

T 3018 EN

Type 42-36 E Pressure-independent Control Valve (PICV)

Series 42 Self-operated Regulators



Application

Self-operated regulators for flow rate control in district heating systems or large heating or cooling networks. Combined with an electric actuator used to transmit the control signal of an electric controller. Valves **DN 15 to 250**¹⁾ · Pressure rating **PN 16 to 40** · Suitable for liquids, air and non-flammable gases from **5 to 150 °C**¹⁾

The valve closes when the flow rate or the output signal of the electric controller increases. The largest signal closes the valve.

The combined regulators consist of:

- A valve with flanged body
- A diaphragm actuator
- Adapter to adjust the flow rate set point and to attach the electric actuator
- An electric actuator

The electric actuator is available with or without fail-safe action and changes the flow rate set point depending on the output signal issued by the electric controller.

The regulators are equipped with the following electric actuators:

- Valves in **DN 15 to 50** with actuator
 - **Type 5827-N** without fail-safe action
 - **Type 5827-A** with fail-safe action
 See Data Sheet ► T 5827 for details
- Valves in **DN 65 to 100** with electric actuator
 - **Type 3374-11** without fail-safe action
 - **Type 3374-21** with fail-safe action
 - **Type 5827-N3** without fail-safe action
 See Data Sheet ► T 8331 and ► T 5827 for details
- Valves in **DN 125 to 250** with electric actuator
 - **Type 3374-15** without fail-safe action
 - **Type 3374-25** with fail-safe action
 See Data Sheet ► T 8331 for details

¹⁾ On request: valves larger than DN 250 for gases · Other temperature ranges

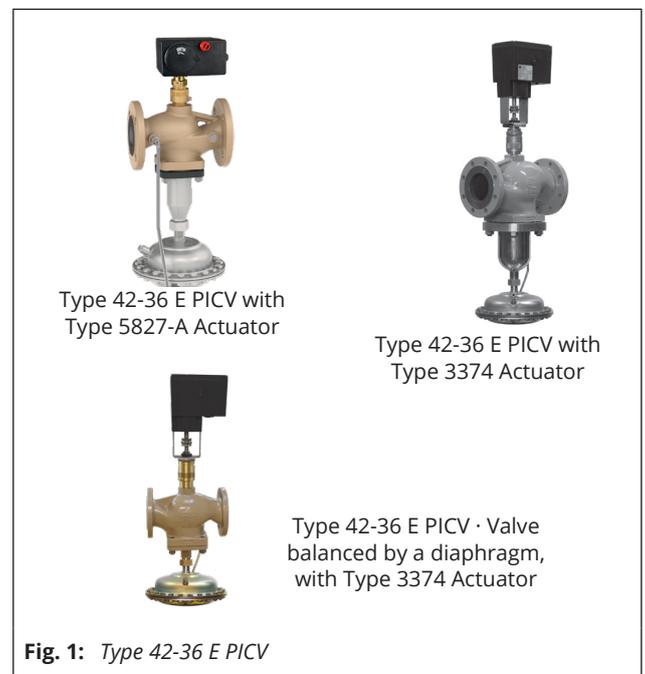


Fig. 1: Type 42-36 E PICV

Special features

- Low-maintenance, medium-controlled proportional regulators requiring no auxiliary energy
- Compact design
- Nominal size DN 125 to 250 with fixed plug guide as standard, e.g. installation in riser pipes.
- Single-seated valve with a balanced valve plug provides high accuracy of the adjusted maximum flow rate
- Control quality independent of the network differential pressure, for example for temperature control with outdoor-temperature-compensated control equipment

- Suitable for water, other liquids and gases, provided these do not cause the materials used to corrode.

Versions

Type 42-36 E (Fig. 1) · Pressure-independent control valve in **DN 15 to 250**, consisting of a **Type 2426** Diaphragm Actuator and a **Type 2423 E** Valve with a restriction to adjust the flow rate set point · Sot-seated restriction for nominal sizes DN 15 to 50 · Installation in the flow or return pipe

The set point ranges for the flow rate based on water listed in Table 3 apply to a differential pressure at the restriction of 0.2 or 0.5 bar.

Control equipment tested according to DIN EN 14597 are available. The register number is available on request.

Special versions

- With actuator with two diaphragms for increased functional safety
- Internal parts made of FKM, e.g. for use with mineral oils
- ANSI or JIS version on request

Principle of operation (see Fig. 3)

The regulators consist of a basic regulator for flow rate control and an electric or electrohydraulic actuator. The principle of operation for the basic regulator is described in the Data Sheet ► **T 3015**.

