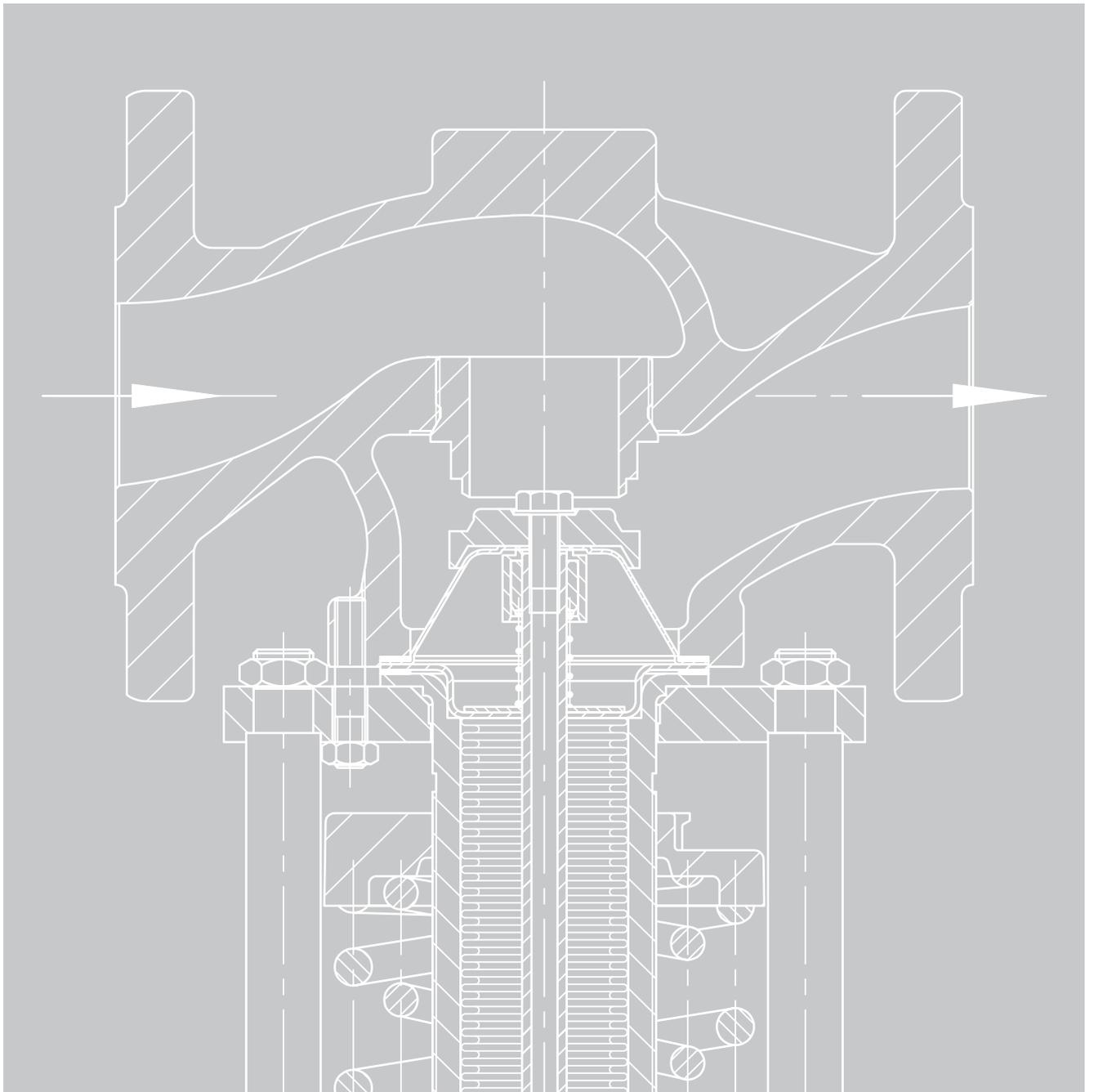


PN 16 to 40 · Class 125 to 300

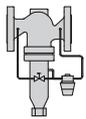
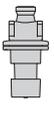
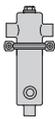
DN 15 to 400 · NPS ½ to 10

G ¾ to G 1 · ½ to 1 NPT

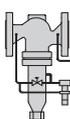
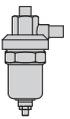
-10 °C to 350 °C · 15 to 660 °F



Pressure Reducing Valves · Valve closes when the downstream pressure rises

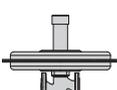
Useable for ...	Steam		•	•	•	•	•	
	Water and other liquids		•	•	•		•	•
	Oil		•	•	•		•	•
	Gases ¹⁾		•	•	•		•	•
	District heating							
Connections	Female thread					•	•	
	Welding ends							•
	Threaded ends							
	Flanges		•	•	•	•	•	
Nominal size	DN	15 to 100	125 to 250	125 to 400	15, 25, 40, 50	15 to 50	20	
Thread size	G				½ to 1			
Nominal pressure	PN	16 to 40	16 to 40	16 to 40	25	16, 40, 160	40, 50, 63	
Perm. temperature, max.	°C	350	350	350	200	200	-196/+200	
Set point ranges	bar	0.005 to 28	0.05 to 2.5	1 to 28	0.2 to 20	0.005 to 12	1 to 40	
Body material	Brass							•
	Red brass					•		
	Cast iron		•	•	•			
	Spheroidal graphite iron		•	•	•	•		
	Cast steel		•	•	•			
	Stainless steel		•	•	•	•	•	
Type		41-23 ⁴⁾	2422/2424 ⁴⁾	2333 ^{4), 5)}	44-0 B ⁴⁾	M 44-2	2357-...	
Data Sheet		T 2512 EN	T 2547 EN	T 2552 EN	T 2628 EN	T 2530 EN	T 2557 EN to T 2560 EN	
								

Excess Pressure Valves · Valve opens when the upstream pressure rises

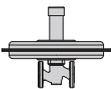
Useable for ...	Steam		•	•	•		•	
	Water and other liquids		•	•	•	•	•	•
	Oil		•	•	•	•	•	•
	Gases ¹⁾		•	•	•	•	•	•
	District heating							
Connections	Female thread					•	•	
	Welding ends		•					• ²⁾
	Threaded ends		•					
	Flanges		•	•	•	•	•	
Nominal size	DN	15 to 50	15 to 100	125 to 250	125 to 400	15, 25, 40, 50	15 to 50	20
Thread size	G					½ to 1		
Nominal pressure	PN	25	16 to 40	16 to 40	16 to 40	25	25	40, 50, 63
Perm. temperature, max.	°C	150	350	350	350	200	200	-196/+200
Set point ranges	bar	0.1 to 11	0.005 to 28	0.05 to 2.5	1 to 28	0.2 to 20	0.005 to 12	1 to 40
Body material	Brass							•
	Red brass		•			•		
	Cast iron		•	•	•			
	Spheroidal graphite iron		• ³⁾	•	•	•	•	
	Cast steel		•	•	•			
	Stainless steel		•	•	•	•	•	•
Type		44-7	41-73 ⁴⁾	2422/2425 ⁴⁾	2335 ^{4), 5)}	44-6 B ⁴⁾	M 44-7	2357-...
Data Sheet		T 2723 EN	T 2517 EN	T 2549 EN	T 2552 EN	T 2626 EN	T 2532 EN	T 2557 EN to T 2560 EN
								

¹⁾ Version for flammable gases on request · ²⁾ Soldering ends · ³⁾ DN 32 to 50 · ⁴⁾ Also in JIS version · ⁵⁾ Alternative: Pilot-operated Type 2334 Universal Regulator

Pressure Reducing Valves • Valve closes when the downstream pressure rises

							•	
	•	•	•	•			•	•
	•	•	•	•				
	•	•	•	•	•	•		•
		•		•		•		
			•					
			•					
	• 4)		•	•	•	•	•	•
	15 to 50	15, 25, 40, 50 ½ to 1	15 to 50	3/8 to ½	15 to 50	15, 25 ½ to 1	15, 20 and 25	15 to 50
	10 5)	25	25	16	16 to 40	25	25 and 40	40
	130	200	150	50	60 (150) 6)	60	170	80
	0.3 to 6	0.2 to 20	0.5 to 10.5	0.2 to 10	0.005 to 10	0.005 to 1	0.3 to 3	0.8 to 16
		•	•	•				
			• 1)		•	•	•	
					•		•	
	• 2)	•			•	•		•
	2371-11	44-1 B 3)	44-2	50 ES/EM	2405	2407	2434	2373
	T 2640 EN	T 2626 EN	T 2623 EN	T 2555 EN	T 2520 EN	T 2524 EN	T 2504 EN	T 2534 EN
								

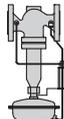
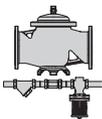
Excess Pressure Valves • Valve opens when the upstream pressure rises

