DATA SHEET

T 3210 EN

Type 2334 Pressure, Differential Pressure, Flow, Temperature [1] or Combined Regulators

Pilot-operated Universal Regulators · Optionally with additional electric actuator

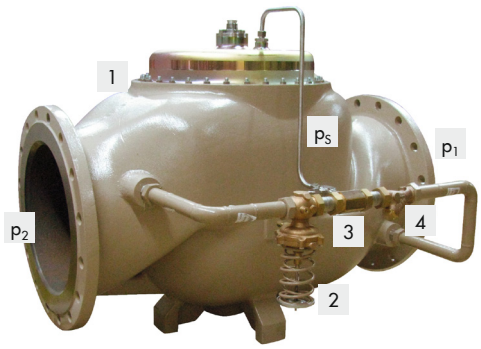
CE

Application

Pilot-operated pressure, differential pressure, flow rate, temperature [1] 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**

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.

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.



1	Main valve (for flow rate control with restriction)	4	Strainer
2	Pilot valve	p_S	Control pressure
3	Venturi nozzle	p_1	Upstream pressure
		p_2	Downstream pressure

Fig. 1: *Type 2334 Differential Pressure Regulator, DN 400 (basic version)*

Special features

- Single-seated globe valve with flanged end connections
- Suitable for district heating plants in accordance with DIN 4747-1 (requirements stipulated by AGFW (German District Heating Association) concerning components in house substations)
- Wide control range and high useable rangeability at low pressure loss
- Pilot operated by the medium, with a maximum of three pilot valves
- Excellent stability and control accuracy even when the pressures fluctuate considerably
- Smooth opening and closing of the main valve
- Wide set point range and convenient set point adjustment at the pilot valve
- Numerous control functions and the possibility to combine several functions

[1] Temperature regulator on request

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Edition July 2021

Versions

- **Type 2423** Valve (with integrated restriction to adjust the maximum flow rate) or **Type 2422** Valve (without restriction) · Pilot valve depending on the application
  - **DN 65 to 100:** with balancing bellows and external Type 2420 Actuator (closing)
  - **DN 125 to 250:** with balancing diaphragm and internal closing spring, also available with balancing bellows · Optionally with Type 2420 Actuator (closing)
  - **DN 300 and 400:** Type 2422 with balancing diaphragm and internal closing spring · Optionally with external orifice plate
- **Basic version**
  - Main valve **DN 65 to 250** and bypass line (DN 15) with strainer, Venturi nozzle and pilot valve as ready-to-install unit
  - Main valve **DN 300 or 400** and bypass line (DN 25) with strainer, Venturi nozzle and pilot valve as ready-to-install unit · Strainer, Venturi nozzle and pilot valve depending on application
- **Version with bypass line (DN 25/40)** · With very high useable rangeability, especially for use in district heating plants · Main valve **DN 65 to 400** · Bypass line (DN 25/40) with strainer, Venturi nozzle and pilot valve · Strainer, Venturi nozzle and pilot valve depending on application (installation on site)

Special versions

- DN 65 to 250: with reduced K_{VS} coefficient
- Version for higher temperatures
- ANSI and JIS version
- Version with flow divider for noise reduction (only valves balanced by a bellows)
- Oil-resistant version
- Pilot valves connected in parallel (instead of in series) free of non-ferrous metal
- Free of graphite for deionized water
- Version with external orifice plate
- Version with downstream attenuation plate for noise reduction

Type 2334 · Flow and differential pressure regulators (DN 125 to 250) for installation in the return flow pipe

The regulator consists of a **Type 2423 Main Valve** (1), acting as the main valve, with adjustable restriction (1.1) and operating diaphragm (5) as well as bypass line with strainer (10), Venturi nozzle (11) and a pilot valve for flow rate (7) and a pilot valve for differential pressure (8).

The pilot valves are used to regulate the flow rate and differential pressure to their adjusted set points. The associated pilot valve closes when either the flow rate or differential pressure exceed their set point, causing the main valve to close as well.

