Self-operated Pressure Regulators

Pilot operated by the medium

Pressure Reducing Valve Type 2333 with pilot valve

Excess Pressure Valve Type 2335 with pilot valve

Application

Pressure regulators for set points from **1 bar** to **28 bar** · Valve sizes **DN 125** to **DN 400** · Nominal pressures from **PN 16** to **PN 40** · For **liquids** up to **150 °C,** non-flammable **gases** up to **80 °C**, and **steam** up to **350 °C**

Type 2333: valve closes when the downstream pressure rises
Type 2335: valve opens when the upstream pressure rises

The differential pressure across the regulator is used as auxiliary energy to operate the valve. To open the regulator, this pressure must be at least as high as the minimum differential pressure Δp_{min} specified in Table 1.

The attached pilot valve–either a pressure reducing valve or an excess pressure valve–determines the regulator's function.

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- High dynamic response and small offset, meaning high control accuracy due to the attached pilot valve
- Easy set point adjustment on the pilot valve
- Single-seated globe valve with flanges

Versions

– Type 2422 Valve (modified), containing a plug with soft sealing and a spring to close the valve (no actuator)
– Each regulator comes with one pilot valve (PV) with a strainer and a fixed restrictor or throttle valve
– Valve body made of either cast iron, spheroidal graphite iron, cast steel or CrNiMo steel

Type 2333 · **Pressure Reducing Valve** for liquids, vapors, and gases. Used to control the downstream pressure p_2 to the set point adjusted on the pilot valve.

Equipped with a pilot valve suitable for the process medium. The standard version including the Type 50 ES Pilot Valve is particularly suitable for cold water applications.

Pilot valves

– **Type 50 ES** · For cold water, oil, and non-flammable gases (50 °C)
– **Type 44-2** · For liquids and oil (150 °C), non-flammable gases (80 °C)
– **Type 44-1 B** · For liquids (150 °C) and non-flammable gases (80 °C)
– **Type 44-0 B** · For steam (200 °C)
– **Type M 44-2** · For liquids (150 °C), non-flammable gases (80 °C), and steam (200 °C)
– **Type 41-23** · For liquids, steam (350 °C), non-flammable gases (80 °C)

Fig. 1 · Type 2335 Excess Pressure Valve (DN 150) with Type 44-7 Pilot Valve

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 on the pilot valve.

Equipped with a pilot valve suitable for the process medium; standard versionis equipped with Type 44-7 Excess Pressure Valve.

Pilot valves

– **Type 44-7** · For liquids and oil (150 °C), non-flammable gases (80 °C)
– **Type 44-6 B** · For liquids (150 °C), non-flammable gases (80 °C), and steam (200 °C)
– **Type M 44-7** · For liquids (150 °C), non-flammable gases (80 °C), and steam (200 °C)
– **Type 41-73** · For liquids, steam (350 °C), non-flammable gases (80 °C)

Special versions

- Main valve Type 2422 as ANSI version
- Main valve Type 2422 as JIS version
- With flow divider for noise reduction (not for liquids)
- Body of CrNiMo steel
- Lower min. required differential pressure Δp
- Larger nominal sizes
- Oil-resistant version
- For flammable gases, on request
- Version with metal sealing (for temperatures above 220 °C)
- Version free of non-ferrous metal
- Additionally with 2/2-way solenoid valve for either emergency operation over a remote control unit or pressure limitation when used in combination with an electric safety pressure limiter

Principle of operation (see Figs. 2 to 4)

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

If the PV remains closed, the valve is fully balanced. The upstream pressure p_1 counterbalances the control pressure p_s ($p_s = p_1$) acting on the outside of the balancing bellows (4) between the pilot valve and the fixed restrictor (8) or throttle valve (6). For valve sizes DN 300 and DN 400, the control pressure acts on the balancing diaphragm from the top. The spring located below the plug closes the valve. By opening the PV, the differential pressure across the fixed restrictor (8) or throttle valve (6) increases. The force acting on the plug opposes the force of the positioning spring and opens the valve.

For safe operation of both valve types (pressure reducing valve and excess pressure valve), the minimum differential pressure Δp_{min} (see Table 1) must be available.