	•						•
	•						
	•		•		•		•
	•						
	• 4)		•		•		•
	15 to 50		15 to 50		15, 25 ½ to 1		15 to 50
	10 5)		16 to 40		25		40
	130		60 (150) 6)		60		80
	0.3 to 6		0.005 to 10		0.005 to 1		0.8 to 16
			•		•		
			•		•		
			•		•		
	• 2)		•		•		•
	2371-00/-01		2406		2408		2375
	T 2642 EN		T 2522 EN		T 2528EN		T 2536 EN
							

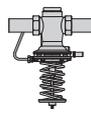
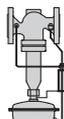
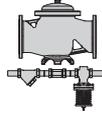
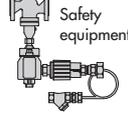
1) DN 32 to 50 · 2) Material: 1.4404 · 3) Also in JIS version · 4) Additional threaded and clamp connections · 5) Max. operating pressure 10 bar

6) For unbalanced versions with FPM diaphragm or FPM soft sealing

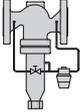
Safety Shut-off Valves (SSV) · Valve closes when the downstream pressure rises · TÜV typetested

Useable for ...	Steam					
	Water and other liquids	•	•	•	•	•
	Oil					
	Gases ¹⁾	•	•	•		
	District heating	•	•	•	•	•
Connections	Female thread					
	Welding ends	•	•			
	Threaded ends	•	•			
	Flanges	•	•	•	•	•
Nominal size	DN	15 to 50	15 to 50	15 to 100	65 to 250	65 to 250
Nominal pressure	PN	25	25	16 to 40	16 to 40	16 to 40
Perm. temperature, max.	°C	150	150	150	150	150
Set point ranges	bar	2 to 10.5	2 to 10.5	2 to 10.5	1 to 10.5	See pilot valve
Body material	Brass					
	Red brass	•	•			
	Cast iron			•	•	•
	Sph. graphite iron	• ¹⁾	• ¹⁾	•	•	•
	Cast steel			•	•	•
	Stainless steel					
Type		44-3	44-9	36-3	33-1	2334
Data Sheet		T 2623 EN	T 2630 EN	T 2546 EN	T 2551 EN	T 3210 EN
						

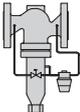
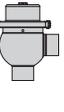
Safety Excess Pressure Valves (SEV) · Valve opens when the upstream pressure rises · TÜV typetested

Useable for ...	Steam						•
	Water and other liquids	•	•	•	•	•	•
	Oil						•
	Gases ¹⁾	•		•	•		•
	District heating	•	•	•		•	• ²⁾
Connections	Female thread						
	Welding ends	•					
	Threaded ends	•					
	Flanges	•	•	•	•	•	•
Nominal size	DN	15 to 50	15 to 50	15 to 100	65 to 250	65 to 250	15 to 250
Nominal pressure	PN	25	16 to 40	16 to 40	16 to 40	16 to 40	16 to 40
Perm. temperature, max.	°C	150	150	150	150	150	150/350
Set point ranges	bar	2 to 11	2 to 11	2 to 11	1 to 11	See pilot valve	1 to 10
Body material	Brass						
	Red brass	•	•				
	Cast iron			•	•	•	•
	Sph. graphite iron	• ¹⁾	• ¹⁾	•	•	•	•
	Cast steel			•	•	•	•
	Stainless steel						•
Type		44-4	44-8	36-8	33-7	2334	2111-2119/2401
Data Sheet		T 2632 EN	T 2723 EN	T 2546 EN	T 2551 EN	T 3210 EN	T 2519 EN
							

Pressure Reducing Valves • Valve closes when the downstream pressure rises

Useable for ...	Steam	•	•	•	•		
	Water and other liquids	•	•	•		•	•
	Oil	•	•	•		•	•
	Gases ¹⁾	•	•	•		•	•
	District heating						
Connections	Female thread				•	•	
	Welding ends						
	Threaded ends						
	Flanges	•	•	•			• ⁵⁾
Valve size	NPS	½ to 4	6 to 10	6 to 10			½ to 2
Thread size	NPT				½ to 1 NPT	½ to 1 NPT	
Pressure rating	Class	125 to 300	125 to 300	125 to 300	250	250	150 ⁴⁾
Perm. temperature, max.	°F	660	660	660	390	300	266
Set point ranges	psi	0.075 to 230	0.75 to 35	14.5 to 400	3 to 290	3 to 290	5 to 90
Body material	Red brass (C83600)				•	•	
	Cast iron (A126B)	•	•	•			
	Cast steel (A216 WCC)	•	•	•			
	Stainless steel (A351CF8M)	•	•	•	•	•	• ³⁾
Type		41-23	2422/2424	2333 ²⁾	44-0 B	44-1 B	2371-11
Data Sheet		T 2513 EN	T 2548 EN	T 2554 EN	T 2629 EN	T 2627 EN	T 2640 EN
							

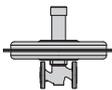
Excess Pressure Valves • Valve opens when the upstream pressure rises

Useable for ...	Steam	•	•	•	•		
	Water and other liquids	•	•	•	•	•	•
	Oil	•	•	•	•	•	•
	Gases ¹⁾	•	•	•	•	•	•
	District heating						
Connections	Female thread					•	
	Welding ends						• ⁵⁾
	Threaded ends						
	Flanges	•	•	•			• ⁵⁾
Valve size	NPS	½ to 4	6 to 10	6 to 10			½ to 2
Thread size	NPT				½ to 1 NPT		
Pressure rating	Class	125 to 300	125 to 300	125 to 300	250		150 ⁴⁾
Perm. temperature, max.	°F	660	660	660	390		266
Set point ranges	psi	0.075 to 230	0.75 to 35	14.5 to 400	3 to 290		5 to 90
Body material	Red brass (C83600)				•		
	Cast iron (A126B)	•	•	•			
	Cast steel (A216 WCC)	•	•	•			
	Stainless steel (A351CF8M)	•	•	•	•		• ³⁾
Type		41-73	2422/2425	2335 ²⁾	44-6 B		2371-00/-01
Data Sheet		T 2518 EN	T 2550 EN	T 2554 EN	T 2627 EN		T 2642 EN
							

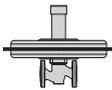
¹⁾ Version for flammable gases on request · ²⁾ Alternative: Pilot-operated Type 2334 Regulator · ³⁾ Material: 316L · ⁴⁾ Max. operating pressure 150 psi

⁵⁾ Additional threaded and clamp connections

Pressure Reducing Valves • Valve closes when the downstream pressure rises

Useable for ...	Steam		
	Water and other liquids		
	Oil		
	Gases ¹⁾	•	•
	District heating		
Connections	Female thread		•
	Welding ends		
	Threaded ends		
	Flanges	•	
Valve size	NPS	½ to 2	
Thread size	NPT		½ to 1 NPT
Pressure rating	Class	125 to 300	250
Perm. temperature, max.	°F	140 (300) ²⁾	140
Set point ranges	psi	0.075 to 150	0.075 to 15
Body material	Red brass (C83600)		
	Cast iron (A126B)	•	
	Cast steel (A216 WCC)	•	
	Stainless steel (A351 CF8M)	•	•
Type		2405	2407
Data Sheet		T 2521 EN	T 2525 EN
			

Excess Pressure Valves • Valve opens when the upstream pressure rises

Useable for ...	Steam		
	Water and other liquids		
	Oil		
	Gases ¹⁾	•	•
	District heating		
Connections	Female thread		•
	Welding ends		
	Threaded ends		
	Flanges	•	
Valve size	NPS	½ to 2	
Thread size	NPT		½ to 1 NPT
Pressure rating	Class	125 to 300	250
Perm. temperature, max.	°F	140 (300) ²⁾	140
Set point ranges	psi	0.075 to 150	0.075 to 15
Body material	Red brass (C83600)		
	Cast iron (A126B)	•	
	Cast steel (A216 WCC)	•	
	Stainless steel (A351 CF8M)	•	•
Type		2406	2408
Data Sheet		T 2523 EN	T 2529 EN
			

¹⁾ Version for flammable gases on request²⁾ For unbalanced versions with FPM diaphragm or FPM soft sealing

Principle of operation

Self-operated pressure regulators are control devices whose measuring units draw their energy from the process medium which creates sufficient force to move the final control element (plug with plug stem).

The regulators consist of a valve and an actuator which either opens or closes the valve when the pressure increases. The regulators are proportional regulators controlled by the process medium. Each deviation from the adjusted set point is assigned a certain valve plug position.

Pressure reducing valves

Pressure reducing valves or pressure reducing stations withdraw as much energy from a pressure vessel with a higher pressure level as needed to maintain a nearly constant pressure level in downstream equipment, although consumption fluctuates.

