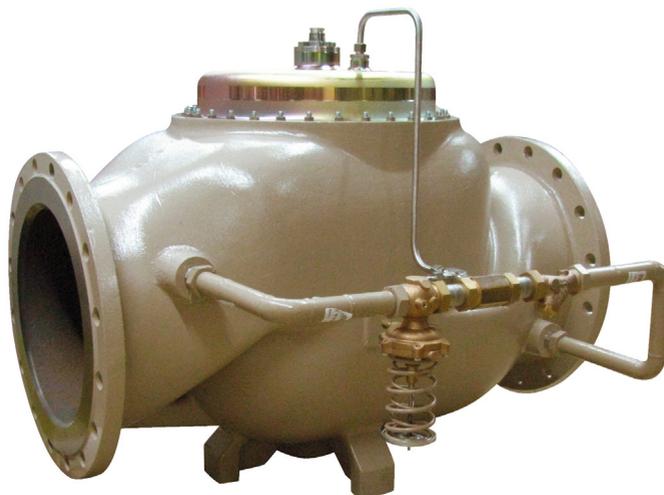


# MOUNTING AND OPERATING INSTRUCTIONS



## EB 3210 EN

Translation of original instructions



Type 2334 Differential Pressure Regulator, balanced by a diaphragm,  
DN 400 (standard version)

## Type 2334 Universal Regulator with pilot valve Self-operated Regulators

Edition March 2024



## 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 ([aftersaleservice@samsongroup.com](mailto:aftersaleservice@samsongroup.com)).



Documents relating to the device, such as the mounting and operating instructions, are available on our website at [www.samsongroup.com](http://www.samsongroup.com) > **Downloads > Documentation.**

### **⚠ WARNING**

#### **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

▶ <https://www.samsongroup.com/en/about-samson/environment-social-governance/material-compliance/reach-regulation/>.

### 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

#### **ℹ Note**

Additional information

#### **💡 Tip**

Recommended action

<b>1</b>	<b>General safety instructions</b> .....	<b>4</b>
<b>2</b>	<b>Process medium and scope of application</b> .....	<b>5</b>
2.1	Transportation and storage .....	5
<b>3</b>	<b>Design and principle of operation</b> .....	<b>6</b>
3.1	Minimum differential pressure for functioning .....	10
<b>4</b>	<b>Installation</b> .....	<b>11</b>
4.1	Notes on installation .....	11
4.2	Strainers .....	13
4.3	Shut-off valves .....	13
4.4	Pressure gauge .....	13
4.5	Bypass .....	13
4.6	Control line, compensation chamber and needle valve .....	15
<b>5</b>	<b>Operation</b> .....	<b>15</b>
5.1	Start-up.....	15
5.2	Adjusting the set point .....	16
5.2.1	Pressure regulators and differential pressure regulators .....	16
5.2.2	Flow regulators .....	17
5.2.3	Combined regulators.....	22
5.3	Decommissioning.....	22
<b>6</b>	<b>Cleaning and maintenance</b> .....	<b>22</b>
<b>7</b>	<b>After-sales service</b> .....	<b>23</b>
<b>8</b>	<b>Nameplate</b> .....	<b>24</b>
<b>9</b>	<b>Technical data</b> .....	<b>25</b>
<b>10</b>	<b>Dimensions</b> .....	<b>27</b>
<b>11</b>	<b>Device versions</b> .....	<b>30</b>



### 1 General safety instructions

- The device must be mounted, started up or serviced by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. Make sure employees or third parties are not exposed to any danger.
- All safety instructions and warnings given in these mounting and operating instructions, particularly those concerning installation, start-up, and maintenance, must be strictly 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 dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- The devices comply with the requirements of the European Pressure Equipment Directive 2014/68/EU. Devices with a CE marking have an EC declaration of conformity, which includes information about the applied conformity assessment procedure. This EC declaration of conformity can be provided on request.
- To ensure appropriate use, only use the device in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the device at the ordering stage.
- The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.
- Any hazards that could be caused in the regulator by the process medium, operating pressure or by moving parts are to be prevented by taking appropriate precautions.
- Proper transport, storage, installation, operation, and maintenance are assumed.

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#### **NOTICE**

*According to the ignition risk assessment performed in accordance with Clause 5.2 of ISO 80079-36, the non-electrical actuators and valve versions do not have their own potential ignition source even in the rare incident of an operating fault. As a result, they do not fall within the scope of Directive 2014/34/EU (ATEX). For connection to the equipotential bonding system, observe the requirements specified in Clause 6.4 of EN 60079-14 (VDE 0165-1).*

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## 2 Process medium and scope of application

Pilot-operated pressure, differential pressure, flow rate, temperature <sup>1)</sup> or combined regulators, optionally with additional electric actuator · Main valve in nominal sizes **DN 65 to 400**  
· Pressure rating **PN 16 to 40** · **Flange end connections** · For heating and cooling plants · Suitable for **liquids** from **5 to 150 °C**, **non-flammable gases** up to **80 °C**

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### **⚠ WARNING**

***Risk of uncontrolled excess pressure in the plant.***

***Risk of bursting***

*If necessary, a suitable overpressure protection must be installed on site in the plant section.*

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### 2.1 Transportation and storage

The device must be carefully handled, transported and stored. Protect the regulator against adverse influences, such as dirt, moisture or temperature outside the ambient temperature range.

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

When regulators are too heavy to be lifted by hand, fasten the lifting equipment to a suitable place on the valve body.

---

### **⚠ WARNING**

***Do not attach lifting slings or rigging equipment to mounting parts, such as control line, pilot valve etc.***

***The valve can fall or mounting parts may be damaged.***

*Securely fasten slings or rigging equipment to the valve body and secure against slipping.*

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<sup>1)</sup> Temperature regulator on request.

### 3 Design and principle of operation

See Fig. 1 on page 7.

The universal regulators consist of a large globe valve acting as the main valve and a maximum of three smaller pilot valves connected in parallel in a bypass line. A strainer, Venturi nozzle and needle valve are mounted in the bypass line.

The pressure drop across the regulator is used to operate the valve, whereby the Venturi nozzle in the bypass line amplifies the pressure drop as the flow rate increases. The pilot valves open depending on the controlled variable used to operate them. As a result, a flow rate arises in the bypass line over the Venturi nozzle, which is used to control the main valve (open or close it). This allows the controlled variable (pressure, differential pressure, flow rate or temperature) to be controlled. Electric signals from an electric actuator can also be used to operate the valve and takes influence on the control loop, too.

The bypass line can be delivered with the instruments hooked up (DN 15 with a main valve, DN 125 to 250 | DN 25 with a main

valve, DN 300 and 400) or the instruments can be hooked up on site (DN 25, DN 40).

The medium flows through the area released between the plug and seat. It flows out of the valve at a downstream pressure  $p_2$  dependent on the plug position. During this process, several forces are compared.

- The force resulting from the upstream pressure  $p_1$  acts on the plug surface.
- The force created by the control pressure  $p_s$  acts on the base of the balancing bellows or the operating diaphragm. This pressure is determined by the Venturi nozzle or the pilot valve.
- The force of the set point springs acts on the plug.

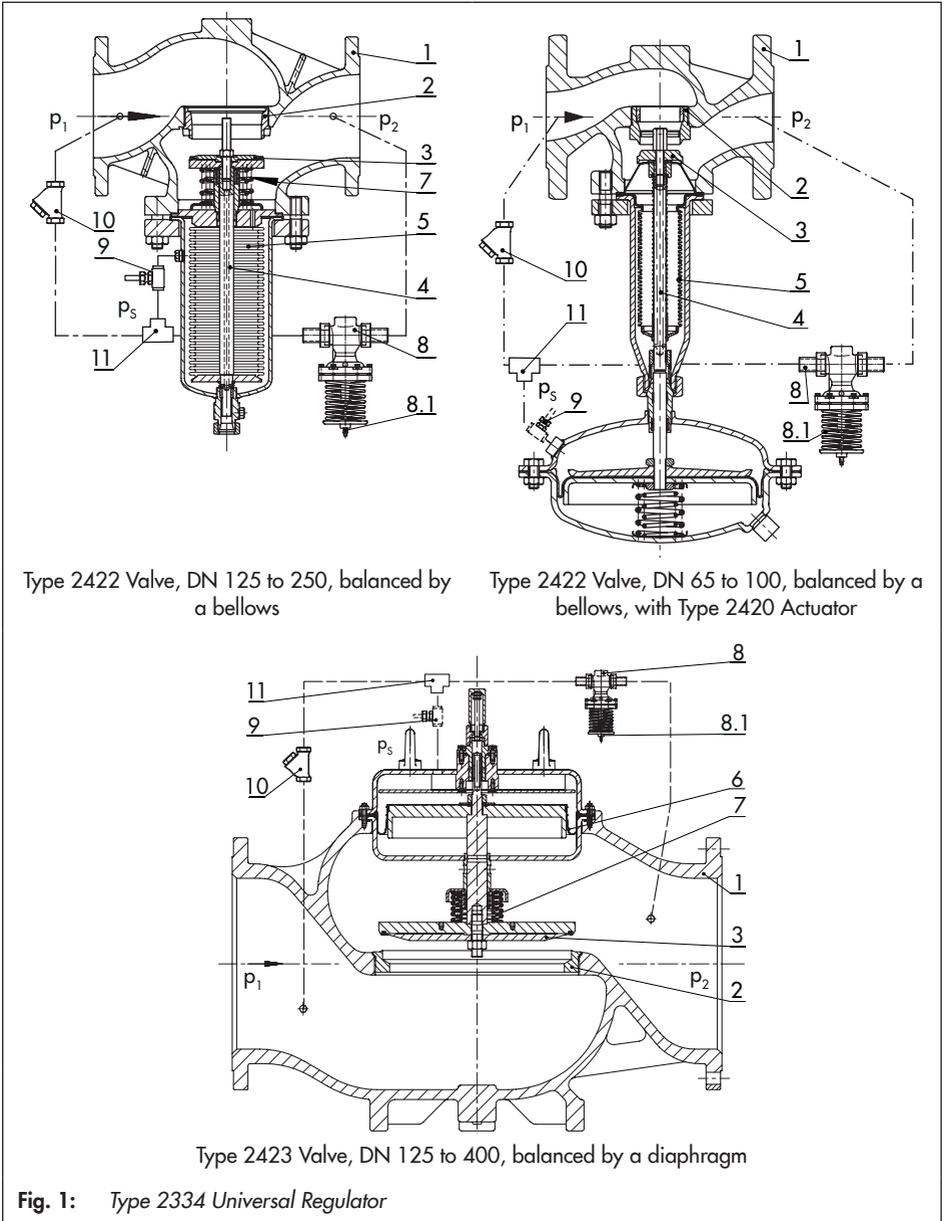
If the pilot valve opens, the control pressure  $p_s$  drops and the plug stem with plug move in the opening direction until a new state of equilibrium is established. If the pilot valve closes, the control pressure  $p_s$  rises and the plug stem with plug move in the closing direction until a new state of equilibrium is established.

