DATA SHEET

T 2552 EN

Type 2333 Pressure Reducing Valve with pilot valve · Type 2335 Excess Pressure Valve with pilot valve

Self-operated pressure regulators · Pilot operated by the process medium

CE

Application

Pressure regulators for set points from **2** to **28 bar** · Valve sizes DN 65 to 400 · Pressure rating **PN 16** to **40** · Suitable for liquids, gases and vapors up to **350 °C**

Type 2333: the valve closes when the **downstream** pressure rises

Type 2335: the valve opens when the **upstream** pressure rises

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The differential pressure across the regulator is used as auxiliary energy to operate the valve. This pressure must be at least as high as the minimum differential pressure Δp_{min} specified in Table 1. If this minimum differential pressure does not exist, the regulator opens only partly and the maximum flow rate cannot be reached.

The attached pilot valve (either a pressure reducing valve or excess pressure valve) determines the function of the regulator.

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- High dynamic response and small system deviation, i.e. excellent control accuracy
- Convenient set point adjustment at the pilot valve
- Single-seated globe valve with flanged end connections
- Regulator delivered as ready-to-install unit

Versions

– Type 2422 Valve (modified), balanced by a bellows or a diaphragm, with soft-seated plug and internal closing spring
– Each regulator comes with one pilot valve with a strainer and a fixed restrictor or Venturi nozzle
– Valve body made of either cast iron, spheroidal graphite iron, cast steel or CrNiMo steel
– Valves balanced by a diaphragm preferable for use with water and non-flammable gases
– Version for steam (valves balanced by a bellows) for DN 65 to 100 with compensation chamber and needle valve

Type 2333 · Pressure reducing valve for liquids, vapors and gases. Used to control the downstream pressure p_2 to the set point adjusted at the pilot valve. Equipped with a pilot valve suitable for the process medium.

Type 2335 · Excess pressure valve (Fig. 1) for liquids, vapors and gases. Used to control the upstream pressure p_1 to the set point adjusted at the pilot valve. Equipped with a pilot valve suitable for the process medium.

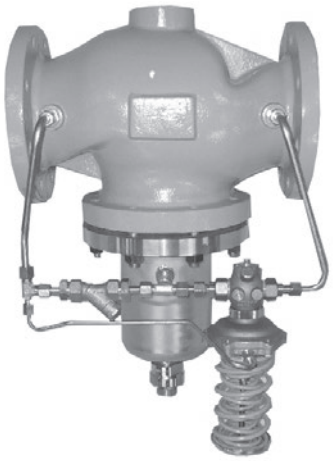

Fig. 1: *Type 2335 Excess Pressure Valve (DN 150) with a Type 44-7 Pilot Valve (modified)*

Special versions

– With flow divider for noise reduction (not for liquids)
– Lower min. required differential pressure Δp
– With internal parts made of FKM, e.g. for use with mineral oils
– Version for flammable gases
– Version free of non-ferrous metal
– Version for deionized water
– Additionally with solenoid valve for either emergency operation over a remote control unit or pressure limitation when used in combination with an electric safety pressure limiter
– Reinforced version for higher differential pressures
– Reduced K_{VS} coefficient

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Principle of operation (see Fig. 2)

The medium flows through the globe valve in the direction indicated by the arrow. The position of the plug determines the flow rate across the area released between plug (3) and valve seat (2). The travel position of the pilot valve (5) determines the pressure conditions across the valve.

The various forces (the upstream pressure p_1 acting on the plug surface, the control pressure p_S acting on the bellows surface and the force of the set point spring (3)) are compared.

In the **Type 2333 Pressure Reducing Valve**, a rise in downstream pressure p_2 causes the pilot valve to close. The control pressure p_S increases and the plug of the main valve starts to close. When the pilot valve is closed ($p_S = p_1$), the pressure reducing valve (main valve) is also completely closed.

Together with the pilot valve, the fixed restriction (6) or the Venturi nozzle (8) create the control pressure p_S.

If the downstream pressure p_2 falls again below the set point, the pilot valve opens. The control pressure p_S falls as a result. The force resulting from the upstream pressure p_1 acting on the plug surface causes the valve to open.

