Self-operated Pressure Regulators
pilot-operated by the medium

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

Application
Pressure regulators for set points from **1 bar** to **28 bar** · Valve sizes **DN 125** to **DN 250** · Nominal pressures **PN 16** to **PN 40** · For steam[1)] up to **350 °C** · With flanges

Type 2333 A: Valve **closes** when the **downstream** pressure rises
Type 2335 A: Valve **opens** when the **upstream** pressure rises

Special features
- Low-maintenance proportional regulators; pilot-operated by the medium
- Type 2422 Globe Valve with Type 2420 Actuator
- High dynamic response and small offset, meaning high control accuracy due to the attached pilot valve
- Easy set point adjustment on the pilot valve
- Fully balanced, single-seated globe valve with flanges

The medium pressure is used as the auxiliary energy to operate the regulator. To open the valve, the differential pressure must be at least as high as the minimum Δp_{min} value specified in Table 1. The attached pilot valve, either a pressure reducing valve or an excess pressure valve, determines the regulator's function.

Versions
Pressure Reducing Valve or Excess Pressure Valve consisting of: Type 2422 Single-seated Globe Valve · Body manufactured of either gray cast iron, spheroidal graphite iron or cast steel · Type 2420 Actuator with EPDM rolling diaphragm having an effective diaphragm area of A = 640 cm^2 · Pilot valve (PV), suitable for the medium regulated, with strainer, equalizing tanks and needle valve.

Type 2333 A · **Pressure Reducing Valve** (Fig. 1) for steam
For regulating the downstream pressure p_2 to the set point adjusted on the pilot valve. The valve closes when the downstream pressure rises.

The standard version includes a Type 44-0 PV or optionally a Type 41-23 PV.

Type 2335 A · **Excess Pressure Valve** for steam
For regulating the upstream pressure p_1 to the set point adjusted on the pilot valve. The valve opens when the upstream pressure rises.

The standard version includes a Type 44-6 PV (modified) or optionally a Type 41-73 PV.

Special versions
– ANSI version
– JIS version
– With flow divider for noise reduction

Fig. 1 · Type 2333 A · Pressure Reducing Valve, DN 150 with Type 44-0 PV

– Higher pressure ratings
– Higher set point ranges
– Higher permissible temperature
– With tandem actuator to reduce the minimum required differential pressure Δp_{min}
– With overstroke actuator to increase the standard K_{VS} value
– Additionally with 2/2-way solenoid valve for emergency operation via remote control

1) Optionally also available for air and liquids

Principle of operation

The medium flows through the fully balanced globe valve (1) in the direction indicated by the arrow. The position of the valve plug influences the flow across the free area between the plug (3) and seat (2).

The internally generated control pressure p_s is used to control the valve. Depending on the error signal, this pressure is available between the PV (10) and the needle valve (9) and is transferred to the operating diaphragm (7) of the actuator (6).

For safe operation of the valve, either as pressure reducing or excess pressure valve, the minimum differential pressure Δp_{min} has to be available as specified in Table 1.

In the **Type 2333 A · Pressure Reducing Valve**, an increasing pressure p_2 causes the PV to close. The differential pressure (p_S – p_2) decreases across the needle valve and, therefore, in the actuator as well. In this case, the force of the actuator springs has more effect and closes the valve. When the PV is closed, there is a pressure balance in the actuator ($p_S = p_2$). The valve is closed only by the force of the actuator springs.

In the **Type 2335 A · Excess Pressure Valve**, an increasing pressure p_1 causes the PV to open. The differential pressure (p_1 – p_S) decreases across the needle valve and, therefore, in the actuator as well. This causes the valve to open against the force of the actuator springs. When the upstream pressure p_1 is below the adjusted value (PV is closed), there is a pressure balance ($p_S = p_1$) in the actuator. The valve is closed by the force of the actuator springs.

