

Self-operated Regulators Series 42



Flow and Differential Pressure Regulator Type 42-37 · Installation in return flow pipe

Flow and Differential Pressure or Flow and Pressure Regulator Type 42-39 · Installation in flow pipe

Application

Flow rate and differential pressure control or flow rate and pressure control in district heating supply networks and extended heating systems.

Differential pressure or pressure set points from 0.1 to 5 bar
Valve sizes **DN 15 to DN 250**¹⁾ · Nominal pressure **PN 16 to 40** · Suitable for liquids from 5 °C to 150 °C²⁾

The valve **closes** when the differential pressure/flow rate increases

The regulators consist of a valve with an adjustable restriction and an actuator with two operating diaphragms.

The regulators limit the flow rate to the set point adjusted at the restriction. The set point for the differential pressure or the downstream pressure is adjusted at the actuator. The largest signal is always used to actuate the valve.

Special features

- Low-noise, self-operated proportional regulators requiring little maintenance
- Suitable for circuit water, water/glycol mixtures up to 30 %, steam and air as well as other liquids, gases and vapors, provided these do not affect the characteristics of the operating diaphragm
- Special version for oil
- Single-seated valve with a plug balanced by a stainless steel bellows or by a balancing diaphragm
- With internal overload protection (excess pressure limiter) in the actuator (Type 42-37)

Versions

Type 42-37 (Fig. 1) · Flow and Differential Pressure Regulators in DN 15 to DN 250¹⁾ · For installation in the return flow pipe of a district heating transfer station

The regulator consists of Type 2423 Globe Valve with an integrated restriction and Type 2427 Actuator · Flow rate set point adjustable at the restriction · Differential pressure set point adjustable at the actuator

Type 42-39 (Fig. 2) · Flow and Differential Pressure or Flow and Pressure Regulator in DN 15 to DN 250¹⁾ · For installation in the flow pipe of a district heating transfer station

The regulator consists of Type 2423 Globe Valve with an integrated restriction and Type 2429 Actuator · Flow rate set point adjustable at the restriction · Differential pressure or pressure set point adjustable at the actuator

Accessories

Refer to the Data Sheet T 3095 EN for any required accessories, e.g. compression-type fittings, needle valves, equalizing tanks and control lines.

¹⁾ On request: Valves in sizes larger than DN 250 for steam and gases · ANSI and JIS versions

²⁾ Other temperature ranges on request



Fig. 1 · Type 42-37 Flow and Differential Pressure Regulator



Fig. 2 · Type 42-39 Flow and Differential Pressure Regulator

Principle of operation

The medium flows through the valve in the direction indicated by the arrow. The position of the restriction (1.1) and the valve plug (3) determine the flow rate and the differential pressure Δp or the downstream pressure p_2 .

The valve is fully balanced. The plug position is not affected by any changes in medium pressure. The pressure downstream of the restriction acts on the outer surface of the metal bellows and the low pressure on the inside of the bellows. In this way, the forces generated by the differential pressure acting on the plug are eliminated.

The differential pressure Δp is converted into a positioning force at the bottom diaphragm (12.1) and the differential pressure at the restriction, dependent on the flow rate, is also converted into a positioning force at the top operating diaphragm (12.3). The largest signal is always used to actuate the valve.

For example, if the differential pressure Δp rises, the positioning force at the bottom operating diaphragm (12.1) rises, too. This change in force causes the diaphragm stems (12.2 and 12.4) and the valve plug (3) to move in the closing direction. If the flow rate increases, the differential pressure at the restriction (1.1) increases and the pressure drops at the diaphragm chamber A. This change in differential pressure at the restriction only causes the diaphragm stem (12.4) and the valve plug (3) to move in the closing direction until the adjusted flow set point is reached.

To control the flow rate, the low pressure downstream of the restriction (1.1) is transmitted through a bore in the plug stem (7) and in the diaphragm stem (12.4) to the diaphragm chamber A. The high pressure of the flow is transmitted through the control line (18), attached to the regulator, to the diaphragm chamber B.

To control the differential pressure in the Type 42-37, the high pressure of Δp is transmitted through the control line (19), which is attached on the site of installation, to the diaphragm chamber D. The low pressure of Δp is equal to the high pressure of the flow and is transmitted also to the diaphragm chamber C.