The set point for the flow rate is adjusted at the adapter (9). The adapter is also used to attach the electric actuator. The actuator is operated by control signals (mostly temperature signals) issued by an electric controller. As a result, the electric actuator adjusts the orifice (restriction) and thus the flow rate set point.

The flow regulation is ultimately performed by the diaphragm actuator. The largest signal is always used to control the regulator.

A differential pressure $\Delta p_{\text{restriction}}$ is created at the restriction (orifice) by the medium flow. This differential pressure is transmitted over the control line (18) and the hole in the valve plug to the operating diaphragm (12) where it is converted into a positioning force. The diaphragm actuator controls the $\Delta p_{\text{restriction}}$ at the restriction (orifice) as well as the flow rate determined by the restriction setting by ensuring that the forces between the plug spring force and the actuator force remain in equilibrium. The maximum flow rate is adjusted at the set point adjuster (1.1), which adjusts the maximum orifice opening. If a slower flow rate is needed in the plant than the maximum flow rate adjusted, the electric actuator positions the orifice accordingly.

As the differential pressure across the orifice (restriction) has to be kept constant even when the network pressure drop changes, the valve (based on the electrically operated orifice) has a valve authority of 1. As a result, the control quality of outdoor-temperature-controlled temperature control equipment is not affected by the pressure drop across the network, for example.

Type 42-36 Differential Pressure Regulator with two diaphragms for increased functional safety (see Fig. 2)

An actuator with two diaphragms is always required when an FKM diaphragm is to be used. It is especially suitable for applications with thin oils (e.g. heat transfer oil).

The two diaphragms separate both diaphragm chambers connected to the high-pressure and low-pressure connections. They generate a positioning force from the differential pressure. A mechanical diaphragm rupture indicator (22) is located between the two diaphragms. In the event of a diaphragm rupture, the pressure in the space between the two operating diaphragm starts to increase. This causes the pin in the diaphragm rupture indicator to be pushed outwards and a red ring appears, indicating the diaphragm rupture (response pressure approx. 1.5 bar). The intact operating diaphragm takes on the control task of the ruptured diaphragm.

A pressure switch can be optionally mounted to the actuator to trigger an alarm.

Additional temperature control or safety equipment

The regulators in DN 150 and smaller can additionally be equipped with a double adapter (see Data Sheet ► T 3019) and a Type 2231 or Type 2232 Control Thermostat (see Information Sheet ► T 2010). In this case, they can perform additional temperature control. Similarly, the regulators can also be equipped with safety equipment, such as Type 2213 Safety Thermostat, Type 2212 Safety Temperature Limiter or Type 2401 Safety Pressure Limiter.

Installation

Choose a place of installation that allows you to freely access the regulator even after the entire plant is completed.

Install the valves in horizontal pipelines with the diaphragm actuator suspended downward. The direction of flow must match the arrow on the valve body.

Valve and actuator are delivered unattached. The electric or electrohydraulic actuator can be easily mounted before or after the valve is installed. A coupling nut is used for attachment.

If the regulator is to be insulated, do not insulate actuator and coupling nut. Make sure the permissible ambient temperature is not exceeded. If necessary, install an extension piece to protect the actuator. The insulating limit is in this case approx. 25 mm above the top of the valve body.

Accessories

Required accessories, such as needle valves, compensation chambers and control lines, are listed in Data Sheet ► T 3095.