In the **Type 2333 Pressure Reducing Valve**, an increasing downstream pressure p_2 causes the pilot valve (5) to close. The control pressure p_s increases, and the plug (3) closes the valve. When the pilot valve (5) is closed ($p_s = p_1$), the pressure reducing valve is also completely closed.

In the **Type 2335 Excess Pressure Valve,** an increasing upstream pressure p_1 causes the pilot valve (5) to open. The control pressure p_s decreases. The valve opens against the force of the positioning springs.

Installation

- Installation in horizontal pipelines
- Direction of flow as indicated by the arrow on the valve body
- Up to DN 250: the valve bonnet including the body must be vertically suspended;
  DN 300, DN 400: installation with the balancing diaphragm pointing upwards
- Install a strainer (e.g. SAMSON Type 2 N/Type 2 NI) upstream of the valve
- Do not insulate pilot valve when handling hot media

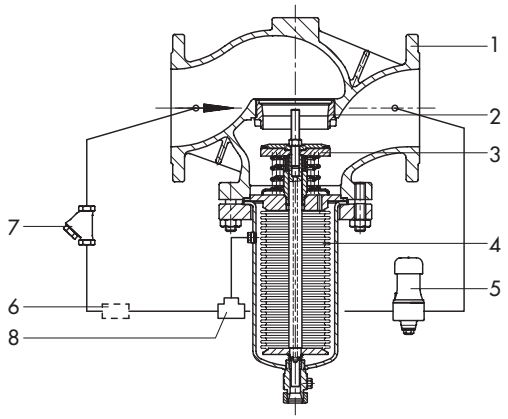


Fig. 2 · Type 2333 Pressure Reducing Valve (DN 125 to DN 250), principle of operation

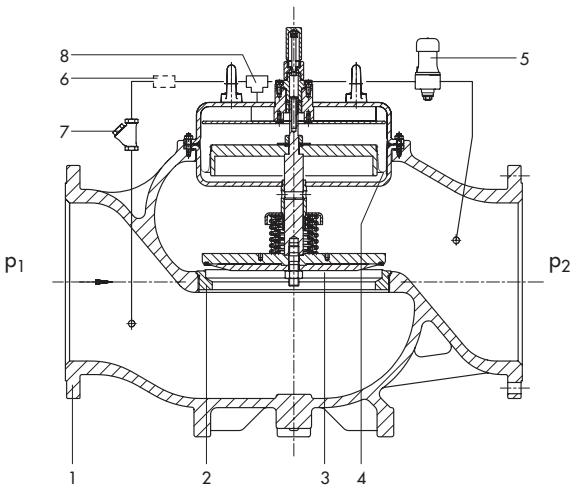


Fig. 3 · Type 2333 Pressure Reducing Valve (DN 300 and DN 400), principle of operation

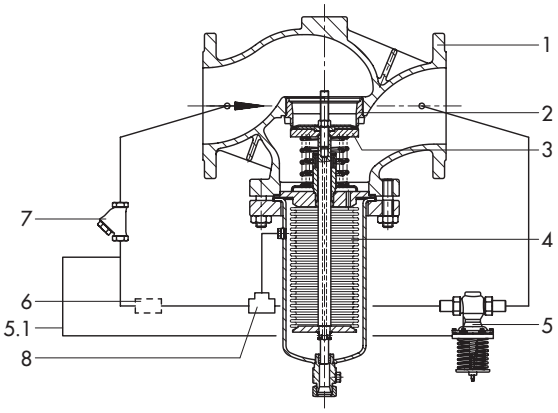


Fig. 4 · Type 2335 Excess Pressure Valve (DN 125 to DN 250), principle of operation

1 Valve body
2 Valve seat
3 Plug with plug stem and positioning spring
4 Balancing bellows; in DN 300/DN 400: balancing diaphragm
5 Pilot valve (PV)
5.1 Set point pressure line
6 Throttle valve (DN 400) or needle valve (optional for DN 125 to DN 300)
7 Strainer
8 Tee with fixed restrictor (not in DN 400)