To control the differential pressure in the Type 42-39, the high pressure of Δp is transmitted over the control line (19) to the diaphragm chamber D. The low pressure of Δp is transmitted over a control line (to be attached on assembling the regulator) to the diaphragm chamber C.

On using Type 42-39 as a flow and pressure regulator, the pressure connection of the diaphragm chamber C remains open. The overload protection (excess pressure limiter) (15) in the actuator protects the seat (2) and plug (3) during extreme operating conditions against overloading and the resulting damage to valve and plant (see Table 1 for the pressure at which the excess pressure limiter responds).

- | | |
|--------|--|
| 1 | Type 2423 Valve (balanced by a bellows) |
| 1.1 | Restriction for adjusting flow set point |
| 2 | Seat |
| 3 | Plug |
| 5 | Metal bellows |
| 7 | Plug stem |
| 11 | Coupling nut |
| 12 | Type 2427 Actuator (Type 42-37)/Type 2439 (Type 42-39) |
| 12.1 | Operating diaphragm |
| 12.2 | Diaphragm stem |
| 12.3 | Operating diaphragm |
| 12.4 | Diaphragm stem |
| 14 | Set point spring |
| 15 | Overload protection
(force limiter with internal excess pressure limiter) |
| 17 | Set point adjustment for differential pressure |
| 18,19 | Control lines |
| A to D | Diaphragm chambers |

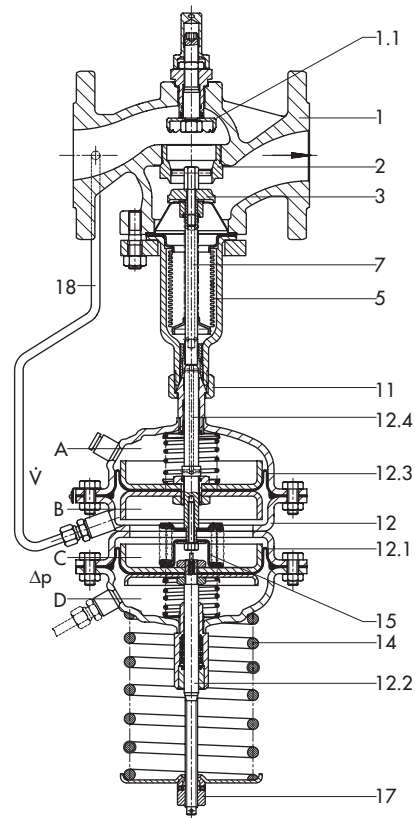


Fig. 3 · Type 42-37 Flow and Differential Pressure Regulator

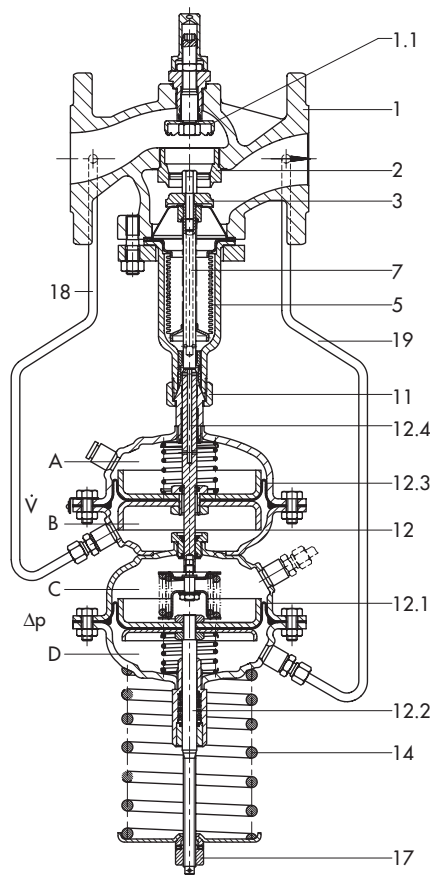


Fig. 4 · Type 42-39 Flow and Differential Pressure Regulator

The principle of operation of the regulator with a valve balanced by a bellows or by a diaphragm only differ concerning their pressure balancing. Valves balanced by a diaphragm (DN 125 to 250) have a balancing diaphragm. The downstream pressure acts on the inside surface of the

diaphragm and the upstream pressure on the outside surface of the diaphragm. As a result, the forces created by the upstream and downstream pressures acting on the valve plug are equally balanced.