When the pilot valve is closed, the control pressure  $p_s$  is the same as the upstream pressure  $p_1$ . The main valve is closed by the force of the set point springs.

Legend for Fig. 1

- 1 Valve body
- 2 Seat
- 3 Plug
- 4 Plug stem
- 5 Operating bellows
- 6 Operating diaphragm

- 7 Set point springs
- 8 Pilot valve
- 8.1 Set point adjuster
- 9 Needle valve
- 10 Strainer
- 11 Venturi nozzle

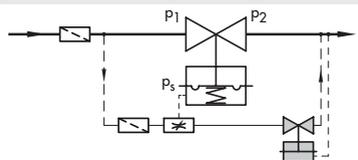
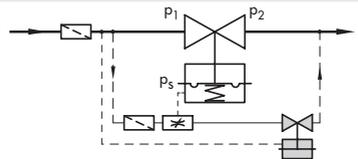
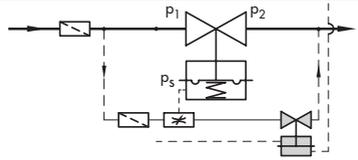
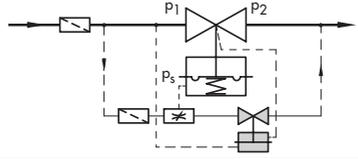


## Design and principle of operation

### Type 2334 · Possible configurations

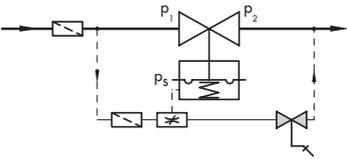
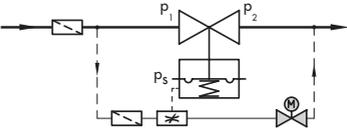
The following schematic diagrams show the principle setup of a Type 2334 Universal Regulator and its possible functions.

A maximum of three pilot valves can be installed in the bypass line.

Main valve	Pilot valve	Schematic diagram	Refer to Data Sheet
<b>Pressure reducing valves</b>			
Type 2422	Type 44-2, Type 44-3 Type 44-9 Type 41-23 Type 36-3		T 2623   EB 2623-1 T 2630   EB 2630 T 2512   EB 2512 T 2546   EB 2546-1
<b>Excess pressure valve</b>			
Type 2422	Type 44-7, Type 44-8, Type 44-4		T 2723   EB 2723 T 2632   EB 2632
<b>Differential pressure regulators</b>			
Type 2422	Types 45-1, 45-2, 45-3 and 45-4 Type 42-24 Type 42-25		T 3124   EB 3124 T 3003   EB 3003 T 3007   EB 3007
<b>Flow regulators</b>			
Type 2423	Types 45-1, 45-2, 45-3 and 45-4		T 3124   EB 3124

Main valve	Pilot valve	Schematic diagram	Refer to Data Sheet
<b>Flow and differential pressure regulators</b>			
Type 2423	Type 45-1, Type 45-2 (installation in flow pipe) Type 45-1, Type 45-4 (installation in return flow pipe)		T 3124   EB 3124
Type 2423 (≤DN 250 in the flow pipe)	Type 2334 with same function as Type 42- 39 Type 45-1, Type 45-2 (installation in flow pipe)		T 3017   EB 3017 T 3124   EB 3124
Type 2423 (≤DN 250 in the return flow pipe)	Type 2334 with same function as Type 42- 37 Type 45-1, Type 45-4 (installation in return flow pipe)		T 3017   EB 3017 T 3124   EB 3124
Type 2422 (≤DN 300 in the flow pipe)	Type 2334 with same function as Type 42- 39 Type 45-1, Type 45-2 (installation in flow pipe) with external orifice plate		T 3017   EB 3017 T 3124   EB 3124
Type 2422 (≤DN 300 in the return flow pipe)	Type 2334 with same function as Type 42- 37 Type 45-1, Type 45-4 (installation in return flow pipe) With external orifice plate		T 3017   EB 3017 T 3124   EB 3124

## Design and principle of operation

Main valve	Pilot valve	Schematic diagram	Refer to Data Sheet
<b>Temperature regulators</b>			
Type 2422	On request		
<b>Regulator with additional electric actuator, controlled by a binary signal</b>			
Type 2422	On request		

### 3.1 Minimum differential pressure for functioning

To allow a pilot-operated regulator to function, a minimum differential pressure  $\Delta p_{\min}$  must prevail in the plant. If this minimum differential pressure  $\Delta p_{\min}$  across the regulator does not exist, the regulator remains closed or opens only partly.

If the maximum flow rate is not achieved, the differential pressure  $\Delta p$  can be raised by increasing the upstream pressure.

**Table 1:** Required *differential pressure*  $\Delta p_{\min}$  of the standard version

Type 2422/2423 (main valve)	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 400
Type 2422 Valve balanced by a bellows with Type 2420 Actuator	A = 320 cm <sup>2</sup> : 0.4 bar A = 640 cm <sup>2</sup> : 0.2 bar			-					
Type 2422 balanced by a bellows	-			1.0 bar	0.7 bar		-		
Type 2422 balanced by a diaphragm	-			0.8 bar	0.4 bar		0.5 bar		
Type 2423 balanced by a bellows with Type 2420 Actuator	A = 320 cm <sup>2</sup> : 0.6 bar A = 640 cm <sup>2</sup> : 0.5 bar			-					

Type 2423 balanced by a bellows	–	1.2 bar	1.3 bar	1.0 bar	–
Type 2423 balanced by a diaphragm	–	1.1 bar		0.6 bar	–
Type 2422 balanced by a diaphragm, with external orifice plate	–			0.7 bar	0.5 bar

## 4 Installation

Select the installation location making sure that the regulator is installed at a distance of at least six times the nominal size (DN) away from pipe fittings or instruments that cause flow turbulence (e.g. pipe bends, manifolds, pressure measuring points or other valves). They can change the flow conditions which may lead to an instable control process especially in applications with gases, air or steam.

Contact SAMSON to obtain the TV-SK 17041 documentation which contains more details on installation requirements.

### 4.1 Notes on installation

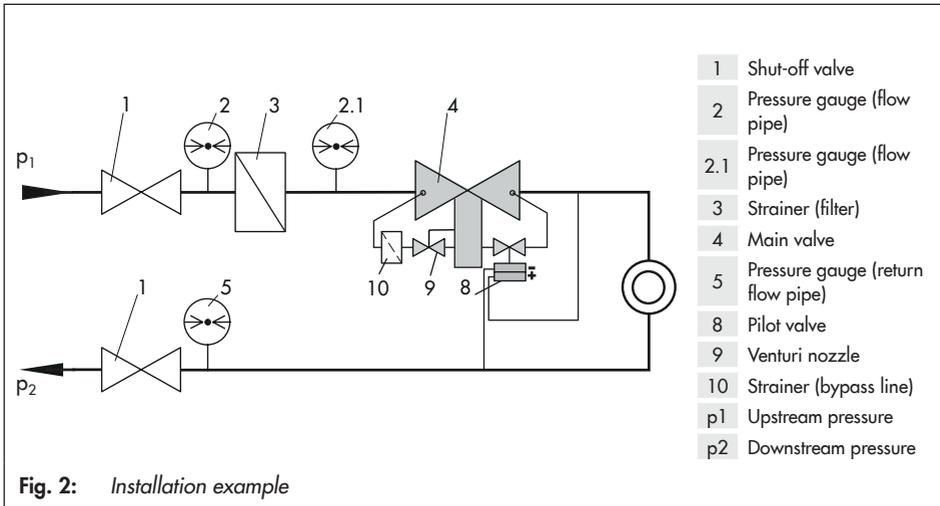
Install the ready-assembled universal regulator in horizontal pipelines.

- Flush and clean the pipeline thoroughly (for several minutes at maximum flow rate) before installing the regulator. Otherwise, impurities in the pipeline may impair the proper functioning of the valve, above all the tight shut-off.