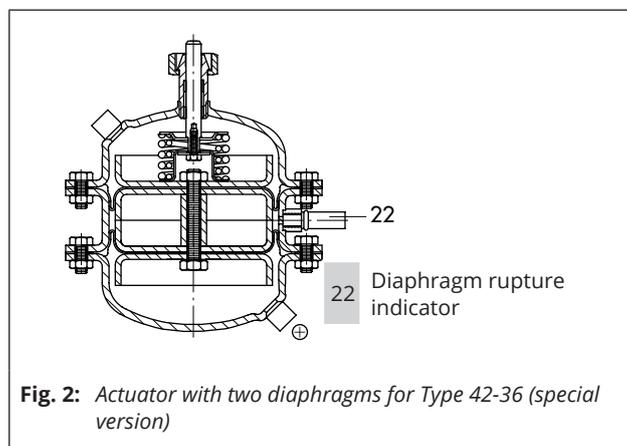
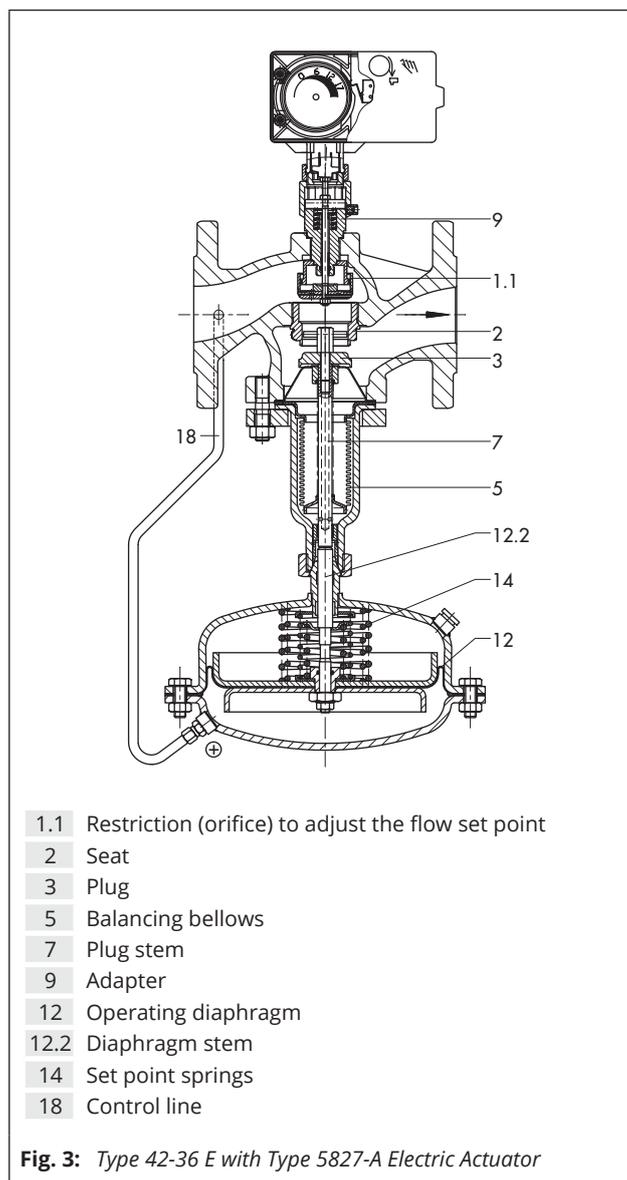


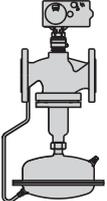
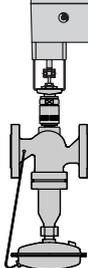
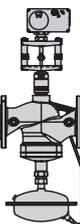
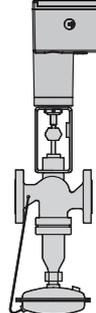
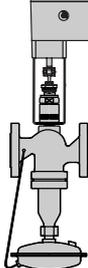
Fig. 2: Actuator with two diaphragms for Type 42-36 (special version)



- 1.1 Restriction (orifice) to adjust the flow set point
- 2 Seat
- 3 Plug
- 5 Balancing bellows
- 7 Plug stem
- 9 Adapter
- 12 Operating diaphragm
- 12.2 Diaphragm stem
- 14 Set point springs
- 18 Control line

Fig. 3: Type 42-36 E with Type 5827-A Electric Actuator

Table 1: Device combinations

Regulator		Type 42-36 E				
Basic unit		Type 42-36 E				
See Data Sheet		▶ T 3015				
Application for flow rate control V						
		Type 42-36 E with Type 5827-N/-A Electric Actuator	Type 42-36 E with Type 3374 Electric Actuator	Type 42-36 E with Type 5827-N3 Electric Actuator	Type 42-36 E with Type 3374 Electric Actuator	
Installation in	Flow pipe	•	•	•	•	
	Return pipe	•	•	•	•	
Adjustable set point V		•	•	•	•	
Electric actuator						
Nominal size	Type I Fail-safe action					
≤DN 50	Type 5827-N	No	•			
	Type 5827-A	Yes	•			
DN 65 to 100	Type 5827-N3	No		• ¹⁾		
	Type 3374-11	No		•		
	Type 3374-21	Yes		•		
≥DN 125	Type 3374-15	No				•
	Type 3374-25	Yes			•	

¹⁾ The adapter (1400-7414) is required in addition to the Type 5827-N3 Actuator.

The table gives an overview of the different versions of the combined regulators and their typical applications. Refer to Data Sheet ▶ T 3015 for details on the basic regulator.