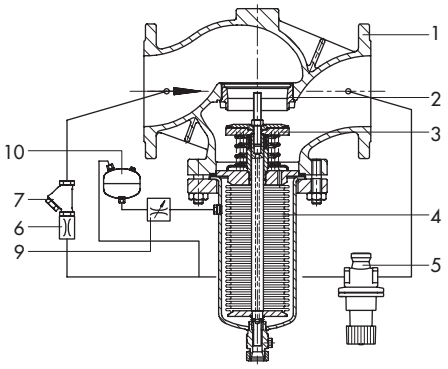
In the **Type 2335 Excess Pressure Valve**, the rising upstream pressure p_1 causes the main valve to open. Together with the pilot valve, the Venturi nozzle (8) (the fixed restriction (6) and needle valve (9) in the version for steam) create the control pressure p_S.

When the pilot valve is closed, the valve is fully balanced. The control pressure p_S between the pilot valve and Venturi nozzle acting on the outside of the balancing bellows (4) or balancing diaphragm (4) and the upstream pressure p_1 balance each other out ($p_S = p_1$). The set point spring below the valve plug closes the valve.

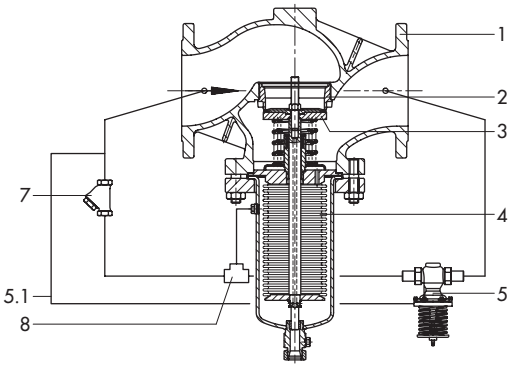
When the pilot valve opens, the control pressure p_S falls, causing the differential pressure at the balancing bellows or balancing diaphragm to increase. The force acting on the plug surface opposes the force of the springs and the valve opens.

To ensure proper functioning, the minimum differential pressure Δp_{min} specified in Table 1 must be available as specified depending on the field of application. If the differential pressure falls below the minimum specification, pressure control is no longer possible. In this case, the pressure reducing valve reduces the downstream pressure to a constant level to balance the forces. The same applies to the excess pressure valve accordingly.

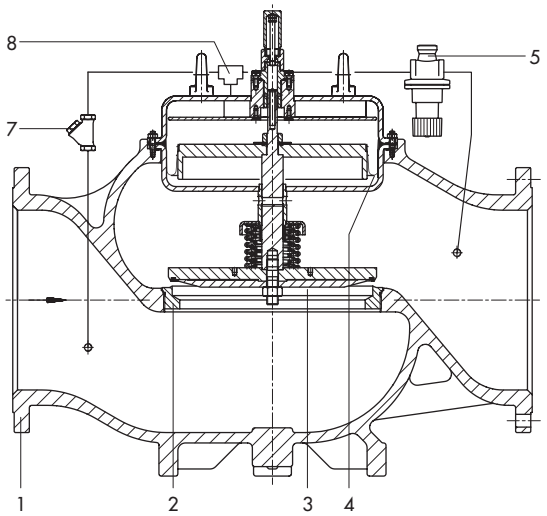
The regulator version for steam is only available with valves balanced by a bellows. This version has a compensation chamber (10) already fitted in the control line. The needle valve (9) is open and lead-sealed. Before start-up, fill the compensation chamber with water at the top filler opening.



Type 2333 Pressure Reducing Valve (DN 125 to 250), Type 2422 Valve **balanced by a bellows** · Version with compensation chamber and needle valve for steam (DN 65 to 100)



Type 2335 Excess Pressure Valve (DN 125 to 250), Type 2422 Valve **balanced by a bellows** · Version suitable for liquids and gases



Type 2333 Pressure Reducing Valve (DN 125 to 400), Type 2422 Valve **Balanced by a diaphragm** · Version suitable for liquids and gases

1	Valve body
2	Valve seat
3	Plug with plug stem and set point spring
4	Balancing bellows or diaphragm
5	Pilot valve
5.1	Set point pressure line
6	Fixed restriction (version for steam only)
7	Strainer
8	Venturi nozzle (for gases and liquids)
9	Needle valve (version for steam only)
10	Compensation chamber (version for steam only)
p_S	Control pressure
p_1	Upstream pressure
p_2	Downstream pressure