The medium flows through the main valve in the direction indicated by the arrow. The areas released by the restriction and the plug (3) determine the flow rate and the differential pressure. The forces created by the upstream pressure p_1 acting on the plug surface and by the control pressure p_S acting on the operating diaphragm and the force of set point springs (6) are compared.

The control pressure p_s is generated by the Venturi nozzle depending on how far the pilot valves are open. If the medium is at a standstill in the bypass line, the control pressure p_s is equal to the upstream pressure p_1. The main valve is closed by the force of the set point springs.

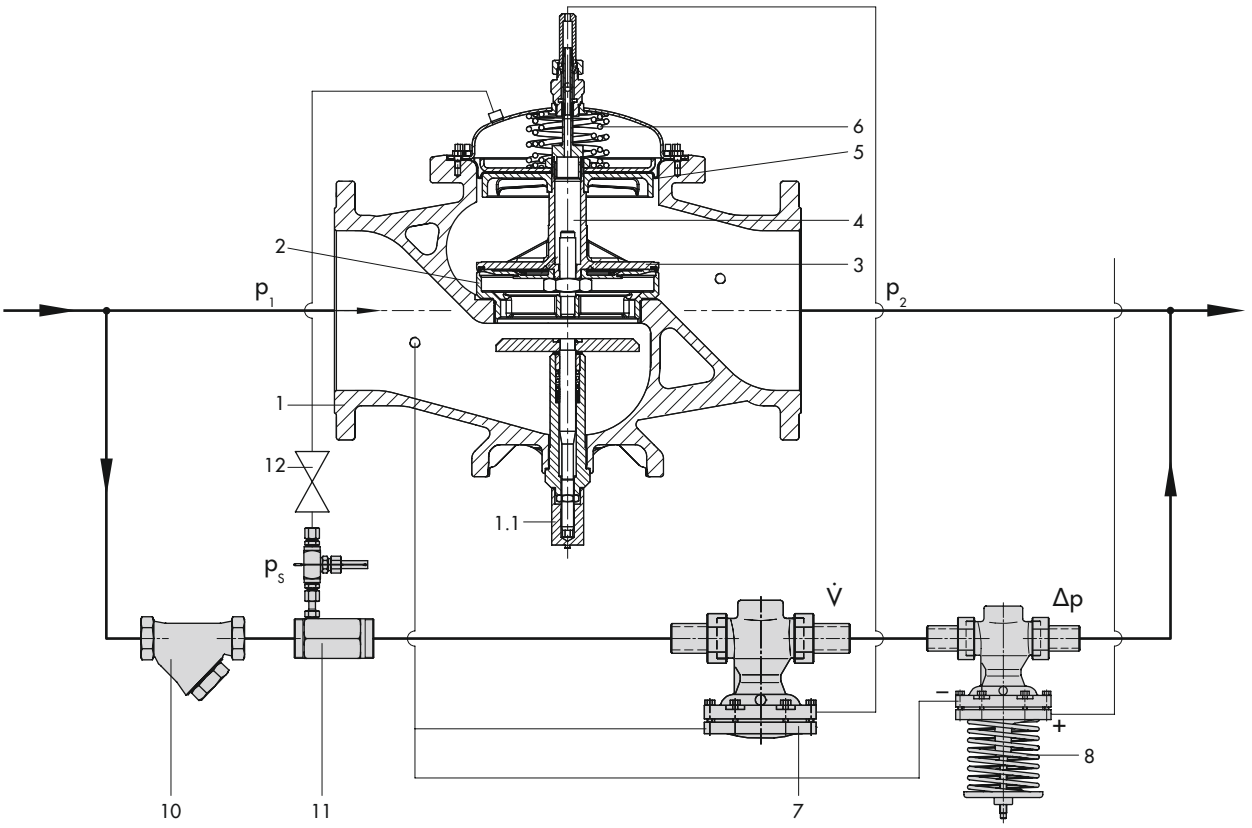
When the differential pressure falls below the set point, the pilot valve responsible for differential pressure control opens and the control pressure p_s drops. The plug (3) opens until the adjusted set point is reached.