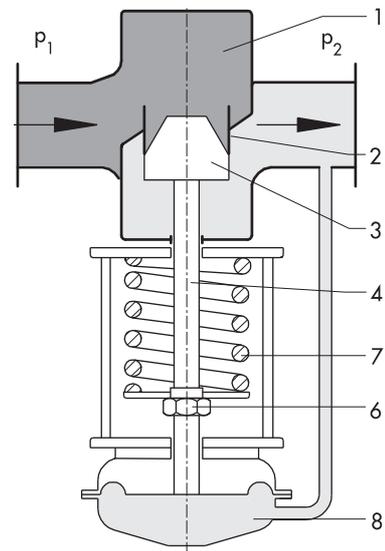
The pressure p_2 to be controlled (controlled variable x) produces the force $F_m = p_2 \times A$, which is proportional to the controlled variable, on the diaphragm area A . This force corresponds to the actual value and is compared at the plug stem with the spring force $F_S = \text{set point } w$. F_S is adjustable at the set point adjuster. If the pressure p_2 changes, and in this way also the force F_m , the valve plug is being adjusted until $F_m = F_S$.

In the version shown in Fig. 1.1, the valve closes when the pressure to be maintained constant rises. The regulator, in this case a pressure reducing valve, adjusts the pressure p_2 downstream of the valve to the value adjusted at the set point adjuster.

Excess pressure valves

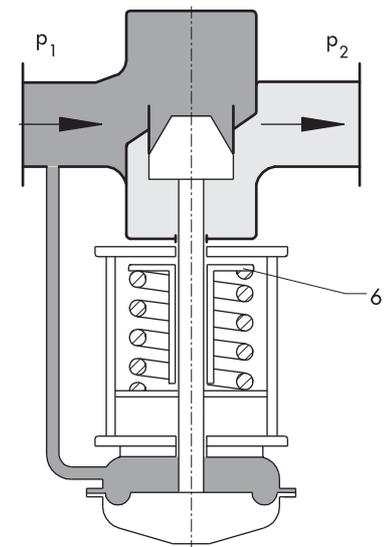
The pressure p_1 to be controlled (controlled variable x) is picked up in the valve body and applied to one side of the actuator diaphragm. The force of the actuator $F_m = p_1 \times A$ is compared via the plug stem to the force $F_S = \text{set point } w$ of the set point spring. In steady state ($x = w$) F_m is equal to F_S . If the pressure p_1 increases, the actuator force increases and the travel of the plug increases against the force of the set point spring. This causes the outlet flow to increase and the pressure p_1 to decrease until a new equilibrium is reached between actuator and spring force.

In the version shown in Fig. 1.2, the valve opens when the pressure to be maintained constant rises. The regulator, in this case an excess pressure valve, adjusts the pressure p_1 upstream of the valve to the value adjusted at the set point adjuster.



Valve closed: $p_2 > p_1$

Fig. 1.1 · Pressure reducing valve
The valve closes when the downstream pressure rises ($p_2 > p_1$)



Valve closed: $p_1 < p_2$

Fig. 1.2 · Excess pressure valve
The valve opens when the upstream pressure rises ($p_1 > p_2$)

- 1 Valve body
- 2 Valve seat
- 3 Plug
- 4 Plug stem
- 6 Set point adjuster
- 7 Positioning spring
- 8 Actuator

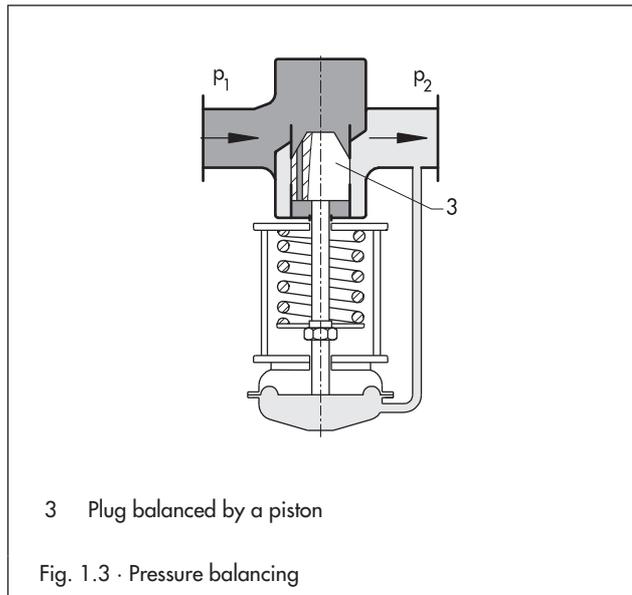
Fig. 1 · Functional diagrams

Details concerning pressure regulators

Pressure balancing

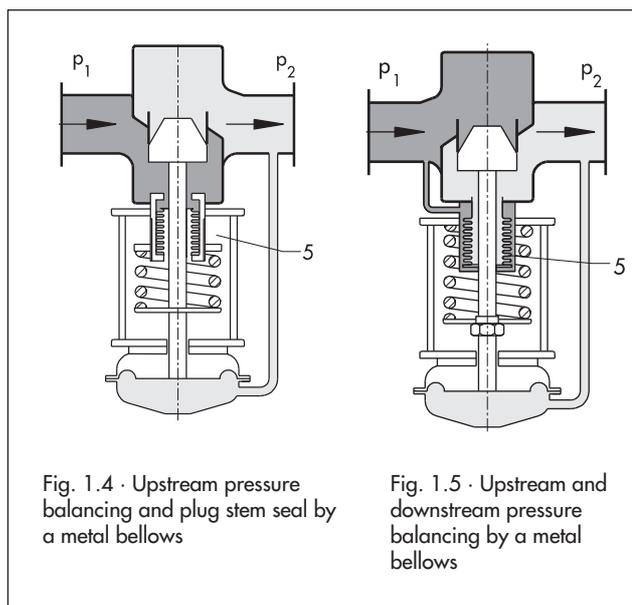
The control accuracy (offset) and stability of the control process depend on the disturbances occurring in the loop (for example, changes in upstream pressure and flow rate). The regulators are designed in such a way that the effect of these disturbances is relatively small. The force acting on the valve plug depending on, for example, either the upstream or differential pressure can be eliminated by balancing the plug correspondingly. In unbalanced valves, the effect on the plug is a force resulting from the cross-sectional seat area and the differential pressure ($\Delta p = p_1 - p_2$).

In regulators with pressure-balanced plugs, this effect is largely neutralized. This version is therefore suitable for handling large pressure drops. Fig. 1.3 shows a plug balanced by a piston.



In the regulator shown in Fig. 1.4, the metal bellows balances the upstream pressure and provides an absolutely tight and frictionless plug stem seal.

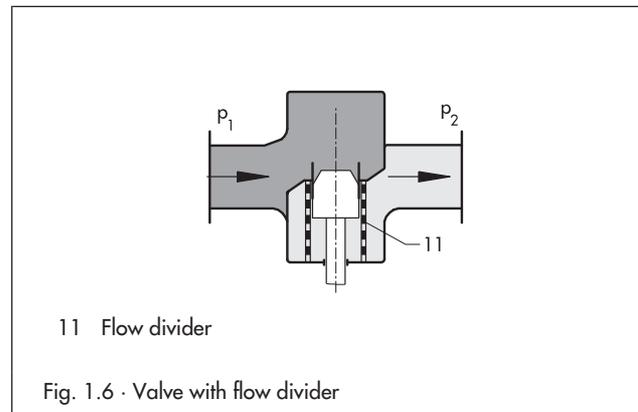
Fig. 1.5 shows a bellows arrangement providing upstream and downstream pressure balancing.



Low-noise operation with a flow divider

All regulators are equipped with standard low-noise plugs. The valves used in the Type 41-23, Type 2422/2424, Type 41-73 and Type 2422/2425 Regulators can be equipped with a flow divider (Fig. 1.6) in special versions.

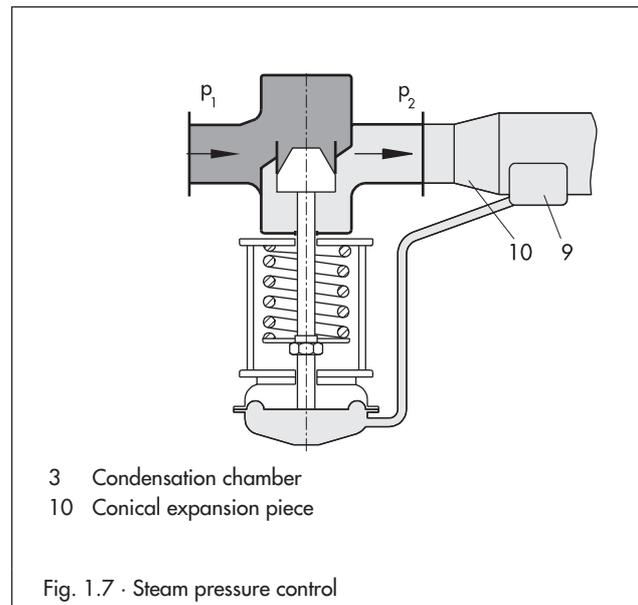
Flow dividers are effective and reliable components used to reduce the noise level or to avoid critical conditions inside the valve. The maximum flow rate is restricted on using a flow divider.