Fig. 2: *Functional diagram*

Table 1: *Technical data · All pressures in bar (gauge)*

Type 2422 Valve · **Balanced by a bellows** · Suitable for liquids, gases or vapors

Valve size	**DN 65**	**DN 80**	**DN 100**	**DN 125**	**DN 150**	**DN 200**	**DN 250**
Pressure rating	**PN 16 to 40**						
Standard K_{VS} coefficients							
K_{VS} coefficient	50 [1]	80 [1]	125 [1]	200	360	520	620
K_{VS} coefficient (with flow divider ST 1)	38 [1]	60 [1]	95 [1]	150	270	400	500
K_{VS} coefficient (with flow divider ST 3)	25 [1]	40 [1]	60 [1]	100	180	260	310
x_{FZ} value	0.4	0.35				0.3	
Minimum differential pressure Δp_{min}							
Version for water	0.4 bar (320 cm² actuator) [1]			1.0 bar/3.0 bar [4]		0.7 bar/3.0 bar [4]	
Version for steam	0.2 bar (640 cm² actuator) [1]			1.9 bar/3.0 bar [4]	2.0 bar/3.0 bar [4]	1.4 bar/3.0 bar [4]	
Max. permissible differential pressure Δp_{max}	20 bar		16 bar	16 bar/35 bar [4]	12 bar/35 bar [4]	10 bar/25 bar [4]	
Reduced K_{VS} coefficient							
K_{VS} coefficient	32 [1]	32 [1]	80 [1]	80 [1]	125 [1]	360	
K_{VS} coefficient (with flow divider ST 1)	–			60 [1]	95 [1]	270	
K_{VS} coefficient (with flow divider ST 3)				40 [1]	60 [1]	180	
x_{FZ} value	0.4	0.35				0.3	
Minimum differential pressure Δp_{min}							
Version for water/air	0.8 bar (320 cm² actuator) [1]			0.2 bar [1]		1.0 bar	
Version for steam	0.4 bar (640 cm² actuator) [1]			–	–	1.9 bar	2.0 bar
Max. permissible differential pressure Δp_{max}	20 bar				16 bar	12 bar	
Leakage class according to IEC 60534-4	**I** ≤0.05 % of K_{VS} coefficient (metal seal) **IV** ≤0.01 % of K_{VS} coefficient (soft seal)						
Max. permissible temperature (depending on the pilot valve)	**Types 44-1 B, 44-2 and 44-7**: 150 °C · **Types 44-0 B and 44-6 B**: 200 °C **Types 2405 and 2406:** 60 °C · **Types 41-23 and 41-73**: 350 °C [2]						
Set point ranges in bar, continuously adjustable at the pilot valve	**Type 44-2**: 2 to 4.2, 2.4 to 6.3, 6 to 10.5 · **Type 44-7**: 2 to 4.4, 2.4 to 6.6, 6 to 11 **Types 44-0 B, 44-1 B and 44-6 B**: 2 to 6, 4 to 10, 8 to 20 · **Types 2405 and 2406**: 2 to 5, 4.5 to 10 **Types 41-23 and 41-73**: 2 to 5, 4.5 to 10, 8 to 16, 10 to 22, 20 to 28						
Conformity	CE · EAC						

[1] Version with Type 2420 Diaphragm Actuator, 640 cm²
[2] Without compensation chamber: 150 °C only
[3] Only balanced by a bellows
[4] Reinforced version with bellows