When the flow rate or differential pressure rises above the set point, their associated pilot valve closes. This results in a rise in control pressure p_s across the Venturi nozzle (11). The plug stem (4) along with the plug start to move in the closing direction until a new state of equilibrium is reached. When the flow rate or differential pressure starts to drop, the described procedure is reversed. The pilot valve opens further, causing the control pressure p_s to drop. The valve plug in the main valve opens until the set point is reached.

The largest signal (either flow rate or differential pressure) determines how much medium flows through the bypass line and how high the resulting control pressure p_s is.

The higher the control pressure p_s, the smaller the area released between the seat and plug in the main valve. When the control pressure p_s is at its maximum and equals p_1, the pilot valve responsible for the differential pressure and the main valve are closed.

Type 2334 · Flow and differential pressure regulator · Balanced by a diaphragm



1	Type 2423 (main valve) with balancing diaphragm and internal closing spring	4	Plug stem	10	Strainer
1.1	Restriction	5	Operating diaphragm	11	Venturi nozzle
2	Valve seat	6	Set point springs	12	Needle valve
3	Plug	7	Pilot valve for flow rate		
		8	Pilot valve for differential pressure		

Fig. 2: *Functional diagram · Main valve balanced by a diaphragm*

Type 2334 · Differential pressure regulator (DN 65 to 100) for installation in the return flow pipe

The regulator consists of a **Type 2422 Main Valve** (1), acting as the main valve, with balancing bellows (5) and external Type 2420 Actuator (7) as well as the bypass line with strainer (10), Venturi nozzle (11) and a pilot valve for differential pressure (8).

The pilot valve is used to regulate the differential pressure to the adjusted set point. The main valve closes when the differential pressure exceeds the set point.

The medium flows through the main valve in the direction indicated by the arrow. The position of the plug (3) determines the flow rate across the area released between plug and valve seat (2). In the fully balanced valve, the pressure upstream of the plug is transferred through a hole in the plug stem (4) and acts on the outside of the balancing bellows. The pressure on the other side of the plug acts on the inside of the bellows. As a result, the forces created by the pressure that act on the plug are eliminated.

The upstream pressure p_1 acts on the plug in the main valve and on the top of the operating diaphragm of the actuator. The control pressure p_s created by the Venturi nozzle acts on the diaphragm from below. As a result, the forces created by the upstream pressure p1 acting on the top of the diaphragm and the control pressure ps and set point springs (6) acting on the diaphragm from below are compared.