For noise calculation according to VDMA 24422, the correction terms ΔL_G for gases and vapors as well as ΔL_F for liquids are required on using flow dividers. Refer to the associated data sheet of the pressure regulator for more details.

Steam pressure control

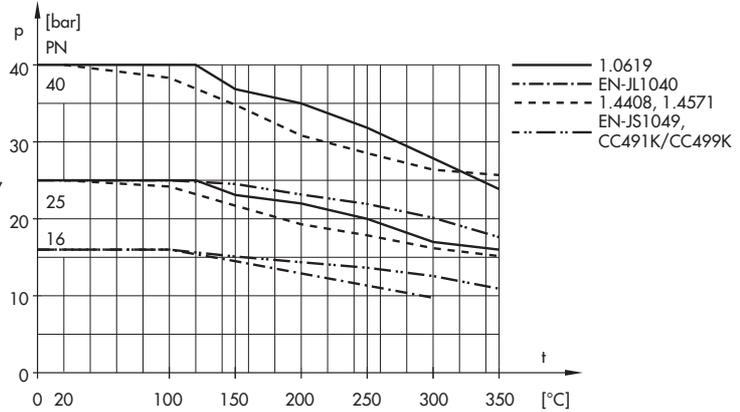
In a steam pressure control application, as shown in Fig. 1.7, a condensation chamber is installed at the point of measurement. It allows steam to condense and protects the connected diaphragm system against high temperatures. Since the steam volume increases as the steam pressure decreases, it is often necessary to enlarge the piping diameter downstream of the regulator by installing a conical expansion piece. This expansion piece (accessories) can double the nominal outlet diameter of the pipeline (e.g. DN 100 to 200).



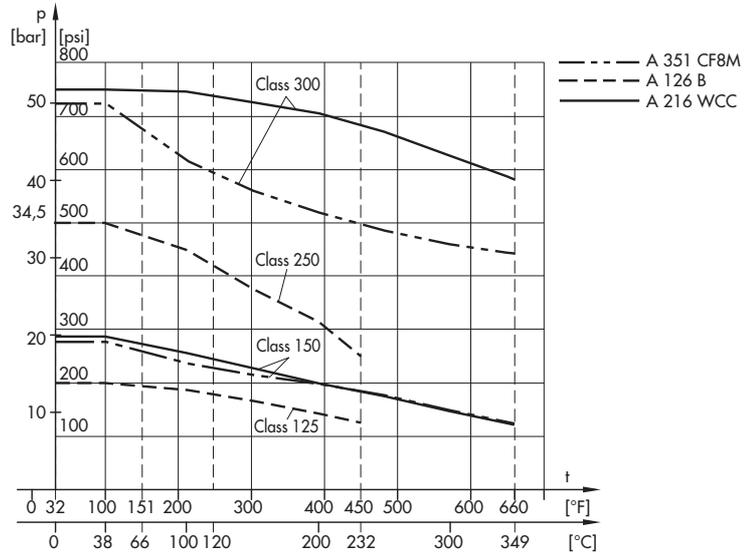
Pressure-temperature diagrams

Pressure-temperature diagram according to DIN

For DIN materials, the diagrams were established according to DIN EN 12516-1. For materials in accordance with US standards, these were prepared in compliance with ANSI B16.1 and ANSI B16.34.



Pressure-temperature diagram according to ANSI



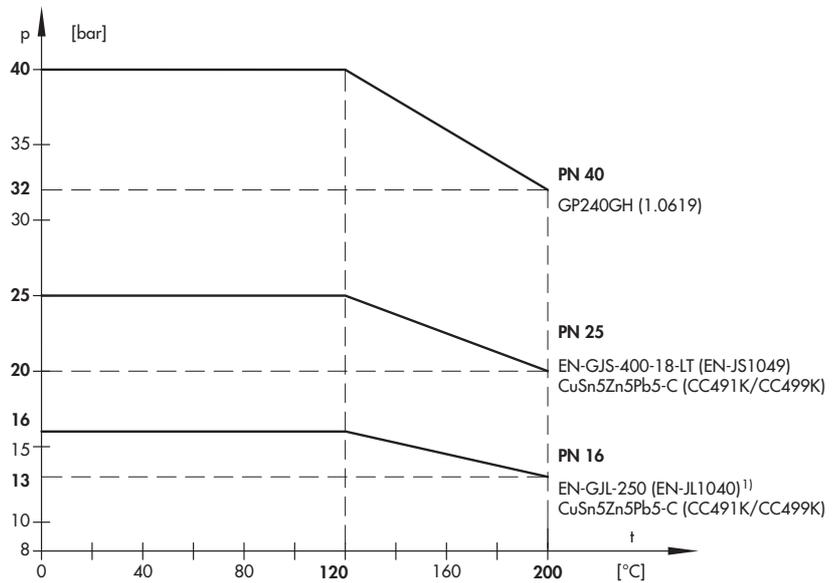
The diagram below applies to the use of regulators for district heating (see DIN 4747-1)

Pressure-temperature diagram acc. to DIN 4747-1 for selected materials

The materials for valves and connecting pieces must be suitable for sizing and the operating conditions.

In this case, material is selected according to DIN 4747-1.

Depending on the valve material, various pressure ratings are also permissible at different temperatures.



¹⁾ Permissible at network flow temperature $\vartheta_{VN} \leq 130 \text{ °C}$
 $\vartheta_{VN} > 130 \text{ °C}$ only up to DN ≤ 100

Fig. 2 · Pressure-temperature diagrams (material number according to DIN EN)

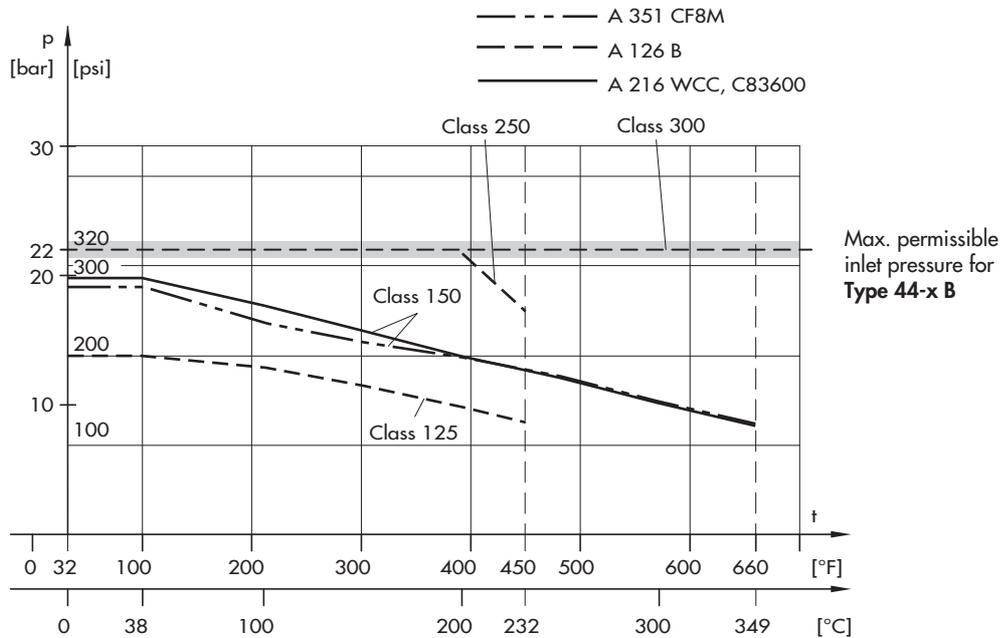


Fig. 3 · Pressure-temperature diagram for Type 44-x B

Conversion factors

K_{VS} and C_V coefficients

These flow coefficients are calculated exactly according to IEC 60534, Part 2-1 and Part 2-2. In addition, the ISA-S75.01-1-1985 standards and the VDI/VDE Guideline 2173 are applied. In most cases, it is sufficiently accurate to calculate the K_V coefficient according to this guideline. The relevant equations are listed in Application Notes AB 04 EN.

$$K_{VS} = 0.86 \times C_V \quad K_{VS} \quad [\text{m}^3/\text{h}]$$

$$C_V = 1.17 \times K_{VS} \quad C_V \quad [\text{US gallons}/\text{min}]$$

Pressure

1 pound/square inch [lbs/in² = psi] = 0.06895 bar

1 bar = 14.5 psi

Area

1 square inch [sq.in; in²] = 6.452 cm²

1 cm² = 0.155 in²

Mass

1 pound [lb] = 0.4536 kg

1 kg = 2.2046 lb

Mass flow

1 pound per second [lb/s] = 0.4536 kg/s

1 kg/s = 2.2046 lb/s

Flow rate

1 US gallon per min [US gal/min] = 0.227 m³/h

1 m³/h = 4.4 US gal/min

Temperature

°F = 9/5 °C + 32 · °C = 5/9 (°F - 32)