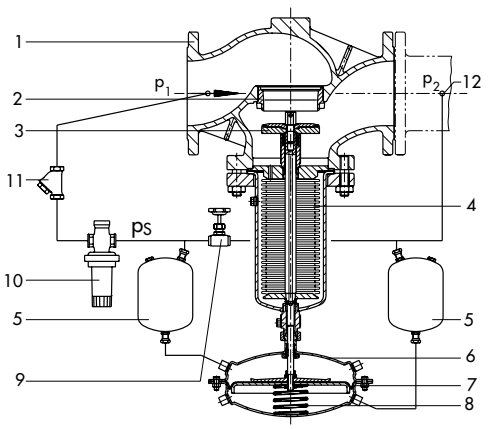


Fig. 2 · Type 2333 A · Pressure Reducing Valve, principle of operation

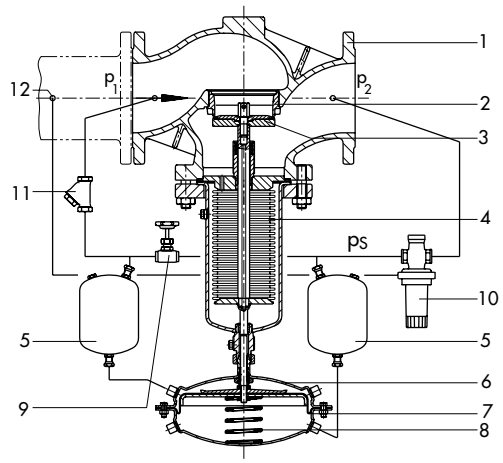


Fig. 3 · Type 2335 A · Excess Pressure Valve, principle of operation

1	Valve body	7	Operating diaphragm
2	Valve seat	8	Spring
3	Plug	9	Needle valve
4	Balancing bellows	10	Pilot valve (PV)
5	Condensation chamber	11	Strainer
6	Actuator	12	Tap point for pressure's actual value

Installation

- Install pipeline horizontally, sloping slightly on both sides (for discharge of condensate)
- Connect the tap point for the pressure's actual value (approx. 20 DN) to the steam pipe, however, at a minimum distance of 1m from the valve
- The direction of medium flow must match the direction indicated by the arrow on the valve body
- Install control valve with the actuator vertically suspended

Pressure-Temperature Diagram

Applies to the body materials GS-C25, GGG-40.3 and GG 25.

The pressures stated in Table 1 are maximum values. These are limited by the Pressure-Temperature Diagram (Fig. 4) depending on the pressure rating and the temperature.

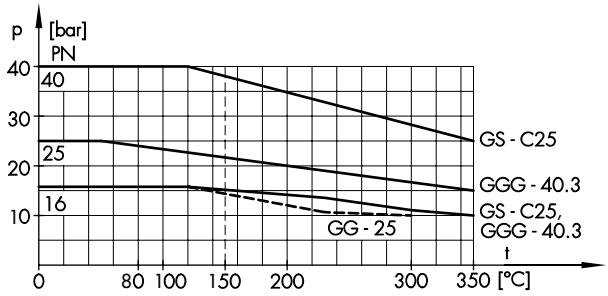


Fig. 4 · Pressure-Temperature Diagram

Table 1 a · All pressures in bar (gauge)

Nominal pressure **PN**	16, 25, 40			
Nominal size **DN**	125	150	200	250
K_{VS} value	190	280	420	500
K_{VS} I value (with flow divider St I)	150	210	315	375
z value	0.35		0.3	
Min. differential pressure Δp_{min}[1] in bar	0.5		0.6	
Max. perm. differen. pressure Δp_{max} in bar	16	12	10	
Max. perm. temperature	200 °C for Types 44-0 and 44-6 PV (modified) 350 °C for Types 41-23 and 41-73 PV			
Set point range continuously adjustable in bar	Type 2333 A: 1 to 4; 2.5 to 6.3; 6 to 10; 9 to 22; 20 to 28 Type 2333 A: 1 to 4; 2.4 to 6.6; 6 to 11; 9 to 22; 20 to 28			

[1] With tandem actuator: 0.3 bar

Table 2 · **Materials** (WN = Material Number according to DIN)