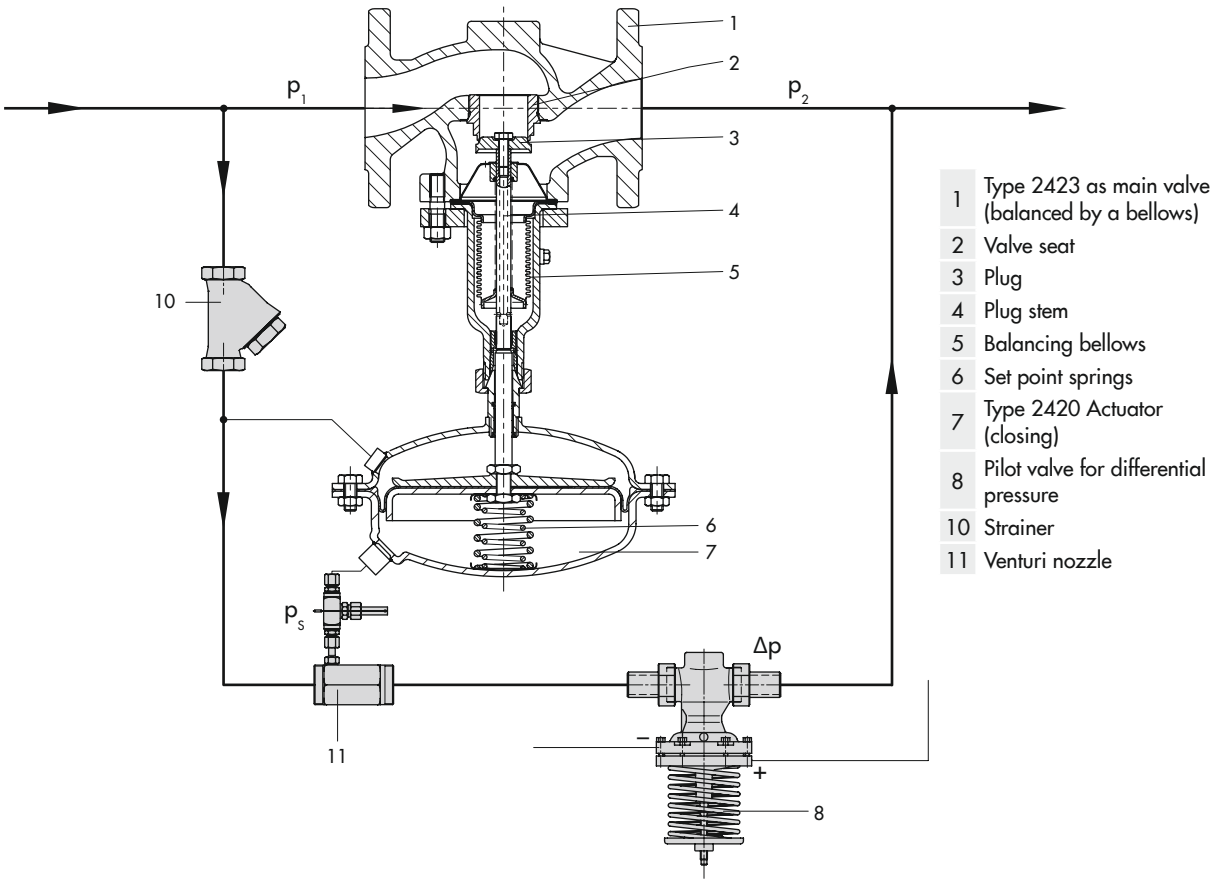
The control pressure p_s is determined by the Venturi nozzle depending on how far the pilot valve is open. If the medium is at a standstill in the bypass line, the control pressure p_s is equal to the upstream pressure p_1. The main valve is closed by the force of the set point springs.

When the differential pressure falls below the set point, the pilot valve responsible for differential pressure control opens and the control pressure p_s drops. If the force resulting from the difference between the upstream pressure p_1 and the control pressure p_s is greater than the force of the set point springs, the plug of the main valve opens until the adjusted set point is reached.

When the differential pressure rises above the adjusted set point, the pilot valve closes. This results in a rise in control pressure p_s across the Venturi nozzle until it is the same as p_1. The plug stem along with the plug start to move in the closing direction until a new state of equilibrium is reached.

When the differential pressure starts to drop, the described procedure is reversed. The pilot valve opens further, causing the control pressure p_s to drop. The valve plug in the main valve opens, opposing the force of the positioning springs, until the set point is reached.

Type 2334 · Flow and differential pressure regulator · Balanced by a bellows

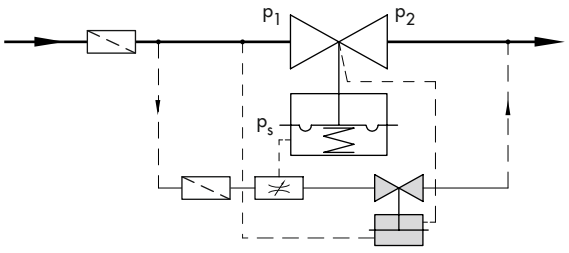


1	Type 2423 as main valve (balanced by a bellows)
2	Valve seat
3	Plug
4	Plug stem
5	Balancing bellows
6	Set point springs
7	Type 2420 Actuator (closing)
8	Pilot valve for differential pressure
10	Strainer
11	Venturi nozzle