Pressure regulators for general applications

Self-operated pressure regulators for general applications

- Low-maintenance, medium-controlled P-regulators requiring no auxiliary energy
- Low-noise standard plugs · Special version available with flow divider St I for further noise reduction
- Actuator and positioning springs replaceable
- Flange connections

Type 41-23 · Pressure Reducing Valve

Type 41-73 · Excess Pressure Valve

- Frictionless plug stem sealing by a stainless steel bellows
- Single-seated valve with upstream and downstream pressure balancing
- Control line kit for pressure tapping directly at the regulator available (accessories)
- All wetted parts are free of non-ferrous metal

Technical data

Type 41-23
Type 41-73

Data Sheets T 2512 EN · T 2513 EN
Data Sheets T 2517 EN · T 2518 EN

Set point ranges	0.005 to 28 bar · 0.075 to 230 psi
Nominal size	DN 15 to 100 · NPS ½ to 4
Nominal pressure	PN 16 to 40 · Class 125 to 300
Temperature ranges	
Liquids and steam	Up to 350 °C · Up to 660 °F
Gases	Up to 80 °C ¹⁾ · Up to 175 °F

¹⁾ At the actuator

Type 2422/2424 · Pressure Reducing Valve

Type 2422/2425 · Excess Pressure Valve

- Easy set point adjustment with a nut
- Spring-loaded valve with upstream and downstream pressure balancing

Technical data

Type 2422/2424
Type 2422/2425

Data Sheets T 2547 EN · T 2548 EN
Data Sheets T 2549 EN · T 2550 EN

Set point ranges	0.05 to 2.5 bar · 0.75 to 35 psi
Nominal size	DN 125 to 250 · NPS 6 to 10
Nominal pressure	PN 16 to 40 · Class 125 to 300
Temperature ranges	
Liquids and steam	Up to 350 °C · Up to 660 °F
Gases	Up to 80 °C ¹⁾ · Up to 175 °F

¹⁾ At the actuator

Accessories

The Type 41-23, Type 41-73, Type 2422/2424, Type 2422/2425 Regulators may require accessories, e.g. condensation chamber, conical expansion piece and screw joint with restriction.

For Type 41-23 and Type 41-73 Regulators, ready-to-assemble pipeline kits are available for the pressure tapping directly at the regulator body (set point range ≥ 0.8 bar) including a condensation chamber and screw joint with throttle. The control line is ready for mounting and the regulator is ready to operate within a short time.

Refer to Data Sheet **T 2595 EN** for further information and a detailed description of the accessories.



Type 41-23 Pressure Reducing Valve



Type 2422/2425 Excess Pressure Valve

Fig. 4 · Pressure regulators for general use

Series 44 Pressure Regulators

These regulators are suitable for regulating pressure of liquids, non-flammable gases and steam in pipelines up to DN 50 (NPS 2) or G 2 (2 NPT).

- Low-maintenance P-regulators, requiring no auxiliary energy
- Set point adjustment by changing the spring compression
- Upstream and downstream pressure are transmitted to the actuator through a bore hole in the valve body or over an attached control line

Type 44-0 B · Steam Pressure Reducing Valve

Type 44-1 B · Pressure Reducing Valve

Type 44-6 B · Excess Pressure Valve

- Spring-loaded, single-seated valve with plug balanced by a stainless steel bellows
- Stainless steel operating bellows functions as operating element
- Control line integrated into body
- Compact design
- Flange connections
- Body in spheroidal graphite iron, red brass, stainless steel

Technical data

Type 44-0 B	Data Sheets T 2628 EN · T 2629 EN
Type 44-1 B/Type 44-6 B	Data Sheets T 2626 EN · T 2627 EN
Set point ranges	0.2 to 20 bar · 3 to 290 psi
Nominal size/thread connection	DN 15, 25, 40, 25 G ½ to 1 · ½ to 1 NPT
Nominal pressure	PN 25 · Class 250
Temperature ranges	
Type 44-1 B/Type 44-6 B	
Liquids	Up to 150 °C · Up to 300 °F
Gases	Up to 80 °C · Up to 175 °F
Type 44-0 B	
Steam	Up to 200 °C · Up to 390 °F

Type M 44-2 · Pressure Reducing Valve

Type M 44-7 · Excess Pressure Valve

- All parts made of CrNiMo steel with smooth surfaces
- Leakage line connection
- Threaded or flange connections

Technical data

Type M 44-2	Data Sheet T 2530 EN
Type M 44-7	Data Sheet T 2532 EN
Set point ranges	0.005 to 20 bar
Nominal size	DN 15 to 50/G ½ to 2
Nominal pressure ¹⁾	PN 16, PN 25 or PN 160
Temperature ranges	
Liquids and gases	Up to 130 °C
Steam	Up to 200 °C

¹⁾ Depending on version (refer to Technical data in T 2530 EN/T 2532 EN)

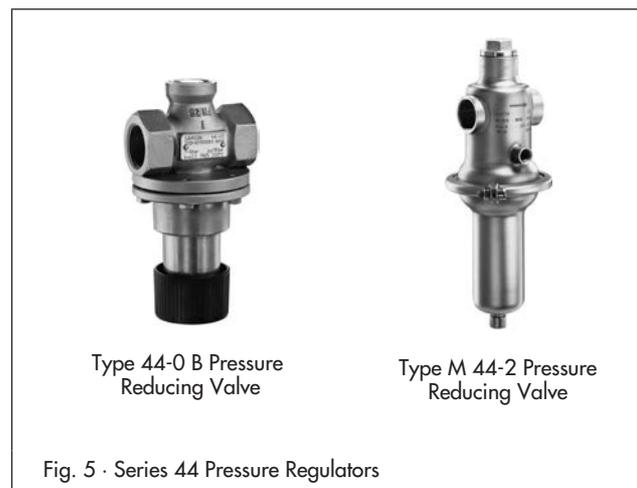


Fig. 5 · Series 44 Pressure Regulators

Regulators and equipment for safety requirements

Safety Shut-off Valves (SSV) and Safety Excess Pressure Valves (SEV)

These regulators meet enhanced safety requirements.

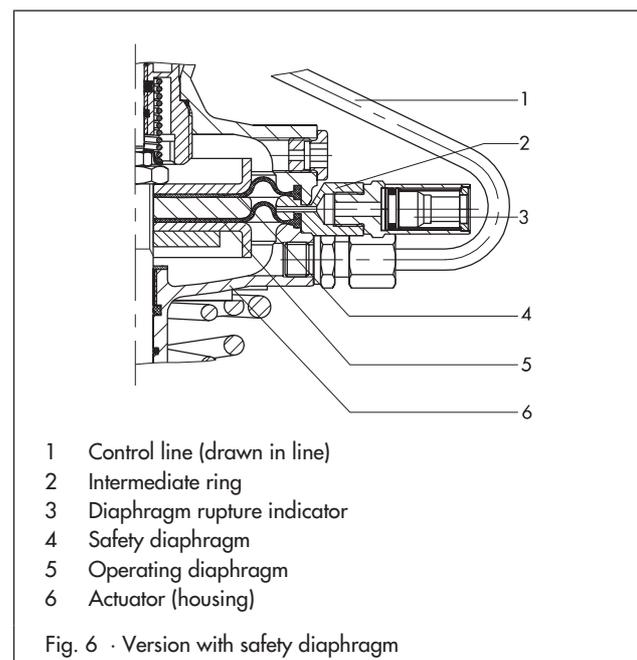
- Low-maintenance P-regulators requiring no auxiliary energy
- Especially suitable for district heating supply plants conforming to DIN 4747 as the regulators comply with AGFW (German District Heating Association) regulations for regulators with safety diaphragm

Safety diaphragm

The regulators are equipped with two operating diaphragms. In case the actual operating diaphragm ruptures, the safety diaphragm ensures emergency operation. To monitor the diaphragm condition, the intermediate ring is equipped with a visual diaphragm rupture indicator, or a pressure switch can be optionally used to indicate the condition (Fig. 4).

Typetesting

The listed safety shut-off valves (SSV) and safety excess pressure valves (SEV) have been **typetested for water** by the German Technical Inspectorate (TUV).