Type 2422 Valve · **Balanced by a diaphragm** · Suitable for liquids and gases

Valve size	**DN 125**	**DN 150**	**DN 200**	**DN 250**	**DN 300**	**DN 400**
Pressure rating	PN 16 to 40					
Standard K_{VS} coefficients						
K_{VS} coefficient	250	380	650	800	1250	2000
X_{Fz} value	0.35		0.3		0.2	
Minimum differential pressure Δp_{min}						
Minimum differential pressure Δp_{min}	0.8 bar		0.4 bar		0.5 bar	0.3 bar
Max. permissible differential pressure Δp_{max}	12 bar		10 bar		10 bar/25 bar [1]	6 bar
Reduced K_{VS} coefficient						
K_{VS} coefficient	–		380		950	–
X_{Fz} value	–		0.35		0.2	–
Minimum differential pressure Δp_{min}						
Minimum differential pressure Δp_{min}	–		0.8 bar		0.95 bar	–
Max. permissible differential pressure Δp_{max}	–		12 bar		25 bar	–
Leakage class according to IEC 60534-4	**IV** ≤0.01 % of K_{VS} coefficient					
Max. permissible temperature (depending on the pilot valve) [2]	**Types 44-2 and 44-7**: 150 °C · **Types 44-1 B and 44-6 B:** 150 °C · **Types 2405 and 2406:** 60 °C **Types 41-23 and 41-73**: 150 °C · Steam pressure regulator as special version on request					
Set point ranges in bar, continuously adjustable at the pilot valve	**Type 44-2**: 2 to 4.2, 2.4 to 6.3, 6 to 10.5 · **Type 44-7**: 2 to 4.4, 2.4 to 6.6, 6 to 1 **Types 44-1 B and 44-6 B**: 2 to 6, 4 to 10, 8 to 20 · **Types 2405 and 2406**: 2 to 5, 4.5 to 10 **Types 41-23 and 41-73**: 2 to 5, 4.5 to 10, 8 to 16, 10 to 22, 20 to 28					
Conformity	CE · EAC					

[1] Reinforced version only available with reduced K_{VS} coefficient (K_{VS} 950)
[2] Max. 50 °C with DN 400

Pilot valves for Type 2333 Pressure Reducing Valve

Type 44-2 · Suitable for liquids and mineral oil (150 °C), non-flammable gases (80 °C)

Type 44-1 B · Suitable for liquids (150 °C), non-flammable gases (80 °C) and nitrogen (150 °C)

Type 44-0 B · Suitable for steam (200 °C)

Type 41-23 · Suitable for gases, liquids and steam (350 °C)

Type 2405 · Suitable for gases (–20 to +60 °C)

Pilot valves for Type 2335 Excess Pressure Valve

Type 44-7 · Suitable for liquids and mineral oil (150 °C), non-flammable gases (80 °C)

Type 44-6 B · Suitable for liquids (150 °C), non-flammable gases (80 °C), steam (200 °C) and nitrogen (150 °C)

Type 41-73 · Suitable for gases, liquids and steam (350 °C)

Type 2406 · Suitable for gases (–20 to +60 °C)

Installation

- Installation in horizontal pipelines
- The direction of flow must match the direction indicated by the arrow on the body
- **Valve balanced by a bellows:** valve with actuator suspended downwards
- **Valve balanced by a diaphragm:** balancing diaphragm facing upward
- Install a strainer (e.g. SAMSON Type 2 N or Type 2 NI) upstream of the valve.
- Do not insulate the pilot valve when the medium temperature exceeds 80 °C.

For further details on installation refer to Mounting and Operating Instructions ▶ EB 2552-1 or ▶ EB 2552-2.

Table 2: *Pilot valves · Overview, technical data*

Pilot valve	Pressure rating	Connection [1]	Material	K_{VS} coefficient	Set point ranges	Medium	Data Sheet
Type 44-2 Pressure Reducing Valve	PN 25	DN 15	Red brass · Spheroidal graphite iron	1	2 to 10.5 bar	Liquids up to 150 °C · Non-flammable gases up to 80 °C	▶ T 2623 ▶ T 2723
Type 44-7 Excess Pressure Valve					2 to 11 bar		
Type 44-0 B Pressure Reducing Valve	PN 25	G ½, DN 15	Red brass · Spheroidal graphite iron · Stainless steel	1	2 to 20 bar	Steam up to 200 °C	▶ T 2628
Type 44-1 B Pressure Reducing Valve						Liquids and mineral oil up to 150 °C · Flammable and non-flammable gases up to 80 °C · Nitrogen up to 150 °C	▶ T 2626
Type 44-6 B Excess Pressure Valve						Liquids and air up to 150 °C · Flammable and non-flammable gases up to 80 °C · Steam and nitrogen up to 150 °C · Vapors up to 200 °C	
Type 2405 Pressure Reducing Valve	PN 16 to 40	DN 15	Cast iron · Cast steel · Spheroidal graphite iron · Stainless steel · Forged steel	1	2 to 10 bar	Gases in temperature range –20 to +60 °C	▶ T 2520
Type 2406 Excess Pressure Valve	PN 16 to 40	DN 15	Cast iron · Cast steel · Spheroidal graphite iron · Stainless steel · Forged steel	1	2 to 10 bar	Gases in temperature range –20 to +60 °C	▶ T 2522
Type 41-23 Pressure Reducing Valve	PN 16 to 40	DN 15	Cast iron · Cast steel · Spheroidal graphite iron · Stainless steel · Forged steel	1	2 to 28 bar	Gases, liquids and steam up to 350 °C	▶ T 2512
Type 41-73 Excess Pressure Valve							▶ T 2517