- The direction of flow must match the direction indicated by the arrow on the body.
- Install the regulator free of stress. If necessary, support the pipeline near the connecting flanges. Do not attach supports directly to the valve or actuator.
- Install a strainer upstream of the regulator.
- Protect the regulator from icing up when controlling media that can freeze. If necessary, depressurize and drain the regulator and remove it from the pipeline while the plant is shut down.
- Tighten the screw fittings in the control line of ready hooked-up bypass line.

#### **i** Note

*The side on which the operating elements (hook-up of the pilot valve) are located varies depending on whether a valve balanced by a bellows or a diaphragm is used.*



## Mounting orientation

### Valve balanced by a bellows

- Bellows including housing suspended downward.

### Valve balanced by a diaphragm

- Balancing diaphragm (diaphragm section) pointing upward

**Insulation** · To insulate cold systems, we recommend first filling the plant and carefully rinsing it (see Chapter 5.1). The regulator must not be insulated until the set point is adjusted.

- Start up the plant and adjust the set point. Shut down the plant again and let it heat up until the condensation water has dried off.
- Afterwards, insulate the regulator and pipes conveying the process medium using insulation material with a water vapor barrier. If the pilot valve has a

spring, it must be protected by a sleeve to allow it to move. The spring-loaded actuator stem must not touch the insulation.

## Thermal insulation

### **i** Note

*Do not insulate the pilot valve as well in applications with medium temperatures above 80 °C.*

**Pressure testing of the plant** · The pressure must not exceed the maximum permissible pressure of the regulator and plant on testing the pressure of the plant when the regulator is already installed. An excessive test pressure can damage the balancing bellows or diaphragm. If necessary, remove the regulator from the pipeline or isolate the regulator in the pipeline and install a bypass line.

## 4.2 Strainers

Install a strainer (e.g. SAMSON Type 1/ Type 2) upstream of the regulator.

- Do not use the strainer to permanently filter the process medium.
- The direction of flow must correspond to the arrow on the body.
- The filter element must be installed to hang downwards or sideways for applications with steam.



**Tip**

*Remember to leave enough space to remove the filter element.*

---

## 4.3 Shut-off valves

Install a hand-operated shut-off valve both upstream of the strainer and downstream of the regulator. This allows the plant to be shut down for cleaning and maintenance, and when the plant is not used for longer periods of time.

## 4.4 Pressure gauge

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

Pressure reducing function: install the pressure gauge on the downstream side behind the downstream pressure tapping point of the control line.

Excess pressure function: install the pressure gauge on the upstream side in front of the

upstream pressure tapping point of the control line.

Differential pressure control: install a pressure gauge in the flow pipe and the return flow pipe. Select the point of installation upstream of the pressure tapping point and downstream of the pressure tapping point in the return flow pipe. Avoid installing them close to components that distort pressure measurement, if at all possible.

## 4.5 Bypass

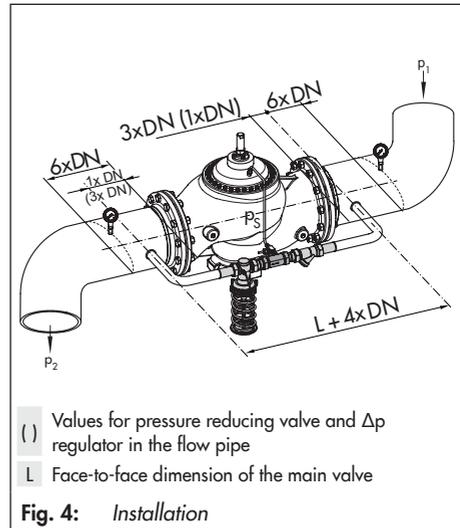
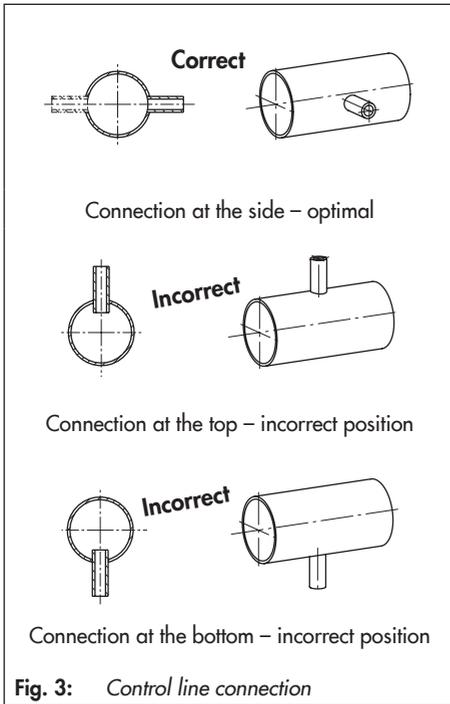
The bypass line with the installed pilot valve (max. three valves possible) has a minimum length of  $L + 4 \times DN$  (L being the face-to-face dimension of the main valve).

Depending on the function of the regulator, the bypass line does not have to run symmetrically.

Minimum distances for pressure reducing valves and differential pressure regulators in the flow pipe:  $1 \times DN$  upstream and  $3 \times DN$  downstream.

Minimum distances for excess pressure valves and differential pressure regulators in the return flow pipe:  $3 \times DN$  upstream and  $1 \times DN$  downstream.

## Installation



## 4.6 Control line, compensation chamber and needle valve

The control line must be provided on site as a 6 x 1 mm pipe (pilot valve with male thread connection) or as a 8 x 1 mm pipe (pilot valve with flanged connection). We recommend to connect it at the side of the main pipe (see Fig. 3). Make sure that the control line connection is at least six times the nominal size (DN) away from pipe fittings or instruments that cause flow turbulence (e.g. pipe bends or manifolds). See Fig. 3. How the lines are routed generally depends on the installation site.

Attach compensation chambers close to the main pipeline and not near the actuator. Pressure reducing valves and excess pressure valves are delivered with control lines which are shaped in such a way that the above mentioned unfavorable effects of the medium flow do not affect them.

All differential pressure regulators come with two external control line connections.

During installation and connection of the control lines, keep the specified distances (see also Fig. 4).

Needle valves and compression-type screw fittings can be supplied as required. These accessories are listed in ► T 3095.

## 5 Operation

### 5.1 Start-up

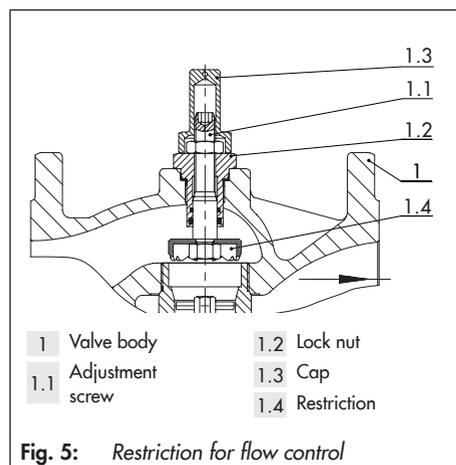
#### **i** Note

*Do not start up the regulator until all parts have been mounted (e.g. valve, actuator, and control lines).*

Open control lines with needle valve and before start-up check to ensure they are connected correctly.

#### **i** Note

*Type 2423 as main valve (flow regulator). On filling the plant, make sure the restriction (1.4) is open by turning the adjustment (1.1) screw counterclockwise (↺) as far as it will go.*



## Operation

- ➔ Open all the valves on the consumer side.
- ➔ Open the shut-off valves preferably starting from the return flow pipe.
- Slowly open the valves in small steps waiting a few minutes in between.

**Rinsing the plant** · After filling the plant, first completely open the consumers. If this is not possible, open the bypass line. Open the restriction to adjust the flow rate.

Rinse out the pipeline at full flow rate for several minutes. Check the installed strainer (e.g. by measuring the pressure drop). Clean the strainer, if necessary.

---

### **NOTICE**

*The pressure at the actuator must not exceed the permissible pressure on testing the pressure of the plant. If necessary, detach the control line and seal the openings with end plugs. Alternatively, install a shut-off valve in the control line.*

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

---

### **Control applications with liquids**

To start up the pressure reducing valve, open shut-off valves slowly.

## 5.2 Adjusting the set point

### 5.2.1 Pressure regulators and differential pressure regulators

#### Type 2422 as main valve

Adjust the required set point while the plant (consumer) is partly open by turning the set point adjuster at the pilot valve.

The pilot valve must remain mounted with the set point adjuster suspended downwards in the control line. Perform the adjustment preferably in the operating point (rated flow rate).

- Turn clockwise (↻) to load the set point spring; the set point is increased.
- Turn counterclockwise (↺) to relieve tension from the set point spring; the set point is reduced.
- ➔ First set the minimum set point by turning the set point adjuster counterclockwise (↺).
- ➔ Wait until the universal regulator starts to regulate before adjusting the set point by slowly turning the adjuster clockwise (↻).  
Details can be found in the mounting and operating instructions of the corresponding pilot valve.

**i Note**

Turn the set point adjuster one turn only initially (possibly repeat) and wait until the plant reacts.

Afterwards, the set point can be adjusted to the required value in larger steps.

- Turning it clockwise (↻) closes the restriction; the flow rate drops.
- Turning it counterclockwise (↺) opens the restriction; the flow rate rises.

The control and shut-off valves as well as all consumers or a bypass valve (if installed) must be open to ensure that the maximum flow rate is reached.