Sample applications

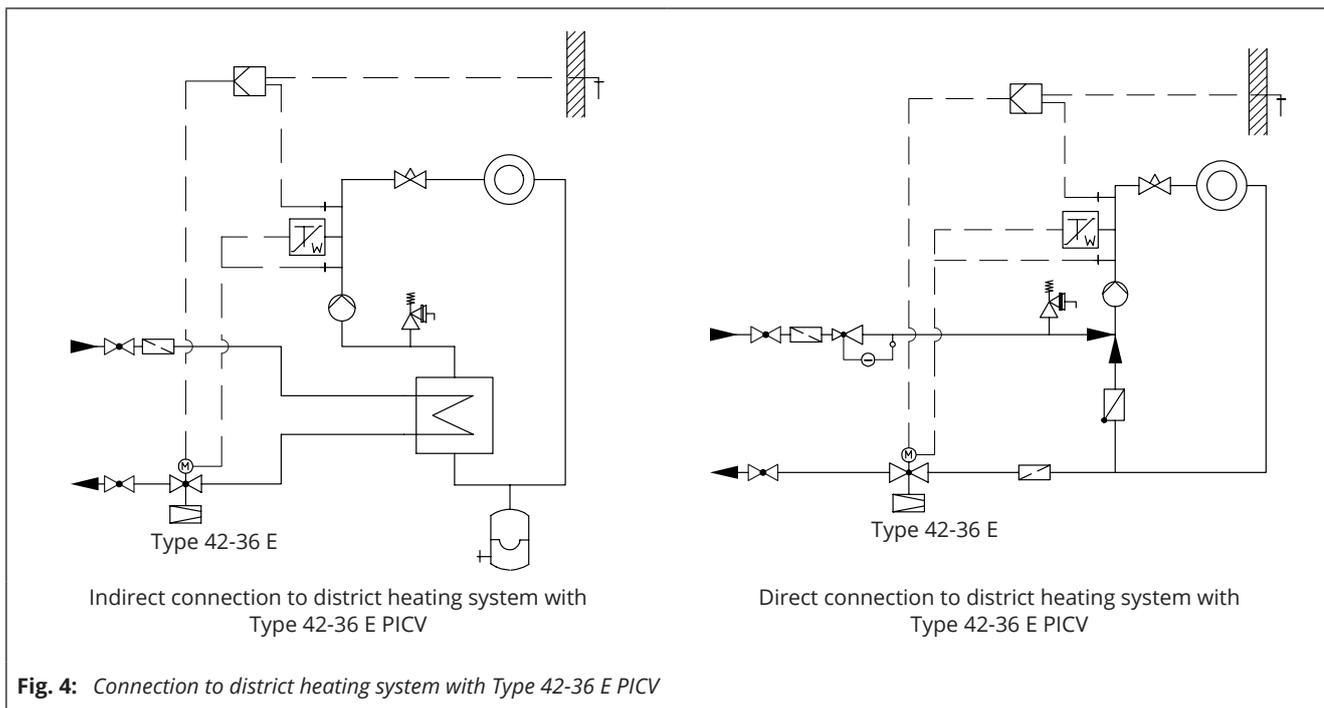


Table 2: Technical data · Valves · All pressures in bar

Type 2423 E Valve	Balanced by a bellows	Balanced by a diaphragm
Nominal size	DN 15 to 250	DN 65 to 250
Pressure rating	PN 16, 25 and 40	
Max. medium temperature	Liquids: 150 °C ¹⁾ · Nitrogen and air: 150 °C ²⁾	Liquids 150 °C ¹⁾ · Air 80 °C
Max. ambient temperature	50 °C	
Conformity	CE	

¹⁾ Use an intermediate insulating piece (1990-1713) for DN 15 to 50 and water temperatures ≥130 °C.

²⁾ Special version: valve with orifice stem seal and operating diaphragm made of FKM

Table 3: K_{VS} coefficients, x_{FZ} values, flow rate set point ranges for water and max. permissible differential pressures