[1] Main valve DN 300/400: all pilot valves with flanged connection (DN 25), K_{VS} 8 or with male thread (DN 25), K_{VS} 5 or optionally with female thread (G 1), K_{VS} 5

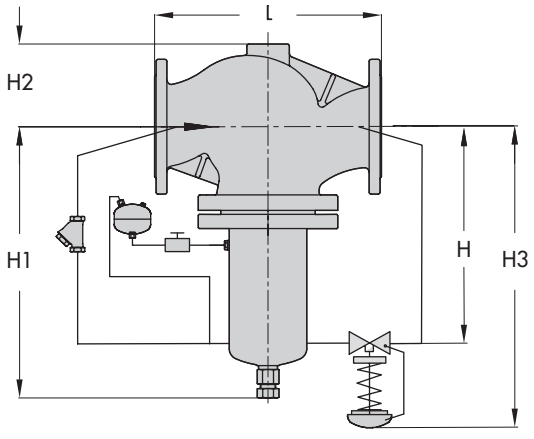
Table 3: *Materials · Material numbers according to DIN EN*

Type 2422 Valve · Balanced by a bellows					
Pressure rating		**PN 16**	**PN 16/25**	**PN 16, 25 and 40**	**PN 16, 25 and 40**
Body		Cast iron EN-GJL-250	Spheroidal graphite iron EN-GJS-400-18-LT	Cast steel 1.0619	Cast stainless steel 1.4408
Valve seat		1.4006			1.4401/1.4404
Plug	Standard version	1.4301 with PTFE soft seal [1], max. 220 °C			1.4401/1.4404 with PTFE soft seal, max. 220 °C
	Version for steam	PTFE soft seal, max. 220 °C · Metal seal, max. 350 °C			
Pressure balancing		Balancing cases made of sheet steel DD11 · Balancing bellows made of 1.4571			
Seal		Graphite on metal core			
Type 2422 Valve · Balanced by a diaphragm					
Pressure rating		**PN 16**	**PN 16/25**	**PN 16, 25 and 40**	**PN 16/25/40** [2]
Body		Cast iron EN-GJL-250	Spheroidal graphite iron EN-GJS-400-18-LT	Cast steel 1.0619	Cast stainless steel 1.4408
Valve seat	DN 125 to 250	CC499K [3]			1.4409
	DN 300, 400	Stainless steel 1.4301			
Plug	DN 125 to 250	CC499K [3]			1.4409
	DN 300	Stainless steel 1.4301 with EPDM soft seal [4], max. 150 °C			
	DN 400	Stainless steel 1.4301 with EPDM soft seal, max. 50 °C			
Pressure balancing		Balancing cases made of sheet steel DD11 · EPDM balancing diaphragm, max. 150 °C			

1) Optionally with EPDM soft seal, max. 150 °C.
2) DN 125 to 250
3) Optionally 1.4409
4) Optionally with PTFE soft seal, max. 150 °C.