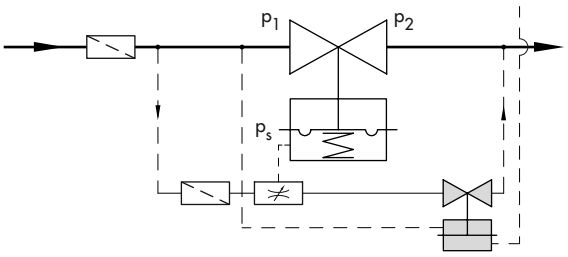
Fig. 3: *Functional diagram · Main valve balanced by a bellows*

Versions of Type 2334 Regulator

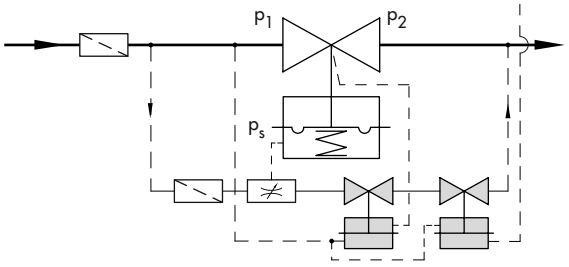
The Type 2334 Universal Regulators consist of a Type 2422 or Type 2423 Globe Valve (acting as the main valve) and a bypass line with a strainer, Venturi nozzle and a maximum of three special pilot valves (regulators).
The following schematic diagrams show the principle setup of a Type 2334 Universal Regulator and its possible functions.



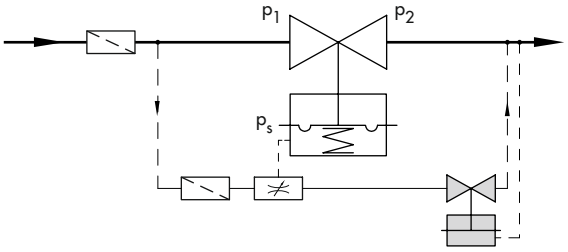
Flow regulator
Type 2423 Main Valve (modified) · Type 45-1 Pilot Valve (modified) · Installation in flow pipe or return flow pipe



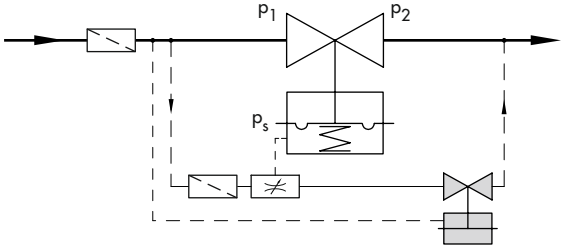
Differential pressure regulator
Type 2422 Main Valve (modified) · Type 45-2 Pilot Valve for installation in flow pipe or Type 45-4 Pilot Valve for installation in return flow pipe (control lines drawn for installation in return flow pipe)



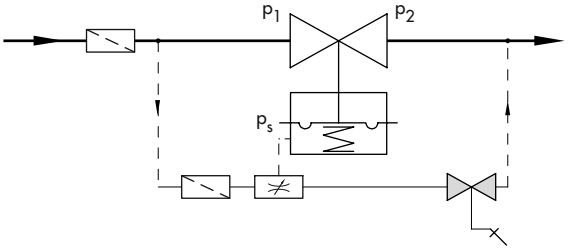
Flow and differential pressure regulator
Type 2423 Main Valve (modified) · Type 45-1 and Type 45-2 Pilot Valve for installation in flow pipe or Type 45-1 and Type 45-4 Pilot Valve for installation in return flow pipe (control lines drawn for installation in return flow pipe)