Type 2423 E Valve · Balanced by a bellows															
Nominal size	DN	15	20	25	32	40	50	65	80	100	125	150	200	250	
Valve travel		10 mm						16 mm			22 mm				
K_{VS} coefficient		4	6.3	8	16	20	32	50	80	125	190	280	420	500	
x_{FZ} value		0.65	0.6	0.55		0.45	0.4		0.35			0.3			
Max. perm. differential pressure Δp		25 bar						20 bar		16 bar		12 bar	10 bar		
Flow rate set point ranges for water in m ³ /h															
Diff. pressure across restriction ²⁾	$\Delta p_{restriction} = 0.2$ bar	0.5 to 2	0.5 to 3	0.8 to 3.5	2 to 7	3 to 11	3 to 16	5 to 28	7 to 35 ¹⁾	10 to 63	40 to 80	50 to 120	70 to 180	90 to 220	
	$\Delta p_{restriction} = 0.5$ bar	0.8 to 3	0.8 to 4.5	1.2 to 5.3	3 to 9.5	4.5 to 16	4.5 to 24	7.5 to 40	10 to 55	15 to 90	60 to 120	75 to 180	100 to 260	120 to 300	
Type 2423 E Valve · Balanced by a diaphragm															
Nominal size	DN	65	80	100	125	150	200	250							
Valve travel		15 mm						35 mm							
K_{VS} coefficients in m ³ /h		50	80	125	250	380	650	800							
x_{FZ} value		0.4	0.35						0.3						
Max. perm. differential pressure Δp		12 bar		10 bar		12 bar		10 bar							
Flow rate set point ranges for water in m ³ /h															
Diff. pressure across restriction ²⁾	$\Delta p_{restriction} = 0.2$ bar	5 to 28	7 to 35 ¹⁾	10 to 63	40 to 90	50 to 140	70 to 220	90 to 260							
	$\Delta p_{restriction} = 0.5$ bar	7.5 to 40	10 to 55	15 to 90	60 to 130	75 to 200	100 to 310	120 to 360							

¹⁾ 7 to 35 m³/h (160 cm² actuator), 7 to 40 m³/h (320 cm² actuator)

²⁾ $\Delta p_{restriction}$ in 0.3 bar possible as special version

Differential pressure across the valve

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

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

Δp_{min} Minimum differential pressure across the valve in bar
 $\Delta p_{restriction}$ Differential pressure created at the restriction for measuring the flow rate in the regulator
 \dot{V} Adjusted flow rate in m³/h
 K_{VS} Valve flow coefficient in m³/h

Sample application

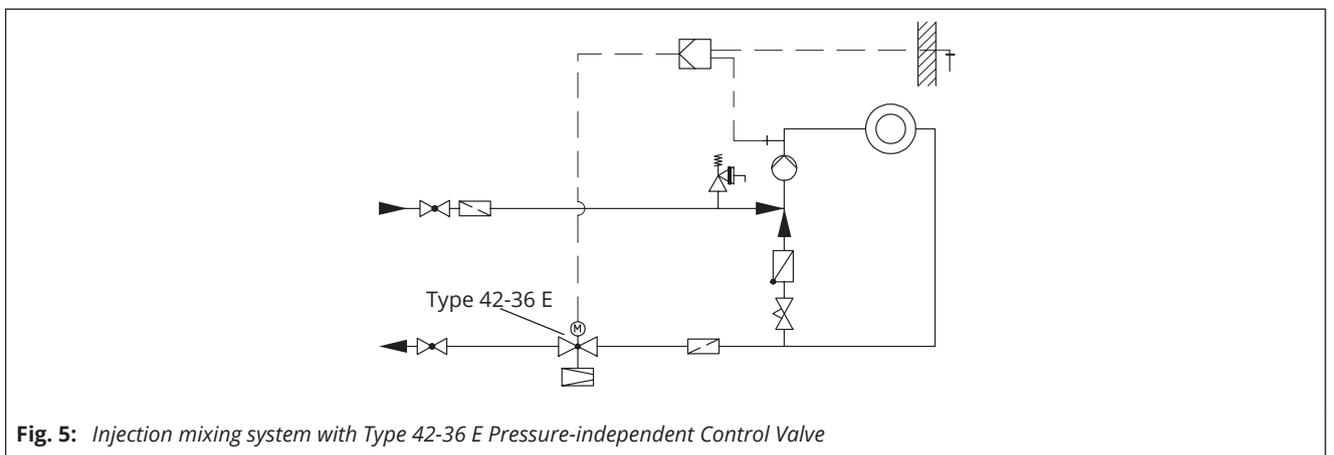


Fig. 5: Injection mixing system with Type 42-36 E Pressure-independent Control Valve