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

Type 2422 Valve							
Nominal pressure	PN 16 to PN 40						
Nominal size DN	125	150	200	250	300	400	
K_{VS} coefficient	200	360	520	620	1100	2000	
K_{VS} I (with flow divider St I)	150	270	400	500	–	–	
K_{VS} III (with flow divider St III)	100	180	260	310	–	–	
z value	0.35		0.3		0.2		
Min. differential pressure Δp_{min} in bar	0.8	0.9	0.6		0.3		
Max. perm. diff. press. Δp_{max} in bar	16	12	10			6	
Leakage rate	≤ 0.1 % of K_{VS} [1]						
Max. permissible temperature for pilot valve types	50 °C for Type 50 ES · 150 °C [2] for Types 44-2/44-7 · Max. 200 °C for Types 44-0 B/44-6 B/M 44-2 Max. 150 °C for Type 44-1 B · Max. 350 °C for Type 41-23/Type 41-73						
Set point ranges in bar, continuously adjustable at the PV	**Type 50 ES**: 1 to 4; 2.5 to 6; 4 to 10 · **Type 44-2**: 1 to 4; 2 to 4.2; 2.4 to 6.3; 6 to 10.5 **Type 44-7**: 1 to 4; 2 to 4.4; 2.4 to 6.6; 6 to 11 · **Type M 44-2/Type M 44-7**: 1 to 5; 4 to 12 **Types 44-0 B/44-1 B/44-6 B**: 1 to 4; 2 to 6; 4 to 10 **Types 41-23/41-73**: 0.8 to 2.5; 2 to 5; 4.5 to 10; 8 to 16; 10 to 22; 20 to 28						

[1] ≤ 0.05 % of K_{VS} with soft sealing plug · [2] Sizes DN 300 and DN 400: 80 °C for gases; 150 °C for liquids

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

Pilot valve (PV)	**Nominal pressure**	**Connection** [1]	**Material**	**K_{VS}**	**Set point ranges**	**Medium**	**Data Sheet**
Type 50 ES Press. Reducing Valve	PN 16	G ½	Brass	0.93	1 to 10 bar	Water, liquids, and gases up to 50 °C	T 2555 EN
Type 44-2 Press. Reducing Valve	PN 25	DN 15 DN 25	Red brass	1	1 to 10.5 bar	Liquids and oil up to 150 °C, gases up to 80 °C	T 2623 EN
Type 44-7 Excess Pressure Valve					1 to 11 bar		
Type 44-1 B Press. Reducing Valve	PN 25	G ½	Red brass	1	1 to 10 bar	Liquids and oil up to 150 °C, gases up to 80 °C	T 2626 EN
Type 44-0 B Press. Reducing Valve						Steam up to 200 °C	
Type 44-6 B Excess Pressure Valve						Liquids and oil up to 150 °C, gases up to 80 °C, steam up to 200 °C	
Type M 44-2 Press. Reducing Valve	PN 40	G ½ DN 15	CrNiMo steel	1.5	1 to 12 bar	Liquids and gases up to 130 °C, steam up to 200 °C	T 2530 EN
Type M 44-7 Excess Pressure Valve	PN 25						T 2532 EN
Type 41-23 Press. Reducing Valve	PN 16 to 40	DN 15	EN-GJL-250 (GG-25), GP240GH (GS-C25), EN-GJS400-18U-LT (GGG-40.3), CrNiMo steel	1	1 to 28 bar	Liquids and steam up to 350 °C, gases up to 80 °C	T 2512 EN
Type 41-73 Excess Pressure Valve							T 2517 EN

[1] Main valve DN 400: all pilot valves with G 1 connection

Pressure-temperature diagram

The max. permissible differential pressures Δp_{max} are limited by the values specified in the pressure-temperature diagram (Fig. 5).

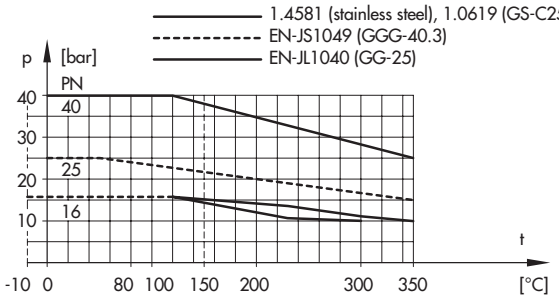


Fig. 5 · Pressure-temperature diagram

Table 3 · Materials · Material numbers according to DIN EN, old designations according to DIN in parentheses ()