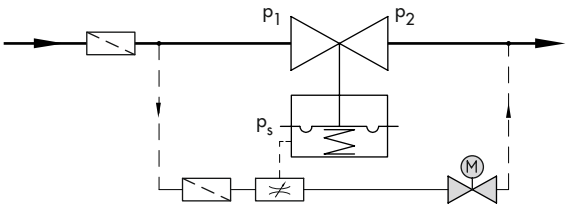
Pressure reducing valve
Type 2422 Main Valve (modified) · Pilot valve on request



Excess pressure valve
Type 2422 Main Valve (modified) · Pilot valve on request



Temperature regulator
Type 2422 Main Valve (modified) · Pilot valve on request



Regulator with additional electric actuator, controlled by a binary signal
Type 2422 Main Valve (modified) · Pilot valve on request

Type 2422 or Type 2423 Valve 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 1: *Technical data*

Type 2422 and Type 2423 Valve									
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 KVS coefficient								
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	DN 25				DN 40				
Type 2334 · With Type 2420 Actuator	320 cm² actuator area			640 cm² actuator area				–	

Table 2: *Permissible differential pressures Δp*

Type 2422 Valve · Balanced by a bellows							
Nominal size	**DN 65**	**DN 80**	**DN 100**	**DN 125**	**DN 150**	**DN 200**	**DN 250**
Min. differential pressure Δp_{min} in bar with Type 2420 Actuator [1]	0.4 with 320 cm² 0.2 with 640 cm²			–			
Min. differential pressure Δp_{min} in bar	–			1.0 [1] · 1.1 [2]	1.0 [1] · 0.7 [3]	0.7 [1] · 0.4 [3]	
Min. differential pressure Δp_{min} in bar [5]	–			1.9	2.0	1.4	
Max. perm. diff. pressure Δp_{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. differential pressure Δp_{min} in bar with Type 2420 Actuator [1]	0.8 with 320 cm² 0.4 with 640 cm²			0.5 with 640 cm²		–	
Min. differential pressure Δp_{min} in bar	–					1.0 [1] · 0.7 [3]	
Min. differential pressure Δp_{min} in bar [5]	–					2.0	
Max. perm. diff. pressure Δp_{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. differential pressure Δp_{min} in bar	0.8 [1] · 1.0 [2]	0.8 [1] · 0.5 [3]	0.4 [1] · 0.2 [3]		0.5 [4] · 0.3 [3]	0.3 [4] · 0.2 [3]	
Max. perm. diff. pressure Δp_{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 Δp_{min} in bar with Type 2420 Actuator [1]	0.6 with 320 cm² 0.5 with 640 cm²			–			
Min. differential pressure Δp_{min} in bar	–			1.2 [1] · 1.4 [2]	1.3 [1] · 0.9 [3]	1.0 [1] · 0.7 [3]	
Max. perm. diff. pressure Δp_{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** [6]	**DN 400** [6]	
Min. differential pressure Δp_{min} in bar	1.1 [1] · 1.3 [2]	1.1 [1] · 0.8 [3]	0.6 [1] · 0.5 [3]		0.7 [4] · 0.5 [3]	0.5 [4] · 0.4 [3]	
Max. perm. differential pressure Δp_{max} in bar	12		10			6	

1) In basic version (pipeline kit DN 15 for water)
2) With bypass line DN 25 for water
3) With bypass line DN 40 for water
4) Fixed hook-up (pipeline kit DN 25 for water)
5) Version for steam
6) Type 2422 Valve with external orifice plate

Table 3: *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 [2]	125 [2]	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** [1]	**DN 400** [1]
Pressure rating	PN 16 to 40					
K_{VS} coefficient	250	380	650	800	1250	2000
x_{FZ} value	0.35		0.3		0.2	

[1] Type 2422 only
[2] Only with Type 2420 Diaphragm Actuator

Table 4: *Flow rate set points for water*

Type 2423 Valve · Balanced by a bellows		**Flow rate set point ranges for water in m³/h**						
Nominal size		**DN 65**	**DN 80**	**DN 100**	**DN 125**	**DN 150**	**DN 200**	**DN 250**
Diff. pressure across restriction	$\Delta p_{restriction}$ = 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
	$\Delta p_{restriction}$ = 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