Table 4: Technical data · Actuators

Type 5827-N1, Type 5827-A1, Type 5827-N2, Type 5827-A2, Type 5827-N3, Type 3374-11 and Type 3374-21 Electric Actuators							
Nominal size	DN 15 to 25		DN 32 to 50		DN 65 to 100		
Type ...	5827-N1	5827-A1	5827-N2	5827-A2	3374-11	3374-21	5827-N3
Fail-safe action	Without	With	Without	With	Without	With	Without
Rated travel	6 mm		12 mm		15 mm		15 mm
Transit time for rated travel	45 s		70 s		120 s		90 s
Transit time for fail-safe action	-	4 s	-	6 s	-	12 s	-
Positioning force	700 N	-	700 N	-	2500 N	500 N · Stem retracts 2000 N · Stem extends	700 N
Nominal closing force of spring	-	500 N	-	500 N			
Electrical connection	24 V, 50 Hz 230 V, 50 Hz				230 V, 50 Hz 24 V, 50 Hz · 24 V (DC) 85 to 264 V, 50/60 Hz ¹⁾		24 V, 50 Hz 230 V, 50 Hz
Power consumption	5 VA	7 VA	5 VA	7 VA	Max. 18 VA		3 VA
Permissible ambient temperature	0 to 50 °C				5 to 60 °C		0 to 50 °C
Perm. temperature at the connecting stem	0 to 130 °C				-		-
Refer to Data Sheet	▶ T 5827				▶ T 8331		▶ T 5827

Type 3374-15 and Type 3374-25 Electric Actuators		
Nominal size	DN 125 to 250	
Type ...	3374-15	3374-25
Fail-safe action	Without	With
Rated travel	30 mm	
Transit time for rated travel	240 s	300 s
Transit time for fail-safe action	-	30 s
Positioning force	2500 N	2100 N · Stem retracts 1800 N · Stem extends
Nominal closing force of spring		
Electrical connection	230 V, 50 Hz · 24 V, 50 Hz · 24 V (DC) 85 to 264 V, 50/60 Hz ¹⁾	
Power consumption	Max. 18 VA	28 VA
Permissible ambient temperature	5 to 60 °C	
Perm. temperature at the connecting stem	-	-
Refer to Data Sheet	▶ T 8331	