Type 2422 Valve					
Nominal pressure PN		16	16/25	16/25/40	16/40
Body		Cast iron EN-JL1040 (GG-25)	Spheroidal graphite iron EN-JS1049 (GGG-40.3)	Cast steel 1.0619 (GS-C 25)	CrNiMo steel 1.4581
Valve seat		Stainless steel 1.4006			1.4581
Plug	Standard version[1)]	Stainless steel (1.4301) with PTFE soft sealing · Max. 220 °C			CrNiMo steel with PTFE soft sealing · Max. 220 °C
	Oil-resistant version	Up to DN 250: PTFE soft sealing, max. 220 °C · For DN 300: FPM soft sealing, max. 150 °C · For DN 400: NBR soft sealing, max. 80 °C			PTFE soft sealing, max. 220 °C Metal sealing, max. 350 °C
	Version for steam	PTFE soft sealing, max. 220 °C · Metal sealing, max. 350 °C			
Pressure balancing		Balancing cases of sheet steel DD11 (StW22) · DN 125 to DN 250: balancing bellows of CrNiMo steel (1.4571) DN 300/DN 400: EPDM balancing diaphragm			
	Oil-resistant version	Up to DN 300: FPM · For DN 400: NBR			
Gasket		Graphite on metal core			

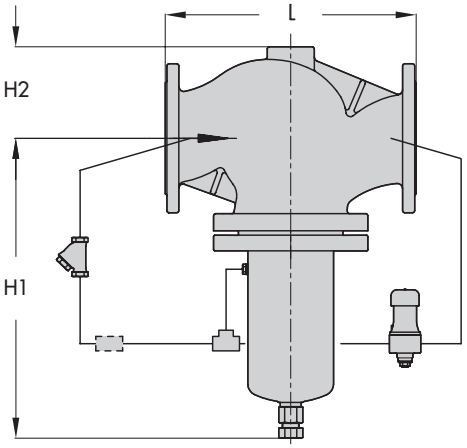
[1)] Optionally with EPDM soft sealing, max. 150 °C

Dimensions

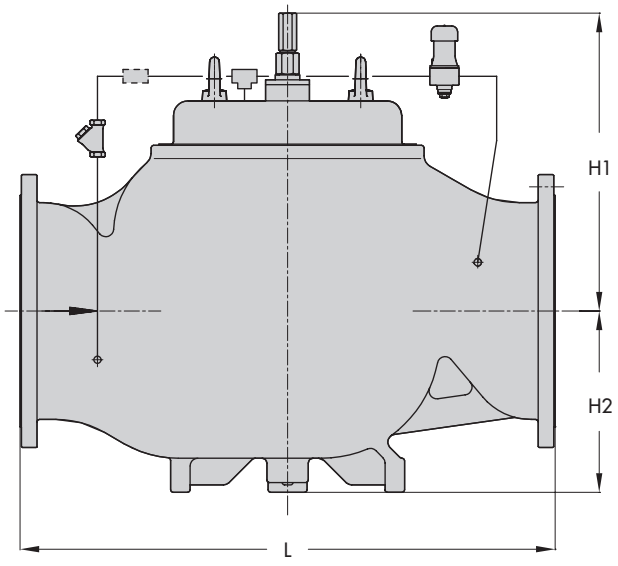
Table 4 · Dimensions in mm and weights in kg

Nominal size DN	125	**150**	**200**	**250**	**300**	**400**
Length L	400	480	600	730	850	1100
Height H1	460	590	730		510	610
Height H2	145	175	270		290	390
Weight [1)] (PN 16 for Type 50 ES PV)	75	118	260	305	315	625

[1)] +10% for cast steel PN 25 and spheroidal graphite iron EN-JS1024 (GGG-40.3) PN 25



Type 2333 Pressure Reducing/Type 2335 Excess Pressure Valve
DN 125 to DN 250



Type 2333 Pressure Reducing/Type 2335 Excess Pressure Valve
DN 300 and DN 400

Above drawings show the version with Type 50 ES Pressure Reducing Valve as pilot valve

Fig. 6 · Dimensions

Ordering text

Type 2333 Pressure Reducing Valve/
Type 2335 Excess Pressure Valve
DN ..., body material ..., PN ...
With Type ... Pilot Valve, set point range ... bar
Medium ..., max. medium temperature ...
Optionally, special version ...

Specifications subject to change without notice.

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