- 1 Control line (drawn in line)
- 2 Intermediate ring
- 3 Diaphragm rupture indicator
- 4 Safety diaphragm
- 5 Operating diaphragm
- 6 Actuator (housing)

Fig. 6 · Version with safety diaphragm

- Type 44-2 · Pressure Reducing Valve
- Type 44-3 · Safety Shut-off Valve (SSV) with pressure reducing valve
- Type 44-7 · Excess Pressure Valve
- Type 44-8 · Safety Excess Pressure Valve (SEV)
- Type 44-9 · Safety Shut-off Valve (SSV) with pressure reducing valve
- Type 44-4 · Safety Excess Pressure Valve (SEV)

- Standard easy-to-replace diaphragm for all set point ranges
- Single-seated valve with balanced plug
- Low-noise valve plug with soft sealing
- Type 44-3/44-9 (SSV) and Type 44-4/44-8 (SEV) comply with AGFW (German District Heating Association) regulations concerning components in house substations (regulators with safety diaphragm)
- Welding ends

Type 44-2 · Type 44-3 · Type 44-7 · Type 44-8

- Type 44-3 (SSV)/Type 44-8 (SEV): The safety diaphragm takes over regulation in the event the operating diaphragm fails.

Technical data

Type 44-2 · Type 44-3 Type 44-7 · Type 44-8	Data Sheet T 2623 EN Data Sheet T 2723 EN
Set point ranges	0.2 to 10.5 ¹⁾ /0.1 to 11 bar
Nominal size ²⁾	DN 15 to 50
Nominal pressure	PN 25
Temperature ranges	
Non-flammable gases	Up to 80 °C
Liquids	Up to 150 °C

¹⁾ Type 44-2/44-3

²⁾ Male thread G ¾ to G 2½ for a coupling nut to connect welding ends or threaded ends · DN 32 to 50 also with flanged valve body

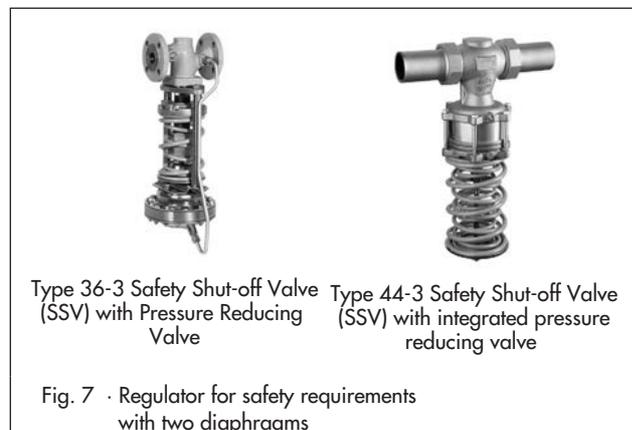
Type 44-4 · Type 44-9

- In the event of a ruptured operating diaphragm, the safety diaphragm comes into operation and moves the valve plug into the fail-safe position open (SEV) and closed (SSV).

Technical data

Type 44-9 Type 44-4	Data Sheet T 2630 EN Data Sheet T 2632 EN
Set point ranges	2 to 11 bar
Nominal size ¹⁾	DN 15 to 50
Nominal pressure	PN 25
Temperature ranges	
Non-flammable gases	Up to 80 °C
Liquids	Up to 150 °C

¹⁾ Male thread G ¾ to 2½ for a coupling nut to connect welding ends or threaded ends · DN 32 to 50 also with flanged valve body



Type 36-3 · Safety Shut-off Valve (SSV) with pressure reducing valve

Type 36-8 · Safety Excess Pressure Valve (SEV)

- Single-seated valve with balanced plug
- Actuator with two diaphragms working independently from each other (regulator with safety diaphragm)
- Flange connections

Technical data

Type 36-3 · Type 36-8	Data Sheet T 2546 EN
Set point ranges	2 to 11 bar
Nominal size	DN 15 to 100
Nominal pressure	PN 16 to 40
Temperature ranges	
Water and other liquids	Up to 150 °C
Air and non-flammable gases	Up to 80 °C

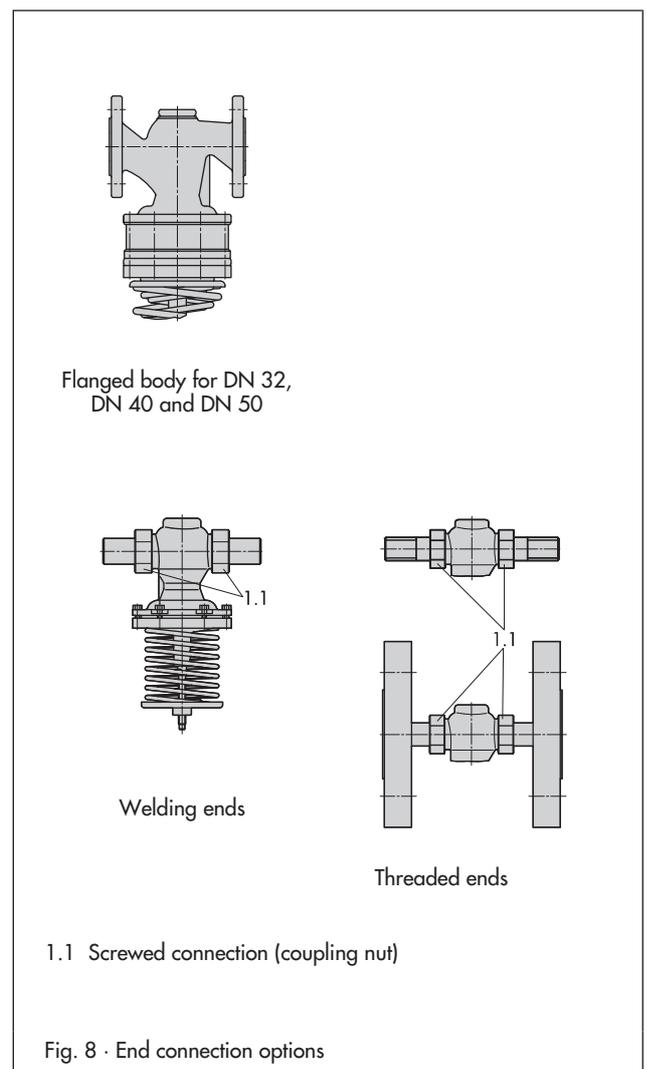
Valve end connections

The Types 44-2, 44-3, 44-4, 44-7, 44-8 and 44-9 Regulators are available with sealing screwed connections (coupling nuts) and welding ends.

Optionally, threaded ends are available.

For nominal size DN 32, 40 and 50, flanged valve bodies ¹⁾ made of spheroidal graphite iron are also available.

¹⁾ Not for Type 44-2



Pressure regulators with pilot valves

The upstream pressure p_1 is transmitted to the attached pilot valve (PV) as an auxiliary energy regardless of whether the regulator is a pressure reducing valve or an excess pressure valve.

The pilot valve generates a control pressure p_5 dependent on the set point adjustment, which is compared to the pressure to be controlled acting from the top of the operating diaphragm.

- Pilot-operated by the process medium
- Convenient set point adjustment on the pilot valve
- Especially favorable control properties, small system deviations and high control accuracy

Type 33-1 · Safety Shut-off Valve (SSV) with pressure reducing valve

Type 33-7 · Safety Excess Pressure Valve (SEV)

- Single-seated valve with upstream and downstream pressure balanced by a stainless steel bellows
- Flange connections

Technical data

Type 33-1 · Type 33-7	Data Sheet T 2551 EN
Set point ranges	1 to 11 bar
Nominal size	DN 65 to 250
Nominal pressure	PN 16 to 40
Temperature ranges	
Water and other liquids	Up to 150 °C

Type 2333 · Pressure Reducing Valve for liquids and non-flammable gases

Type 2335 · Excess Pressure Valve for liquids and non-flammable gases

- Single-seated globe valve with flange connections
- Flange connections

Technical data

Type 2333/Type 2335	Data Sheet T 2552 EN · T 2554 EN
Set point ranges	1 to 28 bar · 14.5 to 400 psi
Nominal size	DN 125 to 400 · NPS 6 to 10
Nominal pressure	PN 16 and 25 · Class 125 to 300
Temperature ranges	
Liquids	Up to 150 °C · Up to 300 °F
Gases	Up to 80 °C · Up to 175 °F
Steam	Up to 350 °C · Up to 660 °F

Type 2334 · Combined Self-operated Regulators for Differential Pressure, Flow Rate or Temperature optionally with additional electric actuator

- Single-seated globe valve with flange connections
- Wide control range and high useable rangeability at low pressure loss
- Suitable for district heating plants according to DIN 4747-1 complying with AGFW (German District Heating Association) regulations concerning components in house substations

Technical data

Type 2334	Data Sheet T 3210 EN
Set point ranges	Depending on pilot valve
Nominal size	DN 80 to 250 ¹⁾
Nominal pressure	PN 16 to 40
Temperature ranges	
Water and other liquids	Up to 150 °C
Non-flammable gases	Up to 80 °C
¹⁾ DN 300/DN 400 on request	