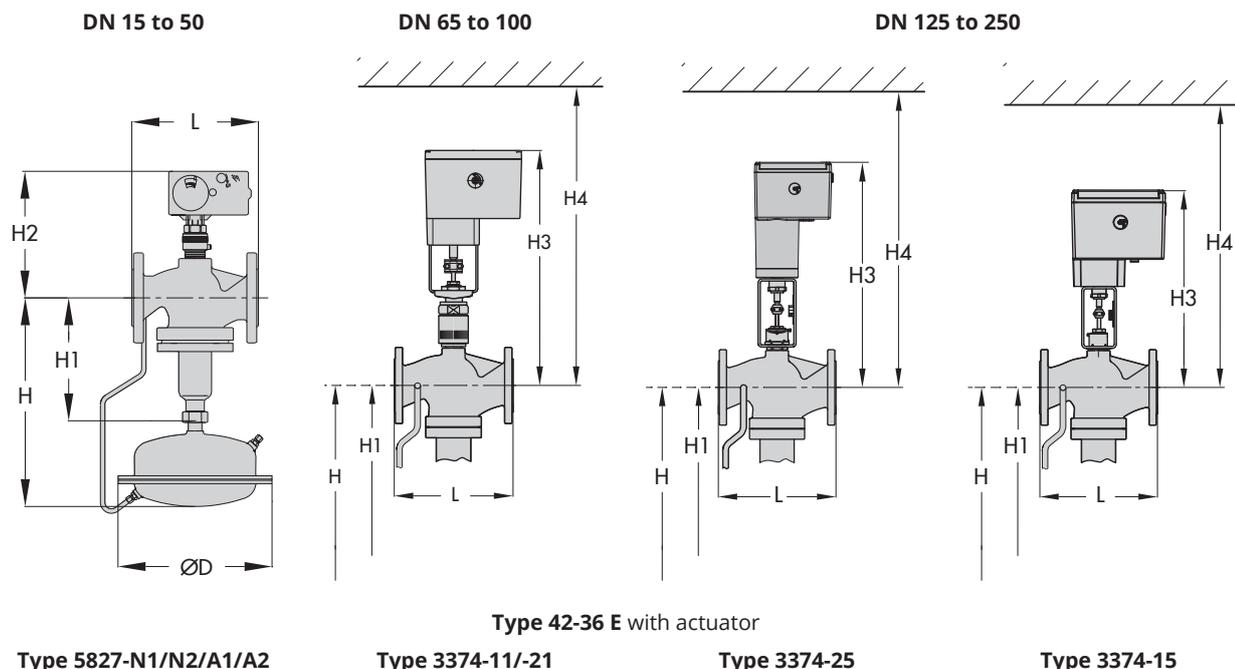
¹⁾ With positioner

Table 5: Materials · Material numbers according to DIN EN

Type 2423 E Valve · 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	Cast steel 1.0619	Cast stainless steel 1.4408	Forged stainless steel 1.4404 ¹⁾
Seat	1.4104, 1.4006			1.4404	
Plug	Up to DN 100	1.4104, 1.4006 ²⁾		1.4404	
	DN 125 to 250	1.4301, 1.4404 with PTFE seal			
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 2423 E Valve · Balanced by a diaphragm					
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	Cast steel 1.0619	Cast stainless steel 1.4408 ⁶⁾	-
Valve seat	Red brass ^{3) 4)}				
Plug (standard version)	Red brass ^{3) 5)} · With 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 2426 Actuator					
Diaphragm cases	1.0332			1.4301	
Diaphragm	EPDM with fabric reinforcement · Special version for mineral oils: FKM with fabric reinforcement ⁷⁾ or FKM without fabric reinforcement ⁹⁾ · PVMQ diaphragm ¹⁰⁾ for inert gases				
Max. perm. temperature at the diaphragm	Air and gases 80 °C; liquids 80 °C · 90 °C ¹⁰⁾ · 120 °C · 150 °C ⁸⁾				
Guide bushing	DU bushing			PTFE	
Seals	EPDM/PTFE ⁷⁾				
Type 5827 Electric Actuator					
Housing, housing cover	Plastic (PPO with glass fiber reinforcement)				
Coupling nut	Brass				
Type 3374 Electric Actuator					
Housing and cover	PPO with glass fiber reinforcement				
Central attachment and yoke	Flange: aluminum, connecting thread M30x1.5 · Formed sheet: 1.4301H injected into housing, 30 mm hole				
Actuator stem	1.4305				

¹⁾ DN 15, 25, 40 and 50 only²⁾ Optionally with soft seal with standard K_{vS} coefficients³⁾ Special version 1.4409⁴⁾ DN 65 to 100: 1.4006⁵⁾ DN 65 to 100: 1.4104/1.4006⁶⁾ DN 125 to 250 only⁷⁾ Only with actuator with two diaphragms, height H +55 mm⁸⁾ Only with mounting position with the actuator suspended⁹⁾ Only with actuator with one diaphragm, max. 80 °C, only with 0.2 bar differential pressure across the restriction¹⁰⁾ Only for temperatures from -60 to +90 °C with air and gases

Dimensional drawings · Type 2423 E Valve balanced by a bellows · DN 15 to 250



Dimensions in mm and weights

		With Types 5827-N1/N2/A1/A2 Actuator					With Type 3374-11/-21 Actuator			
Nominal size	DN	15	20	25	32	40	50	65	80	100
Overall length L		130	150	160	180	200	230	290	310	350
Height H1		225					300		355	
Height H2	Forged steel	218	-	240	-	260	266	-		
	Other materials	220					240		-	
Height H3		-					520		540	
Height H4		-					820		890	
Type 42-36 E PICV										
Height H ^{4) 5)}		390					465		520	
Diaphragm actuator		ØD = 225 mm, A = 160 cm ^{2 2)}								
Weight for PN 16 ¹⁾ in kg (approx.)		13.5	14	15	21.5	22	24.5	51	56	71

		With Type 3374-25 Actuator				With Type 3374-15 Actuator			
Nominal size	DN	125	150	200	250	125	150	200	250
Overall length L		400	480	600	730	400	480	600	730
Height H1		460	590	730	730	460	590	730	730
Height H3		655	685	800	800	510	595	660	690
Height H4		1000	1030	1150	1150	860	950	1010	940
Type 42-36 E PICV									
Height H ^{4) 5)}		625	765	895	895	625	765	895	895
Diaphragm actuator		ØD = 285 mm, A = 320 cm ^{2 3)}							
Weight for PN 16 ¹⁾ in kg (approx.)		130	180	435	495	125	170	425	485

¹⁾ +10 % for cast steel PN 40 and spheroidal graphite iron PN 25

²⁾ Optionally with 320 cm² actuator for DN 65 to 100. For regulators with double adapter (▶ T 3019) for DN 65 to 100: 320 cm² actuator recommended.