Table 1 · Technical data · Type 42-37 · Type 42-39

Type 2423 Valve · Balanced by a bellows		15 to 100	125 to 250
Nominal size	DN		
Nominal pressure		PN 16, 25 or 40 (acc. to DIN EN 12516-1)	
Pressure at which internal excess pressure limiter responds (Type 42-37)	with 160 cm ²	1.2 bar	
	with 320 cm ²	0.6 bar	
Max. perm. temperature	Valve body	See Fig. 6 · Pressure-temperature diagram	
	Actuator ¹⁾	With equalizing tank: Liquids 220 °C · Without equalizing tank: Liquids 150 °C	
Diff. pressure or pressure set point ranges	bar	0.1 to 0.6 bar · 0.2 to 1 bar · 0.5 to 1.5 bar · 1.0 to 2.5 bar · 2 to 5 bar · 4.5 to 10 bar ²⁾	
Leakage rate		≤ 0.05 % of K _{VS}	

Type 2423 Valve · Balanced by a diaphragm		125 to 250
Nominal size	DN	
Nominal pressure		PN 16, 25 or 40 (acc. to DIN EN 12516-1)
Pressure at which internal excess pressure limiter responds (Type 42-37)	with 160 cm ²	1.2 bar
	with 320 cm ²	0.6 bar
	with 640 cm ²	0.3 bar
Max. perm. temperature	Valve body	See Fig. 6 · Pressure-temperature diagram
	Actuator ¹⁾	Liquids 150 °C
Diff. pressure or pressure set point ranges		0.1 to 0.6 bar · 0.2 to 1 bar · 0.5 to 1.5 bar · 1 to 2.5 bar · 2 to 5 bar ²⁾
Leakage rate		≤ 0.05 % of K _{VS}

¹⁾ Higher temperatures on request · ²⁾ On request

Table 2 · K_{VS} coefficients, z values, flow set points for water and maximum permissible differential pressures

Type 2423 Valve · Balanced by a bellows														
Nominal size	DN	15	20	25	32	40	50	65	80	100	125	150	200	250
Travel		10 mm					16 mm			22 mm				
K _{VS}		4	6.3	8	16	20	32	50	80	125	190	280	420	500
z value		0.65	0.6	0.55		0.45	0.4		0.35			0.3		
Flow rate set point ranges for water in m ³ /h														
Differential pressure at restriction 0.2 bar		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 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. diff. pressure Δp bar		25 bar					20 bar			16 bar		12 bar		10 bar

Type 2423 Valve · Balanced by a diaphragm						
Nominal size	DN	125	150	200	250	
K _{VS} in m ³ /h	22 mm travel	190	290	550	600	
	35 mm travel	250	380	650	800	
Flow rate set point ranges for water in m ³ /h						
Diff. pressure Δp _{restriction} = 0.2 bar	22/35 mm travel	11 to 120		18 to 180	20 to 320	26 to 350
z value		0.35		0.35	0.3	0.3
Max. perm. differential pressure Δp		12 bar			10 bar	

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

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

ΔP_{min} Minimum differential pressure across the valve in bar
 ΔP_{restriction} Differential pressure created at the restriction to measure the flow rate in bar
 \dot{V} Adjusted flow rate in m³/h
 K_{VS} Valve flow coefficient in m³/h