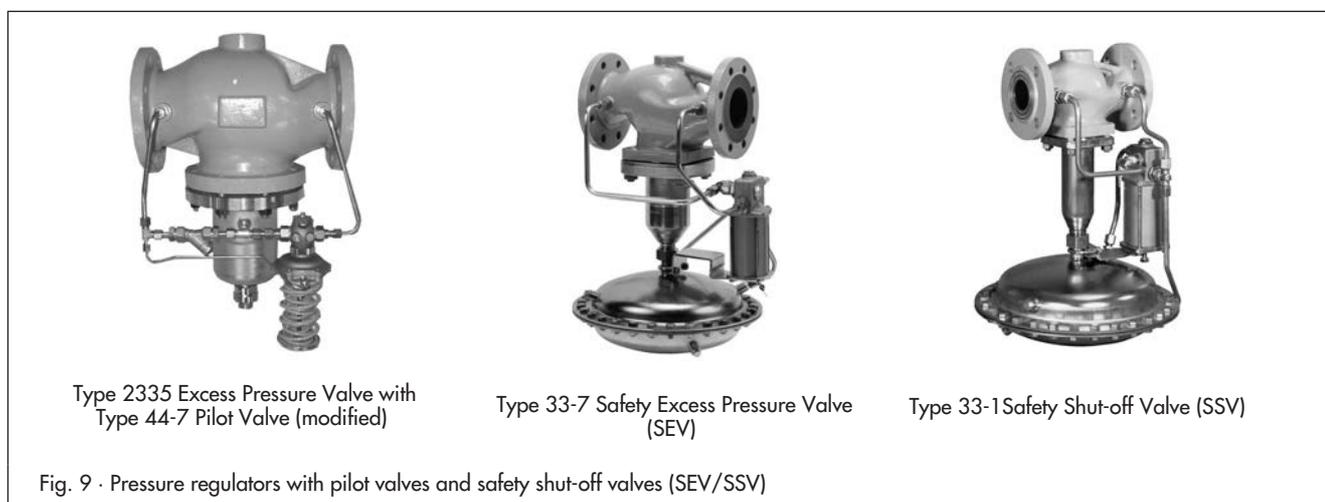


Fig. 9 · Pressure regulators with pilot valves and safety shut-off valves (SEV/SSV)

Pressure regulators for special applications

Series 2357 Pressure Regulators for cryogenic service

Types 2357-1/-6/-11 · Pressure Reducing Valve (globe valve)
 Types 2357-2/-7 · Excess Pressure Valve (angle valve)
 Type 2357-21 · Excess Pressure Valve (globe valve)
 Types 2357-3/-31 · Pressure Build-up Regulator with safety function and excess pressure valve

Pressure regulators for cryogenic gases and liquids as well as other liquids, gases and vapors.

- Wide set point range and convenient set point adjustment
- Rugged design and small overall height
- Suitable for oxygen
- Soldering ends/welding ends

Technical data Types 2357-1/-6 · Types 2357-2/-7 Data Sheet T 2557 EN

Set point ranges	0.2 to 40 bar
Nominal size	DN 20
Connection	G 3/4 A ball-type bushing · G 3/4 female thread Welding ends Ø 18 for pipe DN 15 x 1.5
Nominal pressure	PN 50
Temperature range	-196 to +200 °C

Technical data Type 2357-3 Data Sheet T 2559 EN

Set point ranges	2 to 40 bar
Nominal size	DN 25
Connection	M40 x 2 ball-type bushing M26 x 1.5 ball-type bushing
Nominal pressure	PN 40
Temperature range	-196 to +200 °C

Technical data Type 2357-31 Data Sheet T 2558 EN

Set point ranges	1 to 40 bar
Nominal size	DN 25
Connection	M40 x 2 ball-type bushing M26 x 1.5 ball-type bushing
Nominal pressure	PN 50
Temperature range	-196 to +200 °C

Technical data Type 2357-11 · Type 2357-21 Data Sheet T 2560 EN

Set point ranges	1 to 40 bar
Nominal size	DN 18
Connection	G 3/4 A
Nominal pressure	PN 63
Temperature range	-196 to +200 °C

Series 2371 Pressure Regulators for the food processing and pharmaceutical industries

Type 2371-11 · Pressure Reducing Valve
 Type 2371-00 · Excess Pressure Valve with pneumatic set point adjustment
 Type 2371-01 · Excess Pressure Valve with mechanical set point adjustment

Pressure regulators for the food processing and pharmaceutical industries. Suitable for liquids and gases

- No externally routed control line
- Compact design
- Threaded, clamp, flange connections or welding ends
- Body in stainless steel 1.4404 (316L) with a smooth surface

Technical data Type 2371-11 Data Sheet T 2640 EN Type 2371-00/01 Data Sheet T 2642 EN

Set point ranges	0.3 to 6 bar · 5 to 90 psi
Nominal size	DN 15 to 50 · NPS 1/2 to 2
Connection	Welding ends, clamps, threaded and flange connections
Operating pressure (inlet)	Max. 10 bar · Max. 150 psi
Temperature range	-10 to +130 °C · 14 to 266 °F

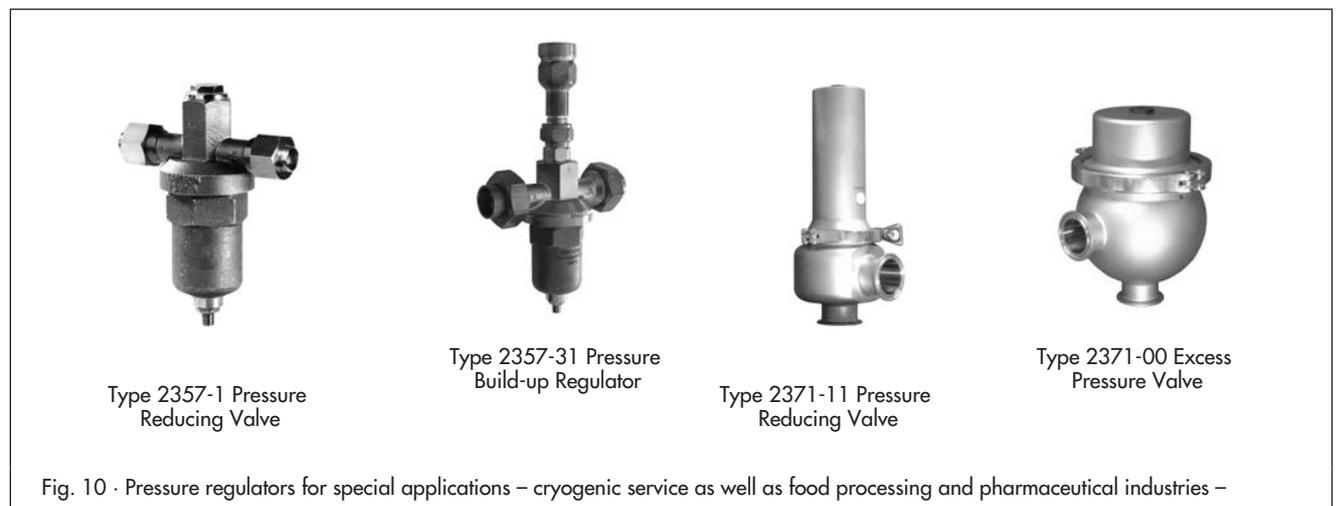


Fig. 10 · Pressure regulators for special applications – cryogenic service as well as food processing and pharmaceutical industries –

Pressure regulators for special applications

Pressure regulators for corrosive media

Type 2373 · Pressure Reducing Valve
Type 2375 · Excess Pressure Valve

Pressure regulators for gases and liquids

- Body made of stainless steel or special alloys for applications with sea water
- Flanged connections

Technical data

Type 2373	Data Sheet T 2534 EN
Type 2375	Data Sheet T 2536 EN
Set point ranges	0.8 to 16 bar
Nominal size	DN 15 to 50
Nominal pressure	PN 40
Temperature range	
Gases and liquids	Up to 80 °C

Pressure reducing valve with pneumatic set point adjustment

Type 2434 · Pressure Reducing Valve

Pressure regulator for steam

- Pneumatically adjustable set point
- Flange connections

Technical data

Type 2434	Data Sheet T 2504 EN
Set point ranges	0.3 to 3 bar
Nominal size	DN 15, 20 and 25
Nominal pressure	PN 25 and 40
Temperature range	
Steam	Up to 170 °C

Pressure regulators for millibar range

Type 2405 · Pressure Reducing Valve
Type 2406 · Excess Pressure Valve

Pressure regulators for gases and to control inert gases

- Suitable for vacuum
- High level of sealing to the atmosphere
- Min. leakage class IV
- Flange connections

Technical data

Type 2405	Data Sheets T 2520 EN · T 2521 EN
Type 2406	Data Sheets T 2522 EN · T 2523 EN
Set point ranges	0.005 to 10 bar · 0.075 to 150 psi
Nominal size	DN 15 to 50 · NPS ½ to 2
Nominal pressure	PN 16 to 40 · Class 125 to 300
Temperature range	-20 to +60 °C (150 °C) ¹⁾ -5 to 140 °F (300 °F) ¹⁾