## 5.2.2 Flow regulators

### Type 2423 as main valve

Adjust the required set point while the plant (consumer) is partly open by turning the set point adjuster at the pilot valve.

The pilot valve must remain mounted with the set point adjuster suspended downwards in the control line. Perform the adjustment preferably in the operating point (rated flow rate).

- ➔ Set the required flow rate by adjusting the restriction at the main valve. In this case, use the flow rate measuring unit of the heat meter, for example and watch its reading (see Table 2).

To adjust the flow rate, use the adjustment diagrams for water (Fig. 6, Fig. 7 and Fig. 8).

**i Note**

Adjustment is always based on the closed restriction.

**i Note**

Observe the differential pressure across the restriction  $\Delta p_{\text{restriction}}$  of 0.2 bar or 0.5 bar (see Chapter 8). It is determined by the springs installed in the actuator.

- ➔ Unscrew cap (1.3) and undo lock nut (1.2). Turn restriction screw clockwise as far as it will go.
- ➔ Find the flow rate set point in the diagram and determine the associated number of turns.
- ➔ Based on a closed restriction, turn the restriction screw counterclockwise (↺) to adjust this value. Wait until the plant has settled. If necessary, readjust.

## Operation

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### **i Note**

*As a rule of thumb: first adjust to a value approx. ½ turn below the required set point. Wait until the plant reacts, then make fine adjustments.*

---

- ➔ Check the flow rate at the heat meter and correct it, if necessary.
- ➔ Lock the restriction screw in place with the nut (1.2) and screw the cap (1.3) back on after the required flow rate is reached.
- ➔ Close a possibly open bypass valve again.
- ➔ Lead-seal the setting, if necessary.

### **Adjust the flow rate.**

Adjust the flow rate with the high plant differential pressure by fully loading the set point spring of the pilot valve (Type 45-2 or Type 45-4).

This setting only affects the flow rate.

1. Load the set point spring of the Type 2424 Actuator until the flow rate reading on the heat meter indicates the required value.
2. Lead-seal the set point adjuster using the boreholes in the spring plate and in the set point adjuster.

### **Type 90 Orifice Flange**

External Type 90 Orifice Flanges are available for DN 300 and DN 400 regulators.

Both connections of the orifice flange are connected to the Type 42-24 Regulator (pilot valve). The differential pressure across the re-

striction is measured and processed by this regulator.

- Load the set point springs by turning the set point adjuster clockwise (↻). The flow rate increases.
- Relieve the tension from the set point springs by turning the set point adjuster counterclockwise (↺). The flow rate drops.

The connection upstream of the orifice flange is routed to the high-pressure connection of the actuator.

The connection downstream of the orifice flange is routed to the low-pressure connection of the actuator.

The plant differential pressure is transferred to both connections of the Type 45-2 or Type 45-4 Regulator (pilot valve).

The high-pressure connection is connected to the flow pipe and low-pressure connection to the return flow pipe.

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### **i Note**

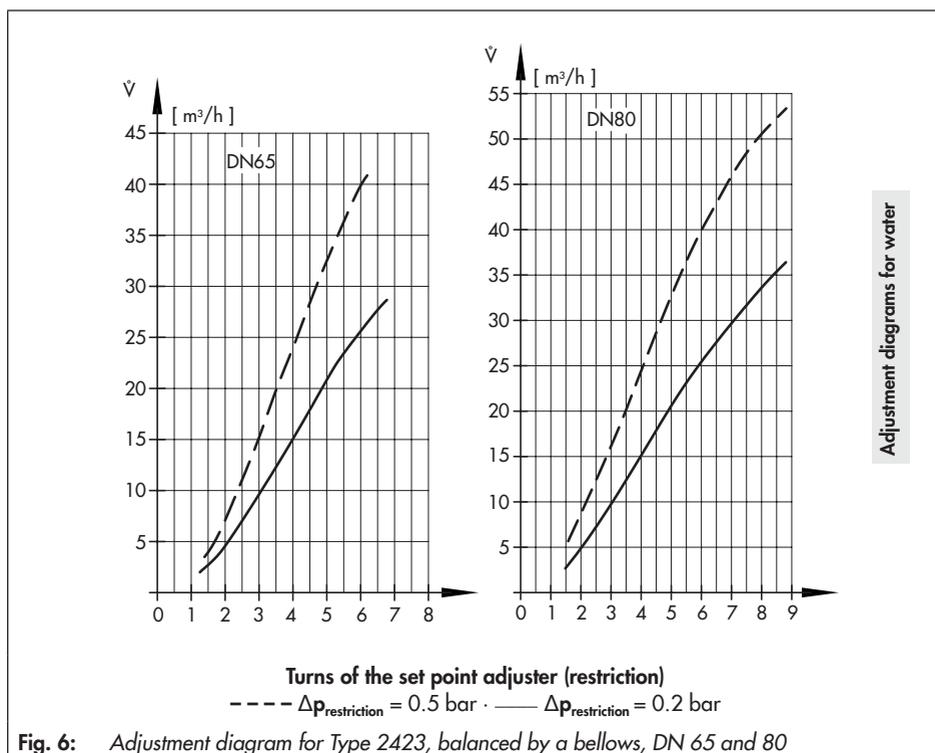
*The Type 2334 Universal Regulator must not be installed in its own separate control loop. Otherwise, the control loop feedback acts on the final control element.*

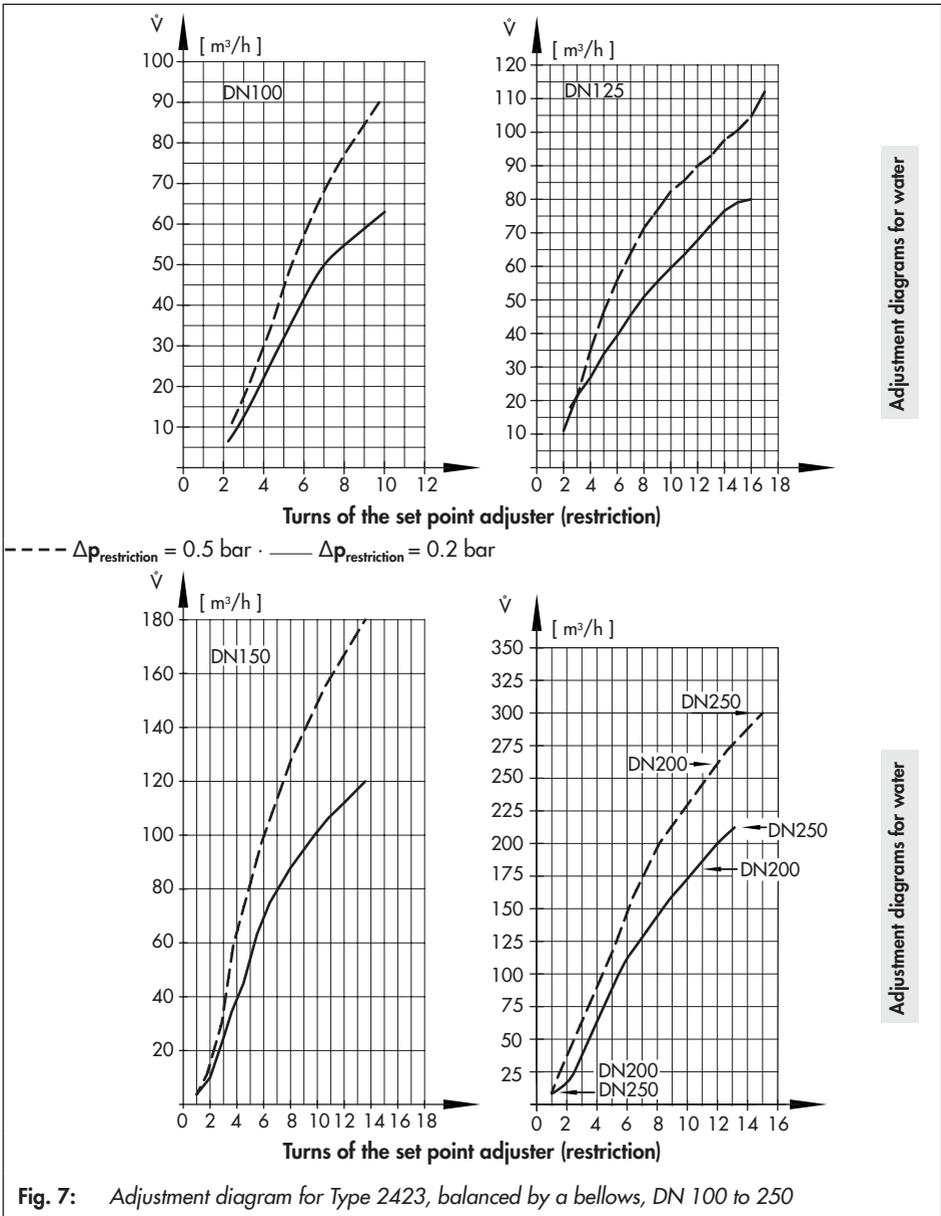
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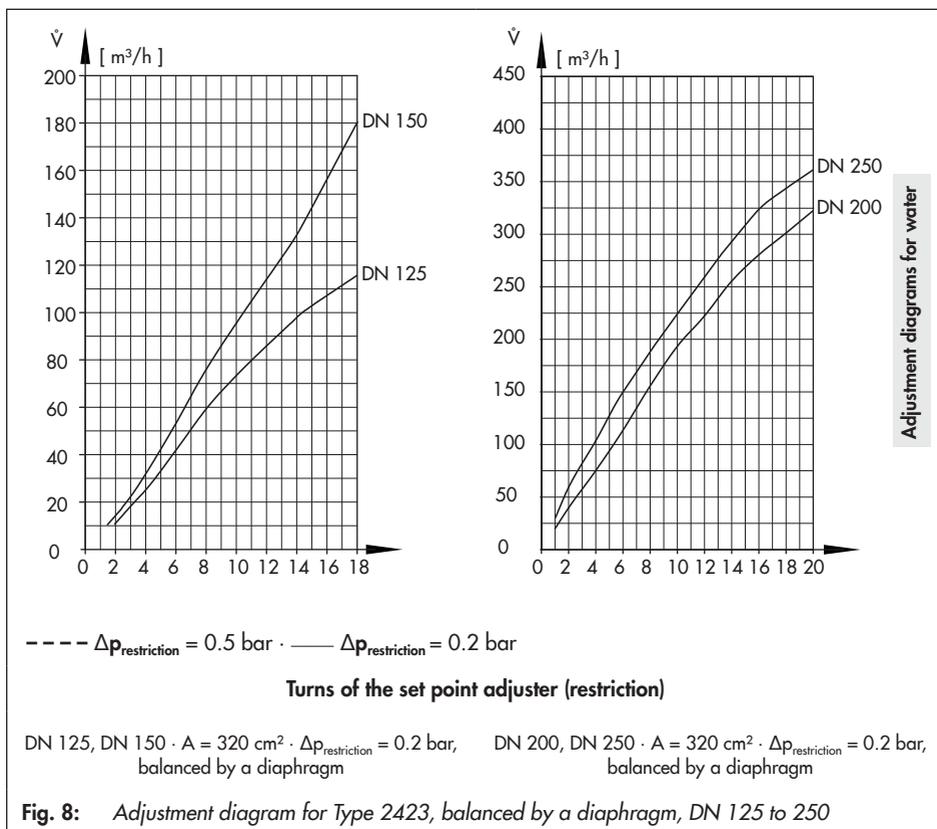
**Table 2:** Flow rate set point ranges for water