Table 3 · Materials · Material number acc. to DIN EN

Type 2423 Valve · Balanced by a bellows			
Valve body	Cast iron EN-JL1040	Sph. graphite iron EN-JS1049	Cast steel 1.0619
Nominal pressure	PN 16	PN 25	PN 25/40 ¹⁾
Sitz	Stainless steel 1.4104 or 1.4006		
Plug	Up to DN 100	Stainless steel 1.4104, 1.4112 or 1.4006	
	DN 125 to 250	1.4301, plug with PTFE sealing	
Plug stem	Stainless steel 1.4301		
Metal bellows	Stainless steel 1.4571		
Lower part of body	P265GH (1.0305)		
Body gasket	Graphite on metal core		
Type 2423 Valve · Balanced by a diaphragm			
Valve body	Cast iron EN-JL1040	Sph. graphite iron EN-JS1049	Cast steel 1.0619
Nominal pressure	PN 16	PN 16/25	PN 25/40 ¹⁾
Seat	Red brass (CC491K)		
Plug	Standard version	Red brass (CC491K) · With EPDM soft sealing, max. 150 °C	
Plug stem	Red brass (CC491K)		
Pressure balancing	Balancing cases made of sheet steel DD 11 Balancing diaphragm made of EPDM with fabric insert, max. 150 °C or NBR diaphragm, max. 60 °C		
Type 2427 and Type 2429 Actuators			
Diaphragm cases	Sheet steel DD 11 (StW22)		
Operating diaphragm	EPDM with fabric insert ²⁾		
Guide bushing	DU bushing		

¹⁾ PN 16 on request

²⁾ Special version for oils: FPM (FKM)

Installation

The valve, actuator and control lines are delivered in separate packaging.

The actuator can be mounted to the valve either before or after the valve is mounted in the pipeline. The actuator is easy to attach over a coupling nut.

The following points need to be observed:

- Install valves in horizontal pipelines
- The medium must flow through the valve in the direction indicated by the arrow on the valve body
- Install a strainer (e.g. SAMSON Type 2 NI) upstream of the valve.



Permissible mounting positions

- All nominal sizes: Install the actuator suspended downwards (see photo)
- DN 15 to DN 80 and max. 120 °C: Install the actuator either suspended or upright
- All nominal sizes with fixed plug guide and max. 120 °C: Any position possible
- Steam applications: Always install actuator suspended downwards

Special version

- With oil-resistant internal parts
- Valve completely made of corrosion-resistant steel (minimum grade 1.4301)
- Suitable for liquids and vapors up to max. 220 °C
- ANSI and JIS versions

Ordering text

Flow and Differential Pressure Regulator **Type 42-37/42-39**
DN ...

Body material ..., PN ...,

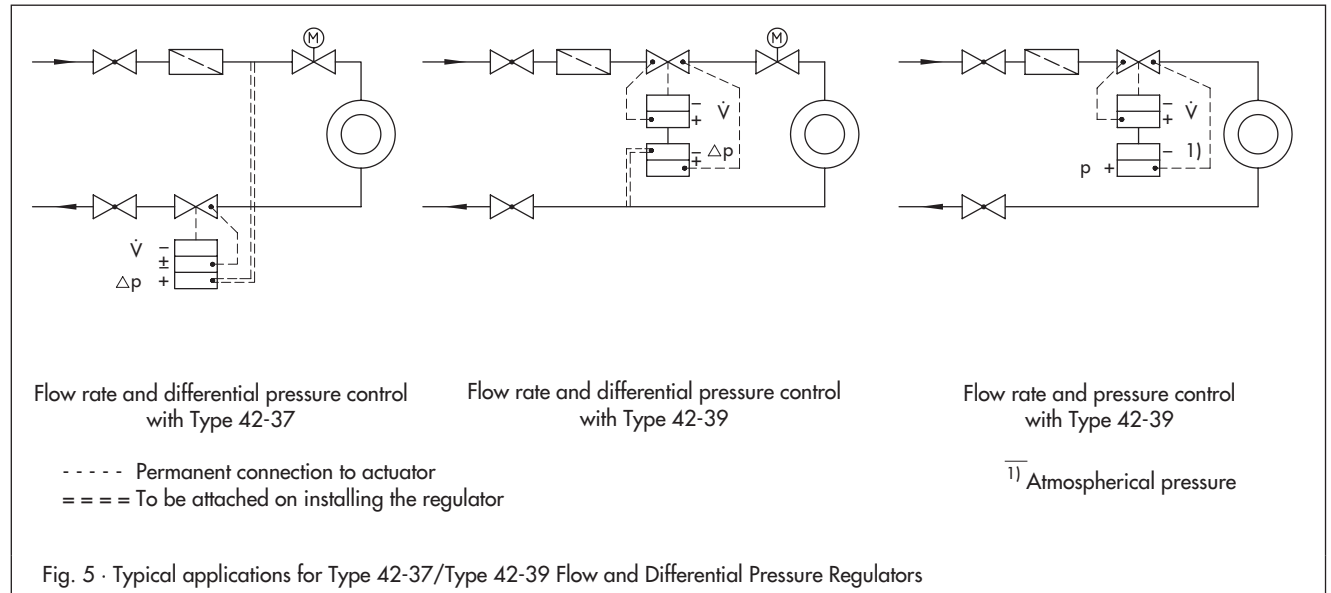
Valve balanced by a bellows/diaphragm

Differential pressure at the restriction of 0.2/0.5 bar;
differential pressure set point range ... bar