Type 2422 Control Valve			
Nominal pressure **PN**	16	16/25	16/25/40
Body	Gray cast iron GG-25 WN 0.6025	Spheroidal graphite iron GGG-40.3 WN 0.7043	Cast steel GS-C 25 WN 1.0619
Valve seat	Stainless steel WN 1.4006		
Plug	Stainless steel (WN 1.4301) with PTFE soft sealing[1] (up to max. 220 °C)		
Pressure balancing	Balancing bellows made of CrNiMo steel		
Gasket	Graphite on metal core		

Type 2420 Actuator	
Diaphragm cases	Sheet steel StW-22
Diaphragm	EPDM with fabrics

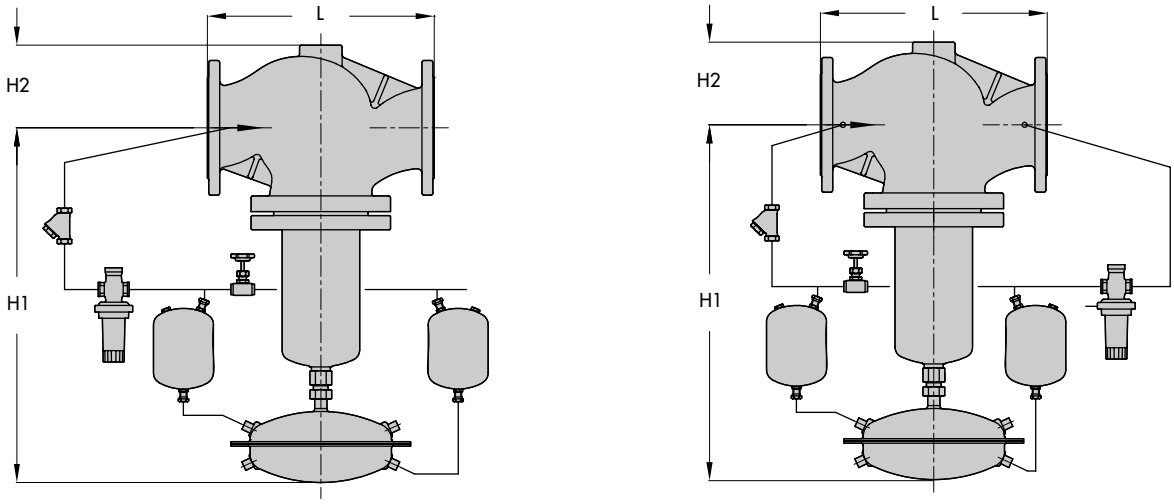
Pilot Valve PV			
Type	**44-0**	**44-6**	**41-23** or **41-73**
Body	Brass CuZn37Pb		Cast steel GS-C25
Seat	WN 1.4104	WN 1.4301	WN 1.4006
Plug	WN 1.4104 With PTFE soft sealing	CuZn40Pb2 With EPDM soft sealing	WN 1.4006
Set point spring	Spring steel wire C		
Operating diaphragm	EPDM		CrNiMo bellows

[1] For higher requirements: Metal sealing up to a temperature of max. 350°C

Dimensions
Table 3 · Dimensions in mm and weights

Nominal size **DN**	125	150	200	250
Length L	400	480	600	730
Height H1	710	840	980	
Height H2	145	175	270	
Weight[1] (PN 16: for PV w. screwed ends) in kg	75	118	260	305

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



Type 2333 A Pressure Reducing Valve

Type 2335 A Excess Pressure Valve

Fig. 5 · Dimensions in mm

Ordering text
Pressure Reducing Valve Type 2333 A /
Excess Pressure Valve Type 2335 A
DN ...
Body ... PN ...
Set point range ... bar
Optional special version ...

Specifications subject to change without notice.

SAMSON AG · MESS- UND REGELTECHNIK
Weismüllerstraße 3 · D-6 0314 Frankfurt am Main
Postfach 10 19 01 · D-60019 Frankfurt am Main
Telefon (069) 4 00 90 · Telefax (069) 4 00 95 07