Type 2423 Valve · Balanced by a diaphragm		**Flow rate set point ranges for water in m³/h**			
Nominal size		**DN 125**	**DN 150**	**DN 200**	**DN 250**
Diff. pressure across restriction	$\Delta p_{restriction}$ = 0.2 bar	11 to 120	18 to 180	20 to 320	26 to 350
	$\Delta p_{restriction}$ = 0.5 bar	18 to 180	20 to 260	26 to 450	30 to 520

Table 5: *Materials · Material numbers according to DIN EN*

Type 2422 and Type 2423 Valves balanced by a bellows					
Pressure rating		**PN 16**	**PN 25**	**PN 16, 25 and 40**	
Valve body		Cast iron EN-GJL-250	Spheroidal graphite iron EN-GJS-400-18-LT [1]	Cast steel 1.0619	Cast stainless steel 1.4408 [1]
Seat	DN 65 to 250	1.4006			1.4571
	DN 300 and 400	1.4301			
Plug	DN 65 and 80	1.4104 [2]			1.4301/1.4571 with PTFE seal
	DN 100	1.4006 [2]			
	DN 125 to 250	1.4571 with PTFE seal and retaining plate made of 1.4301			
	DN 300 and 400	1.4301 with EPDM seal and retaining plate made of 1.4301			
Plug stem		1.4301			
Metal bellows		1.4571 · DN 125 and larger: 1.4404			
Bottom section		P265GH			1.4571
Body gasket		Graphite on metal core			
Type 2422 and Type 2423 Valve balanced by a diaphragm					
Pressure rating PN		**PN 16**	**PN 16/25**	**PN 16, 25 and 40**	**PN 16, 25 and 40**
Valve body		Cast iron EN-GJL-250	Spheroidal graphite iron EN-GJS-400-18-LT [1]	Cast steel 1.0619	Cast stainless steel 1.4408
Valve seat		Red brass [3]			
Plug (standard version)		Red brass [3] · EPDM soft seal, max. 150 °C or with PTFE soft seal, max. 150 °C			
Pressure balancing		Balancing cases made of sheet steel DD11 · EPDM balancing diaphragm, max. 150 °C or NBR diaphragm, max. 80 °C			
Type 2420 Actuator					
Diaphragm cases		Sheet steel DD11			1.4301
Diaphragm		EPDM [4] with fabric reinforcement			
Guide bushing		DU bushing			PTFE
Seals		EPDM/PTFE [4]			

[1] DN 65 to 150 only; PN 16/25 on request
[2] Optionally with PTFE soft seal
[3] Special version: seat and plug made of 1.4409
[4] Special version for mineral oils: FKM

Pilot valve

Various SAMSON valves may be used as pilot valves (see 'Versions of Type 2334 Regulator'). The technical data and valve materials are listed in the corresponding data sheet.

Installation

Install the regulator in such a way that it is still easily accessible after the plant is completed to facilitate maintenance or revision work.

The following points must be observed:

- Install the regulators in horizontal pipelines.
- **Main valve (DN 65 to 100, Type 2422/Type 2423):** bellows and Type 2420 Actuator suspended downward

  Main valve (DN 125 to 250), balanced by a bellows: bellows suspended downward

  Main valve (DN 125 to 400), balanced by a diaphragm: balancing diaphragm facing upward
- The direction of flow must match the direction indicated by the arrow on the valve body.

Typical installation with dimensions

The example in Fig. 4 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 bypass length L + (4 x DN) must be observed.