Type 2423 · Balanced by a bellows · Flow rate set point ranges for water in m <sup>3</sup> /h							
Nominal size	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250
Diff. pressure 0.2 bar	2 to 28	3.5 to 35	6.5 to 63	11 to 80	18 to 120	20 to 180	26 to 220
across restriction $\Delta p_{\text{restriction}}$ 0.5 bar	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 $\Delta p$	20 bar		16 bar		12 bar	10 bar	
Type 2423 · Balanced by a diaphragm · Flow rate set point ranges for water in m <sup>3</sup> /h							
Nominal size <sup>1)</sup>	DN 125	DN 150	DN 200	DN 250			
Diff. pressure 0.2 bar	11 to 120	18 to 180	20 to 320	26 to 350			
across restriction $\Delta p_{\text{restriction}}$ 0.5 bar	18 to 180	20 to 260	26 to 450	30 to 520			
Max. perm. differential pressure $\Delta p$	12 bar			10 bar			

<sup>1)</sup> Special version for DN 300/400 on request.







**Fig. 8:** Adjustment diagram for Type 2423, balanced by a diaphragm, DN 125 to 250

### 5.2.3 Combined regulators

#### Type 2423 as main valve

If several functions are to be adjusted, they must not affect each other during the set point adjustment.

Adjust the flow rate set point first. In this case, the set point spring of the pilot valve for pressure or differential pressure must be tensioned to the maximum by turning the set point adjuster clockwise (↻) to allow the maximum set point to be adjusted.

Proceed as described for flow rate adjustment in Chapter 5.2.2.

The differential pressure or pressure control is adjusted at approx. 5 % of the flow rate set point. Close a motorized valve to approx. 10 % of the valve travel.

Proceed as described for pressure or differential pressure adjustment in Chapter 5.2.1.

---

#### **i** Note

##### **Needle valve**

*If the universal regulator reacts too quickly after load changes, close the needle valve in steps of ¼ turns until the regulator reacts optimally.*

*The needle valve is delivered fully open (approx. 2.5 turns).*

*Do not completely close the needle valve.*

---

### 5.3 Decommissioning

Close first the shut-off valve on the upstream side of the valve and then on the downstream side of the valve.

## 6 Cleaning and maintenance

The universal regulator does not require much maintenance. Nevertheless, the seat, plug and operating diaphragm of the main valve and pilot valve are subject to natural wear.

Depending on the operating conditions, check the regulator at regular intervals to avoid possible malfunctions.

---

#### **⚠ WARNING**

***Be aware of the risks on performing work on pressurized or hot plant sections.***

*Hot process medium can escape uncontrolled on dismantling the regulator. Risk of scalding.*

→ *Allow the regulator to cool down before depressurizing and draining it and remove it from the pipeline.*

---

Malfunctions are often caused by mechanical faults in the main valve or pilot valve as well as incorrect regulator sizing.

- If the set point deviates too much from the adjusted value, first check the control lines for blockage as well as the Venturi nozzle, needle valve and strainer.

- The regulator does not close properly anymore if the operating diaphragm or operating bellows leaks. The valve does not close properly anymore when the seat is damaged.

To repair the pilot valve, read the operating instructions for the corresponding regulator (pilot valve).

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

As in many cases, special tools are required, we advise you to contact SAMSON's After-sales Service. You can find out how to proceed to repair the regulator or replace a component (see Chapter 7).

## 7 After-sales service

If malfunctions or defects occur, contact the SAMSON's After-sales Service for support.

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website (► [www.samsongroup.com](http://www.samsongroup.com)), in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

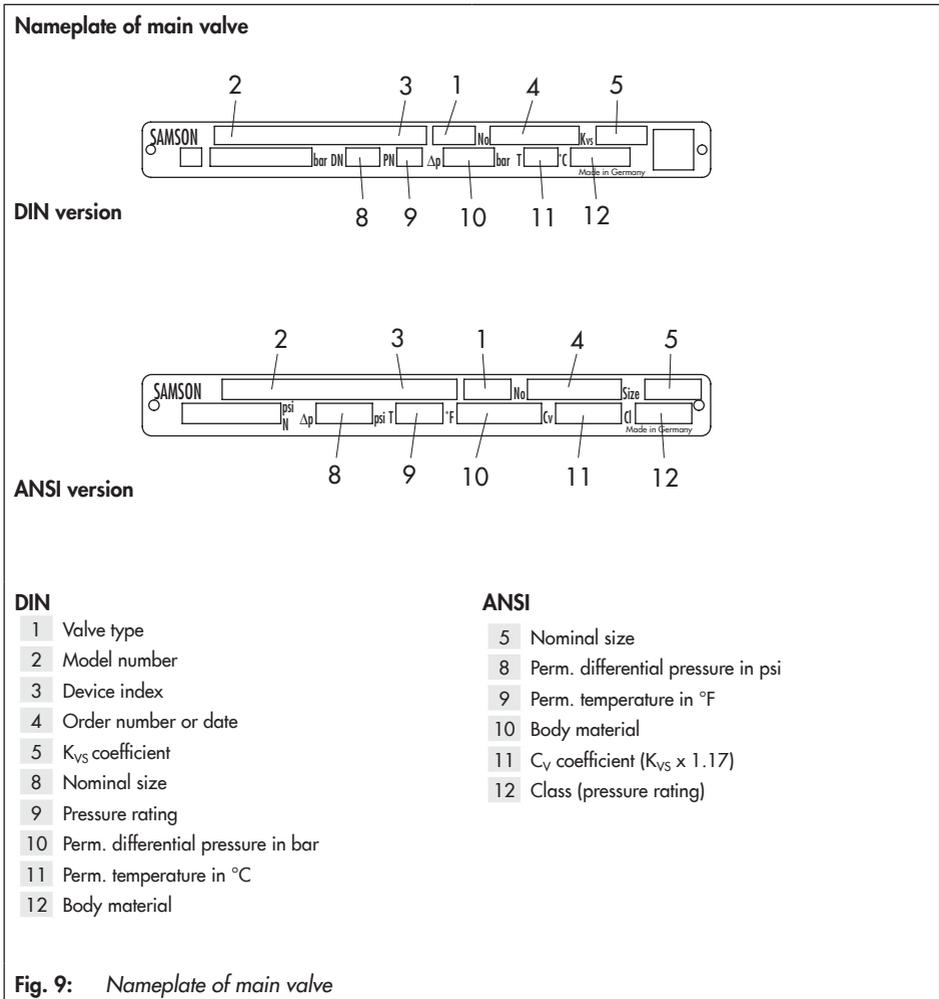
Please send your inquiries to: **service@samsongroup.com**

To assist diagnosis, specify the following details (see Chapter 8):

- Valve type and nominal size
- Order and model number
- Order number or date
- Upstream and downstream pressure
- Temperature and process medium
- Min. and max. flow rate in m<sup>3</sup>/h
- 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.)