Dimensions

Type 2422 Valve balanced by a bellows



Valve size	**DN**	**125**	**150**	**200**	**250**
Length L	mm	400	480	600	730
Height H	mm	285	315	390	390
Height H1	mm	460	590	730	730
Height H2	mm	145	175	235	260
Max. height H3 [2]	mm	≤725	≤825	≤890	≤890
Weight [1], approx. (PN 16, with Type 41-23 Pilot Valve)	kg	77	120	262	307

1) +10 % for cast steel 1.0619 (PN 25) and spheroidal graphite iron EN-GJS-400-18-LT (PN 25)
2) The overall height depends on the pilot valve used

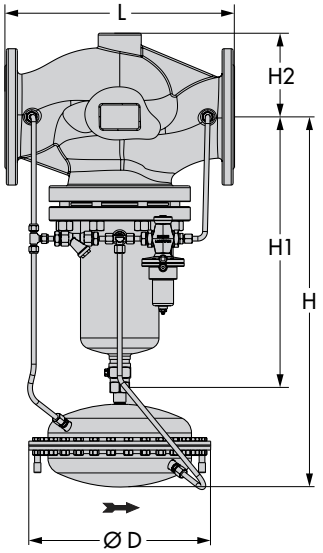
Type 2333 Pressure Reducing Valve/Type 2335 Excess Pressure Valve
DN 65 to 250 · Version balanced by a bellows, with compensation chamber and needle valve for steam (DN 65 to 100)

Drawing shows the version with Type 41-23 Pressure Reducing Valve as the pilot valve. The dimensions apply to an excess pressure valve accordingly.

Fig. 3: *Dimensions in mm*

Dimensions

Type 2422 Valve, balanced by a bellows (with diaphragm actuator)

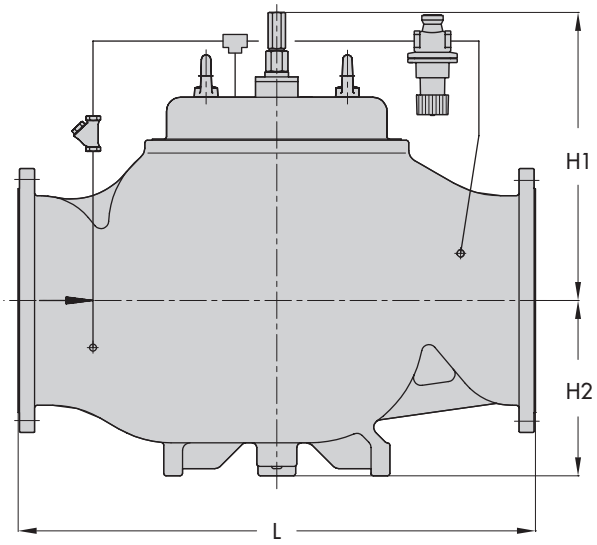


Valve size	DN	65	80	100	125	150	200	250
Length L	mm	290	310	350	400	480	600	730
Height H	mm	465		520	685	775	925	925
Height H1	mm	300		355	460	590	730	730
Height H2	mm	100		120	145	175	260	260
Ø D	mm	285 (320 cm²) 380 (640 cm²)			380 (640 cm²)			
Weight, approx.	kg	On request						

Type 2333 Pressure Reducing Valve/Type 2335 Excess Pressure Valve
DN 65 to 250 · Version balanced by a bellows · Optional with compensation chamber for steam control

Drawing shows the version with Type 44-1 B Pressure Reducing Valve as the pilot valve. The dimensions apply to an excess pressure valve accordingly.

Type 2422 Valve · Balanced by a diaphragm



Valve size	DN	125	150	200	250	300	400
Length L	mm	400	480	600	730	850	1100
Height H1	mm	285	310	380	380	510	610
Height H2	mm	145	175	260	260	290	390
Weight [1], approx. (PN 16, with Type 44-1 B Pilot Valve)	kg	52	72	212	307	317	627

[1] +10 % for cast steel 1.0619 (PN 25) and spheroidal graphite iron EN-GJS-400-18-LT (PN 25)

Type 2333 Pressure Reducing Valve/**Type 2335** Excess Pressure Valve
DN 125 to 400 · Version balanced by a diaphragm

Drawing shows the version with Type 44-1 B Pressure Reducing Valve as the pilot valve. The dimensions apply to an excess pressure valve accordingly.

Fig. 3: *Dimensions in mm*

Ordering text

Type 2333 Pressure Reducing Valve/Type 2335 Excess Pressure Valve

DN ..., valve balanced by a bellows/diaphragm (DN 125 and larger)

Body material ..., PN ..., DN ..., K_{VS} ...

With Type ... Pilot Valve, set point range … bar

Medium ..., max. medium temperature

Optionally, special version (e.g. flow divider etc.)