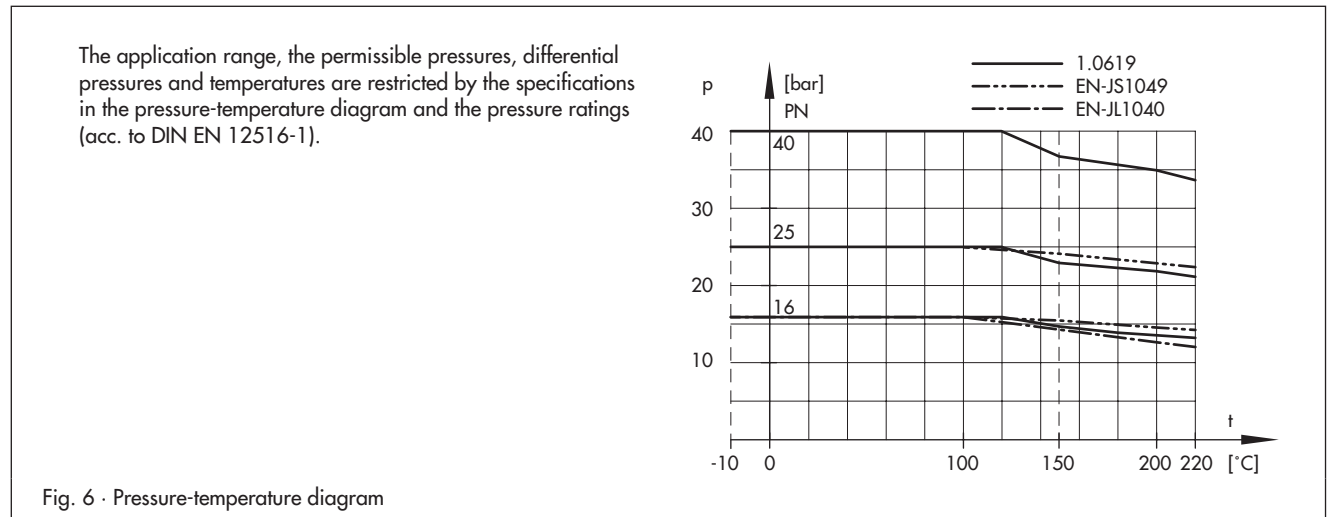
Optionally, special version ...,

Optionally, accessories ... (see T 3095 EN)