Photo of the installed regulator with all components in the installed stated, if possible

## 8 Nameplate



## 9 Technical data

Type 2422 · Type 2423 as main valve · Balanced valve · Functioning as a closing valve or opening valve · Type 2423 with integrated restriction to adjust the flow rate set point

**Table 3: Technical data**

Type 2422 and Type 2423 Valves										
Nominal size	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 400	
Pressure rating	PN 16 to 40									
Leakage class according to IEC 60534-4	≤0.05 % of $K_{VS}$ coefficient									
Conformity	<b>CE · EAC</b>									
Max. permissible temperature	150 °C								80 °C	
Set point ranges in bar, continuously adjustable at the pilot valve	Depending on the pilot valve									
Type ... Pilot Valve	Depending on the application									
Type 2334 · Basic version	DN 15							DN 25		
Type 2334 · Version with bypass line	DN 25				DN 40					
Type 2334 · With Type 2420 Actuator	320 cm <sup>2</sup> actuator area			640 cm <sup>2</sup> actuator area				–		

**Table 4:  $K_{VS}$  coefficients and  $x_{FZ}$  values**

Type 2422 and Type 2423 Valves · Balanced by a bellows							
Nominal size	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250
Standard $K_{VS}$ coefficient	50	80	125	200	360	520	620
$x_{FZ}$ value	0.4	0.35				0.3	
Reduced $K_{VS}$ coefficient	20	32	80	80 <sup>2)</sup>	125 <sup>2)</sup>	360	
$x_{FZ}$ value	0.4	0.35				0.3	
Type 2422 and Type 2423 Valves · Balanced by a diaphragm							
Nominal size	DN 125	DN 150	DN 200	DN 250	DN 300 <sup>1)</sup>	DN 400 <sup>1)</sup>	
Pressure rating	PN 16 to 40						
$K_{VS}$ coefficient	250	380	650	800	1250	2000	
$x_{FZ}$ value	0.35		0.3			0.2	

<sup>1)</sup> Type 2422 only

<sup>2)</sup> Only with Type 2420 Diaphragm Actuator

## Technical data

**Table 5: Permissible differential pressures  $\Delta p$**

Type 2422 Valve - Balanced by a bellows							
Nominal size	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250
Min. diff. pressure $\Delta p_{\min}$ in bar with Type 2420 Actuator <sup>1)</sup>	0.4 with 320 cm <sup>2</sup> 0.2 with 640 cm <sup>2</sup>			-			
Min. differential pressure $\Delta p_{\min}$ in bar	-			1.0 <sup>1)</sup> · 1.1 <sup>2)</sup>	1.0 <sup>1)</sup> · 0.7 <sup>3)</sup>	0.7 <sup>1)</sup> · 0.4 <sup>3)</sup>	
Min. diff. pressure $\Delta p_{\min}$ in bar <sup>5)</sup>	-			1.9	2.0	1.4	
Max. perm. diff. pressure $\Delta p_{\max}$ in bar	20		16		12	10	
Type 2422 Valve - Balanced by a bellows with reduced $K_{vs}$ coefficient							
Nominal size	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250
Min. diff. pressure $\Delta p_{\min}$ in bar with Type 2420 Actuator <sup>1)</sup>	0.8 with 320 cm <sup>2</sup> 0.4 with 640 cm <sup>2</sup>			0.5 with 640 cm <sup>2</sup>		-	
Min. differential pressure $\Delta p_{\min}$ in bar	-					1.0 <sup>1)</sup> · 0.7 <sup>3)</sup>	
Min. diff. pressure $\Delta p_{\min}$ in bar <sup>5)</sup>	-					2.0	
Max. perm. diff. pressure $\Delta p_{\max}$ in bar	20				16	12	
Type 2422 Valve - Balanced by a diaphragm							
Nominal size	DN 125	DN 150	DN 200	DN 250	DN 300	DN 400	
Min. diff. pressure $\Delta p_{\min}$ in bar	0.8 <sup>1)</sup> · 1.0 <sup>2)</sup>	0.8 <sup>1)</sup> · 0.5 <sup>3)</sup>	0.4 <sup>1)</sup> · 0.2 <sup>3)</sup>		0.5 <sup>4)</sup> · 0.3 <sup>3)</sup>	0.3 <sup>4)</sup> · 0.2 <sup>3)</sup>	
Max. perm. diff. pressure $\Delta p_{\max}$ in bar	12			10		6	
Type 2423 Valve - Balanced by a bellows							
Nominal size	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250
Min. differential pressure $\Delta p_{\min}$ in bar with Type 2420 Actuator <sup>1)</sup>	0.6 with 320 cm <sup>2</sup> 0.5 with 640 cm <sup>2</sup>			-			
Min. diff. pressure $\Delta p_{\min}$ in bar	-			1.2 <sup>1)</sup> · 1.4 <sup>2)</sup>	1.3 <sup>1)</sup> · 0.9 <sup>3)</sup>	1.0 <sup>1)</sup> · 0.7 <sup>3)</sup>	
Max. perm. differential pressure $\Delta p_{\max}$ in bar	20		16		12	10	
Type 2423 Valve - Balanced by a diaphragm							
Nominal size	DN 125	DN 150	DN 200	DN 250	DN 300 <sup>6)</sup>	DN 400 <sup>6)</sup>	
Min. diff. pressure $\Delta p_{\min}$ in bar	1.1 <sup>1)</sup> · 1.3 <sup>2)</sup>	1.1 <sup>1)</sup> · 0.8 <sup>3)</sup>	0.6 <sup>1)</sup> · 0.5 <sup>3)</sup>		0.7 <sup>4)</sup> · 0.5 <sup>3)</sup>	0.5 <sup>4)</sup> · 0.4 <sup>3)</sup>	
Max. perm. diff. pressure $\Delta p_{\max}$ in bar	12			10		6	

<sup>1)</sup> In basic version (pipeline kit DN 15 for water)

<sup>2)</sup> With bypass line DN 25 for water

<sup>3)</sup> With bypass line DN 40 for water

<sup>4)</sup> Fixed hook-up (pipeline kit DN 25 for water)

<sup>5)</sup> Version for steam

<sup>6)</sup> Type 2422 Valve with external orifice plate

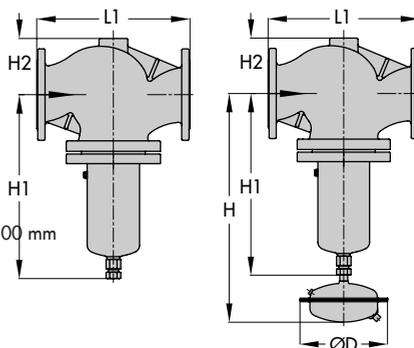
## 10 Dimensions

### Type 2422 - Balanced by the bellows

DN	65	80	100	125	150	200	250
L1	290	310	350	400	480	600	730
H1	300	300	355	460	590	730	
H2	100	100	120	145	175	260	
H <sup>2)</sup>	465		520	685 <sup>1)</sup>	815 <sup>1)</sup>	925 <sup>1)</sup>	
ØD	285			380			

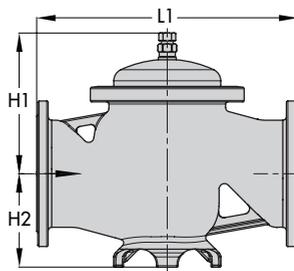
<sup>1)</sup> Optionally Type 2420 Actuator

<sup>2)</sup> Minimum clearance required to remove the actuator: +100 mm



### Type 2422 - Balanced by a diaphragm - With external orifice plate

DN	125	150	200	250	300 <sup>3)</sup>	400 <sup>3)</sup>
L1	400	480	600	730	850	1100
H1	285	310	380		510	610
H2	145	175	260		290	390



All dimensions in mm

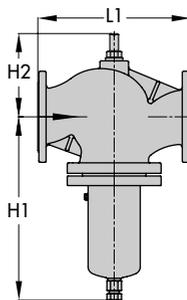
<sup>3)</sup> Also with external orifice plate as flow and differential pressure regulator

**Fig. 10:** Dimensions · Type 2422 as main valve

## Dimensions

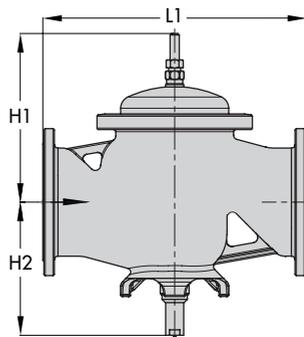
### Type 2423 · Balanced by a bellows

DN	65	80	100	125	150	200	250
L1	290	310	350	400	480	600	730
H1	300		355	460	590	730	
H2	195	220	265	295	400		



### Type 2423 · Balanced by a diaphragm

DN	125	150	200	250
L1	400	480	600	730
H1	370	395	465	
H2	295	325	400	



All dimensions in mm

**Fig. 11:** Dimensions · Type 2423 as main valve

The example shows a main valve with two pilot valves mounted in the bypass line. The dimensions are intended as guidelines. In particular cases, the overall dimensions vary depending on the installed regulators and the conditions on site.

The minimum distance of the bypass line connections to the main valve depend on the length  $L$  of the main valve, the nominal size DN of the main line and the direction of flow.

The minimum length of the bypass line  $L + (4 \times \text{DN})$  must be observed.

Minimum distances for regulator (main valve), installed in the flow pipe:

- 1 x DN on the upstream pressure side
- 3 x DN on the downstream pressure side

Installed in the return flow pipe:

- 3 x DN on the upstream pressure side
- 1 x DN on the downstream pressure side

Make sure that the main valve is installed at a distance of at least six times the nominal size (DN) away from pipe fittings or instruments that cause flow turbulence (e.g. pipe bends or manifolds).