Type 2407 · Pressure Reducing Valve

Type 2408 · Excess Pressure Valve

Pressure regulators for flammable gases and to control inert gases

- Suitable for vacuum
- High level of sealing to the atmosphere
- Min. leakage class IV
- Flange connections/female thread

Technical data

Type 2407	Data Sheets T 2524 EN · T 2525 EN
Type 2408	Data Sheets T 2528 EN · T 2529 EN
Set point ranges	5 to 1000 mbar · 0.075 to 15 psi
Nominal size	DN 15, 25/G ½, ¾, 1 · ½, ¾, 1 NPT
Nominal pressure	PN 25 · Class 250
Temperature range	-20 to +60 °C (150 °C) ¹⁾ -5 to 140 °F (300 °F) ¹⁾

¹⁾ For unbalanced versions with FPM diaphragm or FPM soft sealing



Type 2373 Pressure Reducing Valve for corrosive media



Type 2434 Steam Pressure Reducing Valve



Type 2405 Pressure Reducing Valve

Fig. 11 · Pressure regulators for special applications

Safety equipment

Small-sized Pressure Reducing Valves

Pressure reducing valves suitable for water and other liquids, air and non-flammable gases up to 50 °C.

Type 50 ES · Pressure Reducing Valve without pressure gauge

Type 50 EM · Pressure Reducing Valve with pressure gauge to indicate the downstream pressure

Technical data

Type 50 ES · Type 50 EM

Data Sheet T 2555 EN

Set point ranges	0.2 to 10 bar
Nominal pressure	PN 16
Max. perm. temperature	50 °C
Thread size	G 3/8 and G 1/2

Safety valves

Safety valves are particularly simple pressure regulators. They safeguard the plant or section of plant against excessively high pressures by discharging the process medium in the event of emergency.

Pressure Limiter (PL)

They consist of a **valve** and a **Type 2401** Pressure Element.

The spring assembly in the pressure element closes and locks the valve when the pressure reaches a limit adjustable between 1 and 10 bar. It can only be reset and put back into operation manually after the fault has been remedied.

Types 2111/2114/2118/2119 with Type 2401 Pressure Element

Types 2111/2114/2118/2119 Valves with Type 2401 Pressure Element

Type 2111/2401 · Type 2111 Globe Valve DN 15 to 50

Type 2114/2401 · Type 2114 Globe Valve DN 15 to 250

Type 2118/2401 · Type 2118 Three-way Valve DN 15 to 50

Type 2119/2401 · Type 2119 Three-way Valve DN 15 to 150

Technical data

Type 2111 to 2119/2401

Data Sheet T 2519 EN

Set point ranges	1 to 10 bar
Nominal pressure	PN 16 to 40
Temperature range	Up to 350 °C



Type 50 EM with attached pressure gauge



Type 2111/2114/2118/2119 with 2401 connecting element with spring assembly and Type 2401 Pressure Element

Fig. 12 · Safety equipment

Typical applications

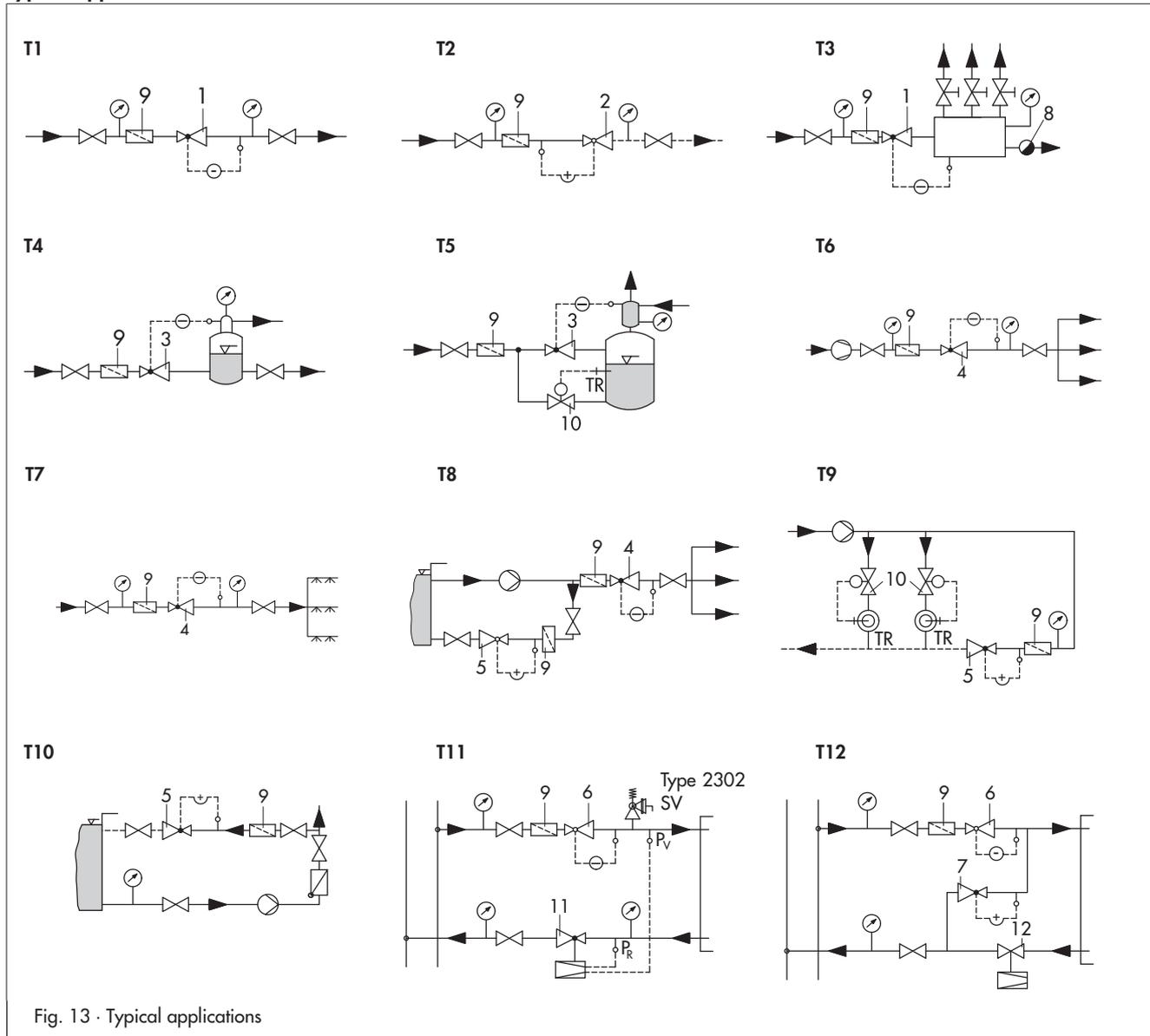


Fig. 13 · Typical applications

Steam pressure control systems

- T1: Pressure reduction in a pipeline
- T2: Excess pressure control in a pipeline
- T3: Steam pressure reduction upstream of a manifold
- T4: Pressure control in a water-heated steam generator
- T5: Pressure control in a steam-heated degasifying plant

Pressure control systems for liquids and non-flammable gases

- T6: Pressure reduction downstream of a compressor
- T7: Pressure reduction upstream of water outlets
- T8: Pipe system with pressure reducing valve (4) and excess pressure valve (5)
- T9: Excess pressure control in pipe systems
- T10: Excess pressure control in a constant pressure system

Pressure control in transfer stations

(house substations) of district heating systems or corresponding pipe systems

- T11: With safety shut-off valve (SSV) (6), safety valve, differential pressure regulator (11)

- T12: With safety shut-off valve (SSV) (6), safety excess pressure valve (SEV) (7) and flow regulator (12)

Legend for typical applications:

- 1 Type 41-23, 2422/2424 or 44-0 B Pressure Reducing Valve
- 2 Type 41-73, 2422/2425 Excess Pressure Valve
- 3 Type 41-23, 2422/2424 Pressure Reducing Valve
- 4 Type 41-23, 2422/2424, 33-1, 36-3, Series 44, Type 50 E, Type 2371-11 Pressure Reducing Valve
- 5 Type 41-73, 2422/2425, 33-7, 36-8 or 44-6 B/7/8, Type 2371-00/-01 Excess Pressure Valve
- 6 Type 33-1, 36-3, 44-3 or 44-9 Safety Shut-off Valve
- 7 Type 33-7, 36-8, 44-4 or 44-8 Safety Excess Pressure Valve
- 8 SAMSON steam trap
- 9 SAMSON strainer
- 10 SAMSON temperature regulator
- 11 SAMSON differential pressure or flow regulator
- 12 SAMSON flow regulator

Specifications subject to change without notice



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