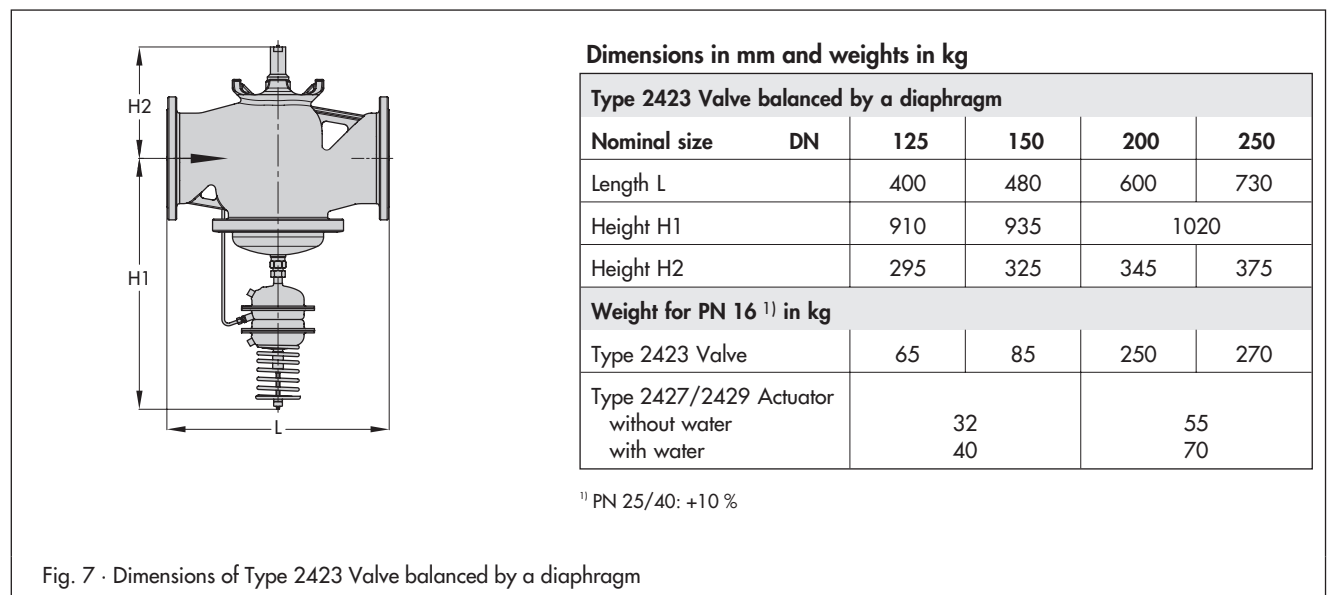
Typical applications



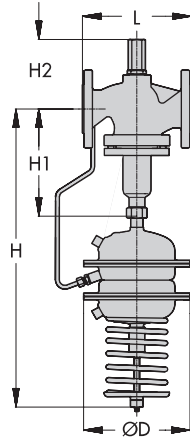
Pressure-temperature diagram according to DIN EN 12516-1



Dimensional drawing · Type 2423 Valve · Balanced by a diaphragm



Dimensional drawing · Type 2423 Valve · Balanced by a bellows



Type 42-37/Type 42-39

Dimensions in mm and weights in kg

Type 2423 Valve · Balanced by a bellows																
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			150			175	180	200	250	280	400			
	1.4571	113	-	130	-	170	176	-								
Set point ranges ³⁾	0.1 to 0.6 bar	Height H ¹⁾	675						790		845	-				
		Actuator	Ø D = 225 mm, A = 160 cm ²						Ø D = 285 mm, A = 320 cm ²		-					
		Weight ²⁾	20.5	21	22	28.5	29	31.5	51	56	71	-				
	0.2 to 1 bar	Height H ¹⁾	675						770		825	1130	1160	1240		
		Actuator	Ø D = 225 mm, A = 160 cm ² ⁴⁾									Ø D = 285 mm, A = 320 cm ²				
		Weight ²⁾	20.5	21	22	28.5	29	31.5	43	48	65	130	180	420	480	
	0.5 to 1.5 bar	Height H ¹⁾	675						770		825	1130	1160	1240		
		Actuator	Ø D = 225 mm, A = 160 cm ² ⁴⁾									Ø D = 285 mm, A = 320 cm ²				
		Weight ²⁾	20.5	21	22	28.5	29	31.5	43	48	65	135	185	425	485	
	1.2 to 2.5 bar	Height H ¹⁾	675						770		825	1130	1160	1240		
		Actuator	Ø D = 225 mm, A = 160 cm ²									Ø D = 285 mm, A = 320 cm ²				
		Weight ²⁾	20.5	21	22	28.5	29	31.5	43	48	65	135	185	425	485	
	2 to 5 bar	Height H ¹⁾	615						690		745	-				
		Actuator	Ø D = 225 mm, A = 160 cm ²									-				
		Weight ²⁾	20.5	21	22	28.5	29	31.5	43	48	65	-				

¹⁾ Add 50 mm to height H for Type 42-39
²⁾ The weight applies to the version with material specifications EN-JL 1040/PN 16. Add 10 % to this weight for versions made of cast steel 1.0619/PN 40, spheroidal graphite iron EN-JS 1049/PN 25 and 1.4581/1.4571.
³⁾ Δp = 4.5 bar to 10 bar on request
⁴⁾ 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.

Fig. 8 · Dimensions of Type 2423 Valve balanced by a bellows

Specifications subject to change without notice.



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