³⁾ Optionally with 640 cm² actuator and ØD = 390 mm

⁴⁾ Minimum clearance required to remove the actuator: +100 mm

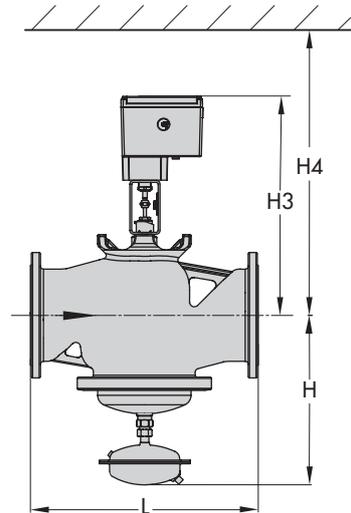
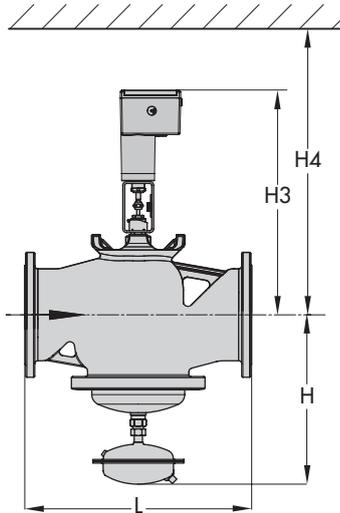
⁵⁾ Actuator with two diaphragms: Height H +55 mm

Fig. 6: Dimensions of the regulators with a valve balanced by a bellows

Dimensions and weights · Type 42-36 E with Type 2423 E Valve balanced by a diaphragm

Dimensional drawings · Type 2423 E Valve balanced by a diaphragm · DN 65 to 250

Type 42-36 E with Type 3374 Electric Actuator



Dimensions in mm and weights in kg

With Type 3274-25 Actuator				
Nominal size DN	125	150	200	250
Overall length L	400	480	600	730
Height H ^{2) 3)}	450	475	545	545
Height H3	655	685	800	800
Height H4	1000	1030	1150	1150
Weight ¹⁾ in kg (approx.)	95	115	295	315

- ¹⁾ Based on cast iron (EN-JL1040), other materials +10 %
- ²⁾ Minimum clearance required to remove the actuator: +100 mm
- ³⁾ Actuator with two diaphragms: Height H +55 mm

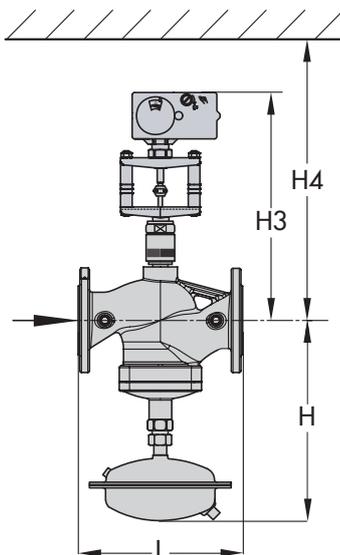
Dimensions in mm and weights in kg

With Type 3374-11/-21 Actuator			Type 3374-15				
Nominal size DN	65	80	100	125	150	200	250
Overall length L	290	310	350	400	480	600	730
Height H ^{2) 3)}	355	355	380	450	475	545	545
Height H3	520	520	540	510	595	660	690
Height H4	820	820	890	860	950	1010	940
Weight ¹⁾ in kg (approx.)	46	51	68	90	110	290	310

- ¹⁾ Based on cast iron (EN-JL1040), other materials +10 %
- ²⁾ Minimum clearance required to remove the actuator: +100 mm
- ³⁾ Actuator with two diaphragms: Height H +55 mm

Dimensional drawing · Type 2423 E Valve balanced by a diaphragm · DN 65 to 100

Type 42-36 E with Type 5827-N-30 Electric Actuator



Dimensions in mm and weights in kg

With Type 5827-N-30 Actuator			
Nominal size DN	65	80	100
Overall length L	290	310	350
Height H ^{2) 3)}	355	355	380
Height H3	430	430	450
Height H4	730	730	800
Weight ¹⁾ in kg (approx.)	43	48	65

- ¹⁾ Based on cast iron (EN-JL1040), other materials +10 %
- ²⁾ Minimum clearance required to remove the actuator: +100 mm
- ³⁾ Actuator with two diaphragms: Height H +55 mm

Fig. 7: Dimensions of the regulators with a valve balanced by a diaphragm

Ordering text**Type 42-36 E Pressure-independent Control Valve (PICV)**

Valve balanced by a bellows/diaphragm DN ..., PN ..., K_{VS}

...

Differential pressure at the restriction ... bar,

With Type ... Electric Actuator

Power supply ... V, ... Hz

Optionally with Type ... Control Thermostat, set point range ... °C

Optionally, accessories, special version