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

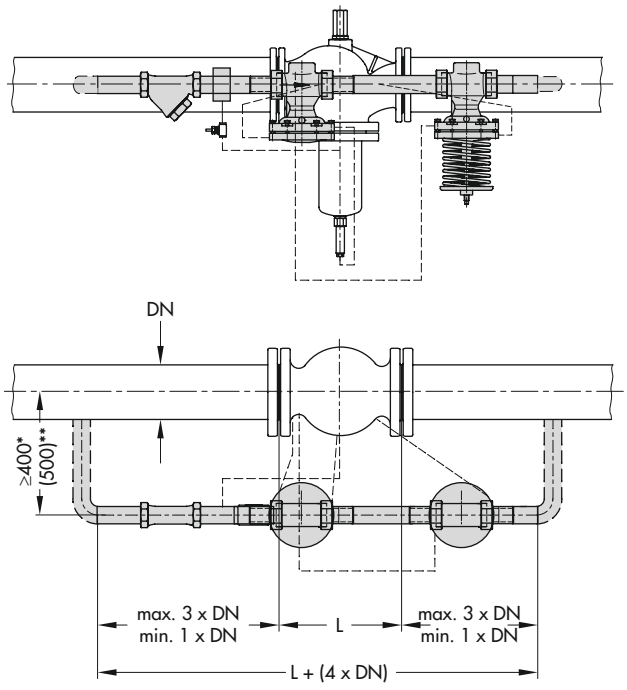
- 1 x DN on the upstream pressure side
- 3 x DN on the downstream pressure side

Minimum distances for regulator (main valve), 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 five times the nominal size (DN) away from pipe fittings or instruments that cause flow turbulence (e.g. pipe bends or manifolds).

More details in ▶ EB 3210.



* For a main valve up to DN 100

** For a main valve in DN 125 and larger

DN = Nominal size of main pipe

L = Installation length of main valve

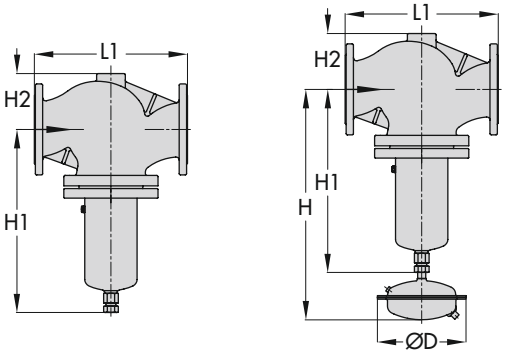
Fig. 4: *Functional diagram · Main valve balanced by a bellows*

Dimensions (in mm)

Type 2422 · Balanced by a bellows

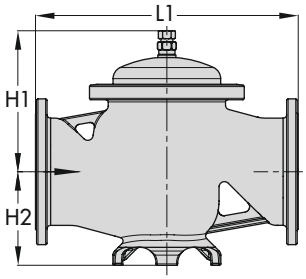
DN	65	80	100	125	150	200	250
L1	290	310	350	400	480	600	730
H1	300	300	355	460	590	730	
H2	100	100	120	145	175	260	
H	465		520	685 [1]	815 [1]	925 [1]	
ØD	285			380			

[1] Optionally Type 2420 Actuator



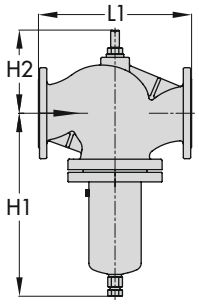
Type 2422 · Balanced by a diaphragm

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



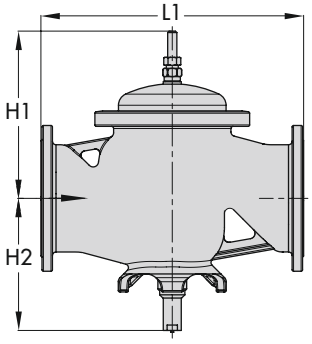
Type 2423 · Balanced by a bellows

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	



Ordering text

Type 2334 Pilot-operated Regulator

Main valve DN …

Material:
Cast iron EN-GJL-250 · Spheroidal graphite iron EN-GJS-400-18-LT · Cast steel 1.0619 · Stainless steel 1.4408 · Forged steel 1.457

Pressure rating PN …

Version functioning as differential pressure regulator/flow regulator etc.

Type … Pilot Valve

Set point range/control range ...

Optionally, special version