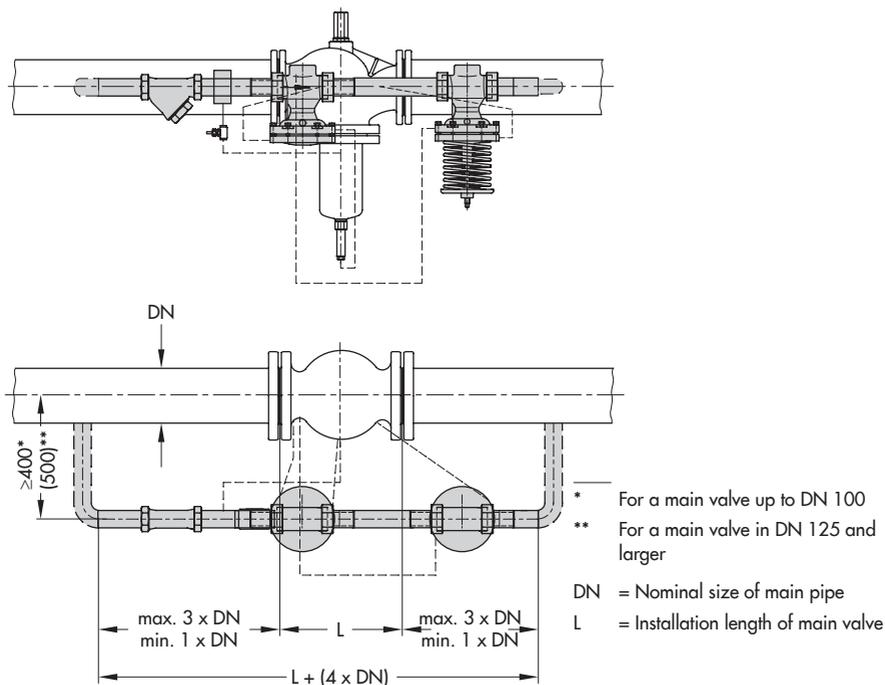
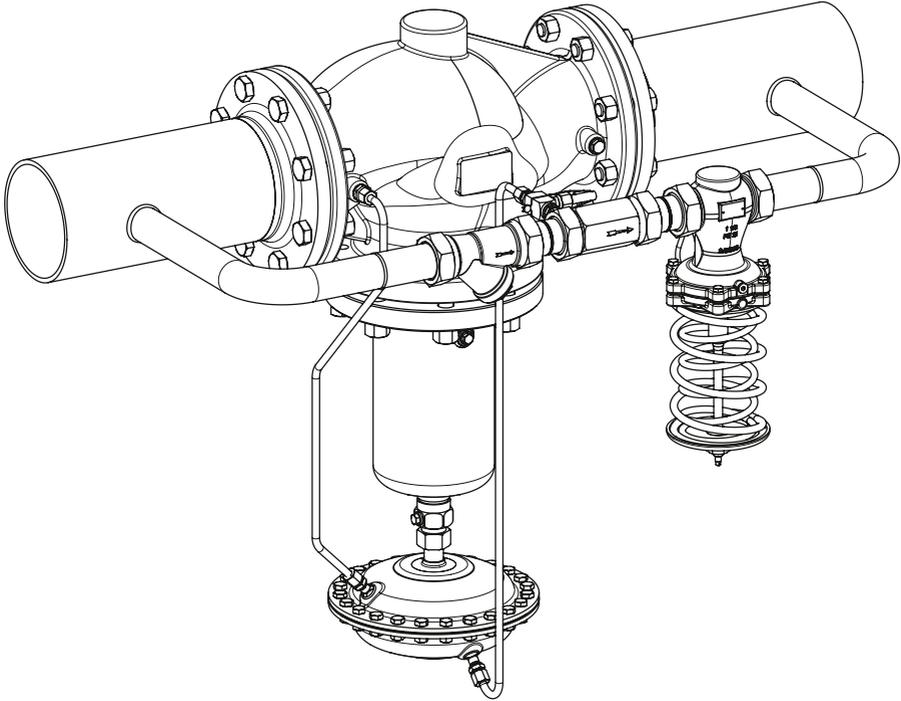


Fig. 12: Installation dimensions (main valve balanced by a bellows)

## 11 Device versions

Pressure reducing valve, DN 65 to 250, with bypass line DN 25/40



**Regulator consisting of:**

**Type 2422** as main valve (balanced by a bellows) with Type 2420 Diaphragm Actuator (optionally for DN 125 to 250)

Bypass line DN 25/40 <sup>1)</sup> with:

**Type 44-2/44-3** as pilot valve

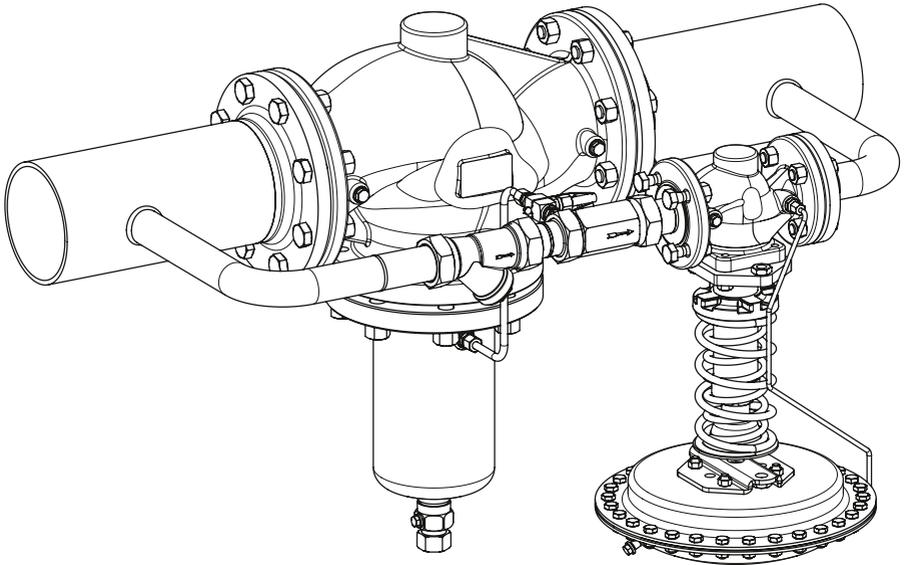
Venturi nozzle

Type 1 N and Type 1 NI Strainers

<sup>1)</sup> DN 65 to 100: bypass line DN 25 only

**Fig. 13:** Type 2334 Pressure Reducing Valve (balanced by a bellows) with Type 44-2/44-3 as pilot valve

Pressure reducing valve, DN 125 to 250, with bypass line DN 25/40



**Regulator consisting of:**

**Type 2422** as main valve balanced by a bellows

Bypass DN 25/40 with:

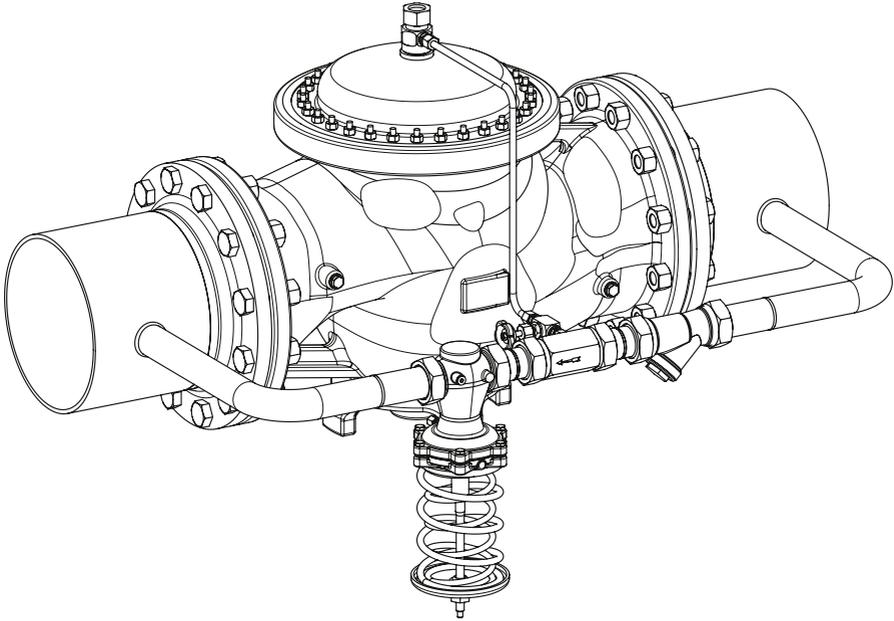
**Type 41-23** as pilot valve

Venturi nozzle

Type 1 N and Type 1 NI Strainers

**Fig. 14:** *Type 2334 Pressure Reducing Valve (balanced by a bellows) with Type 41-23 as pilot valve*

Differential pressure regulator DN 125 to 250, bypass line DN 25/40



**Regulator consisting of:**

**Type 2422** as main valve, balanced by a diaphragm

Bypass DN 25/40 with:

**Type 45-2** Differential Pressure Regulator as pilot valve (flow pipe)

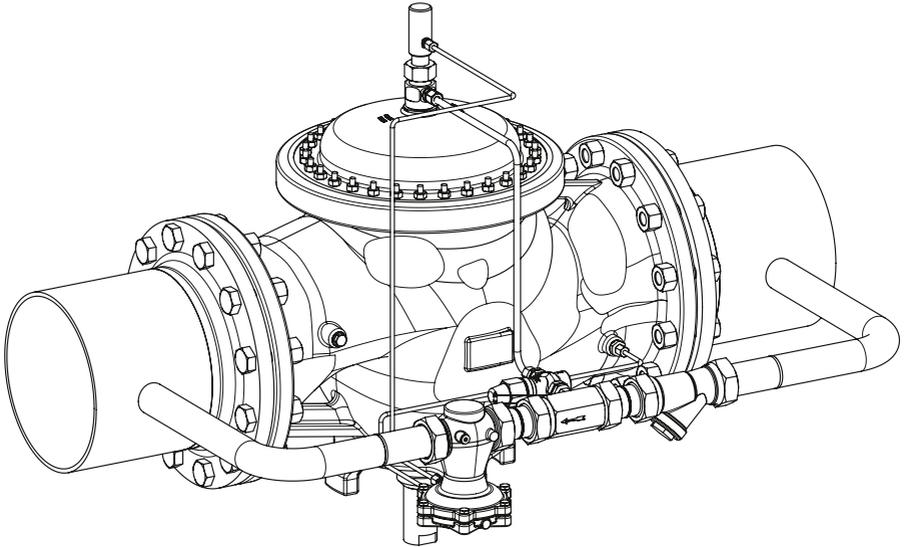
**Type 45-4** Differential Pressure Regulator as pilot valve (return flow pipe)

Venturi nozzle

Type 1 N and Type 1 NI Strainers

**Fig. 15:** *Type 2334 Differential Pressure and Flow Regulator (balanced by a diaphragm), DN 125 to 250*

Flow regulator DN 125 to 250, bypass line DN 25/40



**Regulator consisting of:**

**Type 2423** as main valve, balanced by a diaphragm

Bypass DN 25/40 with:

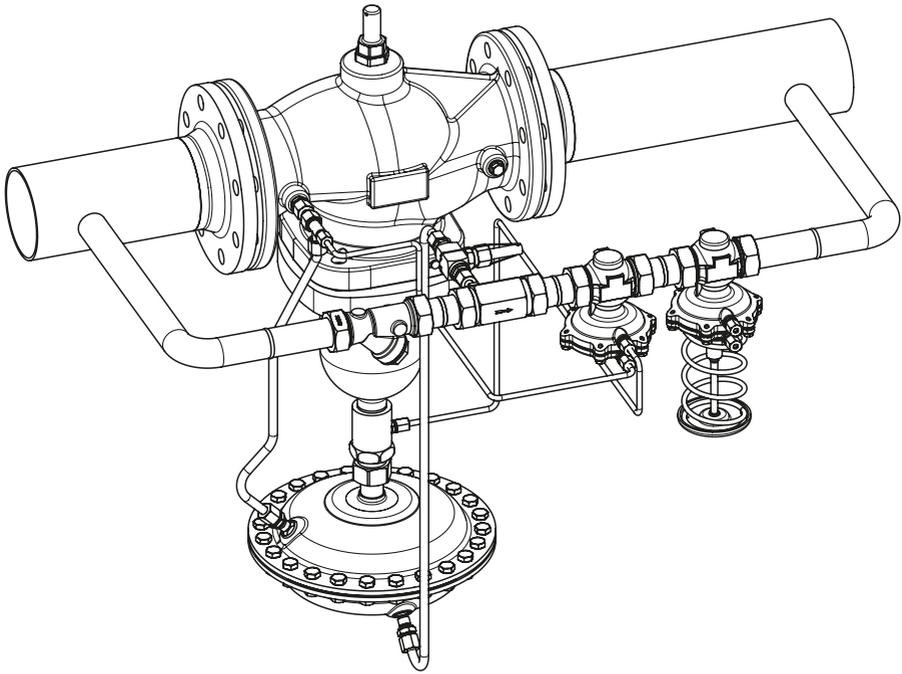
**Type 45-1** Differential Pressure Regulator as pilot valve

Venturi nozzle

Type 1 N and Type 1 NI Strainers

**Fig. 16:** *Type 2334 Differential Pressure and Flow Regulator (balanced by a diaphragm), DN 125 to 250*

Differential pressure and flow regulator DN 65 to 100, bypass line DN 25



**Regulator consisting of:**

**Type 2423** as main valve (balanced by a bellows) with Type 2420 Diaphragm Actuator

Bypass DN 25 with:

**Type 45-1** Differential Pressure Regulator as pilot valve (flow rate)

**Type 45-2** Differential Pressure Regulator as pilot valve (installation in the flow pipe)

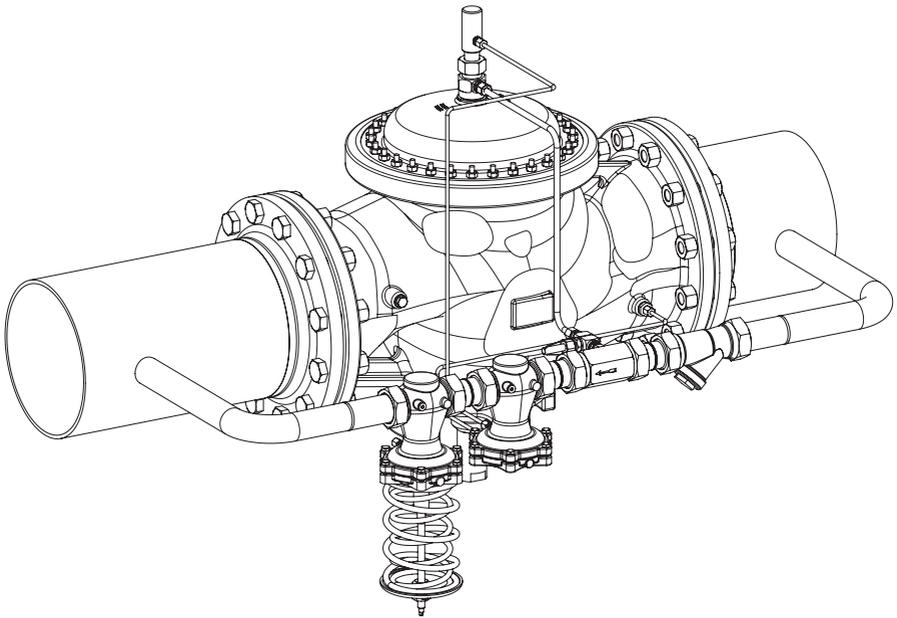
**Type 45-4** Differential Pressure Regulator as pilot valve (installation in the return flow pipe)

Venturi nozzle

Type 1 N and Type 1 NI Strainers

**Fig. 17:** Type 2334 Differential Pressure and Flow Regulator (balanced by a bellows), DN 65 to 100

**Differential pressure and flow regulator DN 125 to 250, bypass line DN 25/40**



**Regulator consisting of:**

**Type 2423** as main valve, balanced by a diaphragm

Bypass DN 25/40 with:

**Type 45-1** Differential Pressure Regulator as pilot valve (flow rate)

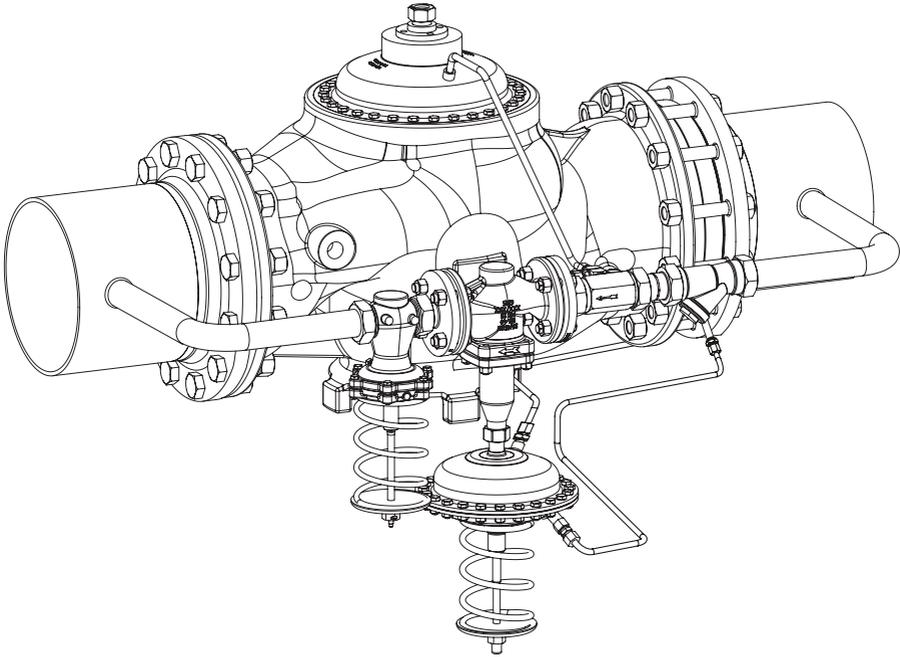
**Type 45-2** Differential Pressure Regulator as pilot valve (flow pipe)/**Type 45-4** (return flow pipe)

Venturi nozzle

Type 1 N and Type 1 NI Strainers

**Fig. 18:** *Type 2334 Differential Pressure and Flow Regulator (balanced by a diaphragm), DN 125 to 250*

Differential pressure and flow regulator DN 300, with external orifice plate, bypass line DN 40



**Regulator consisting of:**

**Type 2422** as main valve, balanced by a diaphragm  
Orifice plate DN 300

Bypass line DN 40 with:

- Type 45-4** Differential Pressure Regulator as pilot valve
- Type 42-24** Differential Pressure Regulator as pilot valve
- Venturi nozzle
- Type 1 N and Type 1 NI Strainers

**Fig. 19:** *Type 2334 Differential Pressure and Flow Regulator, balanced by a diaphragm, with external orifice plate*



**EB 3210 EN**



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