Self-operated Pressure Regulators

Universal Pressure Reducing Valve Type 41-23

Application

Pressure regulator for set points from **0.05** to **28 bar** · Valves in sizes **DN 15** to **100** · Nominal pressure **PN 16** to **40** · Suitable for liquids, gases and steam up to **350 °C**

The valve **closes** when the **downstream** pressure increases.

Special features

- Low-maintenance P-regulator requiring no auxiliary energy
- Frictionless plug stem seal with stainless steel bellows
- Control line kit for pressure tapping directly at the body (accessories)
- Wide set point range and convenient set point adjustment on a nut
- Exchangeable actuator and positioning springs
- Spring-loaded, single-seated valve with upstream and downstream pressure balancing[1] by a stainless steel bellows
- Soft-seated plug for better shut-off performance
- Standard low-noise plug · Special version with flow divider St I or St III (DN 65 to 100) for further noise reduction (refer to Data Sheet T 8081 EN)
- All wetted parts are free of non-ferrous metal

Versions

Pressure reducing valve to control the downstream pressure p_2 to the adjusted set point. The valve closes when the downstream pressure increases.

Type 41-23 · Standard version

Type 2412 Valve in DN 15 to 100 · With metal-seated plug · Body made of cast iron EN-JL1040, spheroidal graphite iron EN-JS1049, cast steel 1.0619, forged steel or CrNiMo steel 1.4408

Type 2413 Actuator with EPDM rolling diaphragm

Extended versions

Pressure reducing valve for low flow rates
Valve with micro-trim (K_{VS} = 0.001 to 0.04) or K_{VS} in special version (reduced cross-sectional area of flow)

Steam pressure reducing valve
With condensation chamber for steam up to 350 °C

Pressure reducing valve with increased safety
Actuator with leakage line connection and seal or two diaphragms and diaphragm rupture indicator · Valve with downstream packing

[1] $K_{VS} \leq 2.5$: without balancing bellows

Fig. 1 · Type 41-23 Universal Pressure Reducing Valve

Special versions

- Control line kit for pressure tapping at the valve body (accessories)
- Internal parts made of FPM (FKM), e.g. for use with mineral oils
- Free of oil and grease for oxygen with FPM diaphragm
- EPDM diaphragm with protective PTFE foil
- Actuator for remote set point adjustment (autoclave control)
- Bellows actuator for valves in DN 15 to 100 · Set point ranges 2 to 6, 5 to 10, 10 to 22, 20 to 28 bar
- Valve with flow divider St I or St III (DN 65 to 100) for particularly low-noise operation with gases and vapors
- Version entirely made of corrosion-resistant steel
- Seat and plug of corrosion-resistant Cr steel with PTFE soft seal (max. 220 °C) · With EPDM soft seal (max. 150 °C)
- Stellited seat and plug for low-wear operation

– Free of lubricants for high-purity water or gas
– Free of oil and grease for high-purity applications
– Wetted plastic parts complying with FDA regulations (max. 60 °C)

Principle of operation (Fig. 2)

The medium flows through the valve body (1) in the direction indicated by the arrow. The position of the valve plug (3) determines the flow rate across the area released between the plug and seat (2). The plug stem (5) with the plug is connected to the actuator stem (11).

To control the pressure, the operating diaphragm (12) is pretensioned by the positioning springs (7) and the set point adjuster (6). As a result, the valve is opened by the force of the positioning springs in pressureless state ($p_1 = p_2$).

The downstream pressure p_2 to be controlled is tapped downstream of the valve and transmitted through the control line (14) to the operating diaphragm (12) where it is converted into a positioning force. This force is used to move the valve plug (3) depending on the force of the positioning springs (7). The spring force can be adjusted on the set point adjuster (6). When the force resulting from the downstream pressure p_2 exceeds the adjusted pressure set point, the valve is closed proportionally to the change in pressure.

The fully balanced valve is equipped with a balancing bellows (4): The downstream pressure p_2 acts on the inside of the bellows, the upstream pressure p_1 acts on the outside of the bellows. As a result, the forces produced by the upstream and downstream pressures acting on the valve plug are balanced.

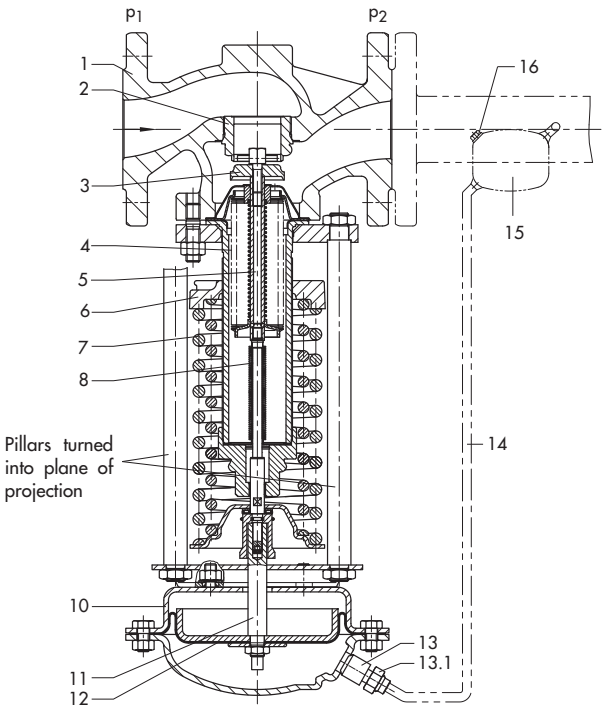
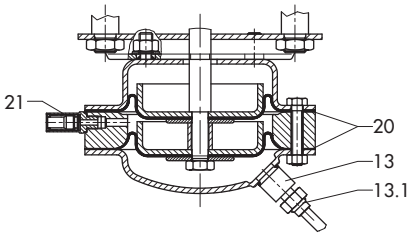
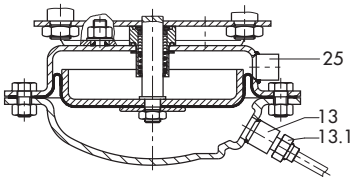


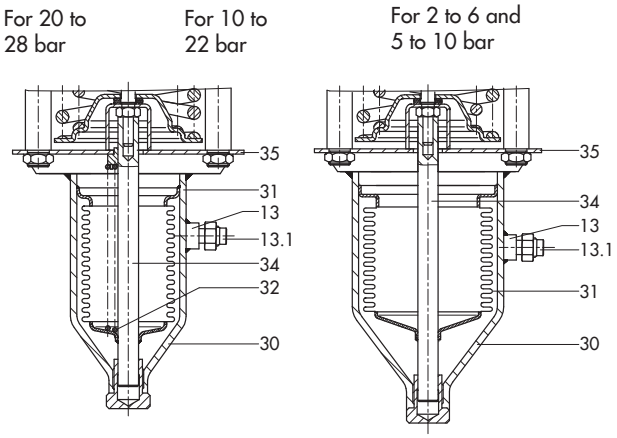
Fig. 2.1 · Type 41-23 Universal Pressure Reducing Valve, sectional drawing



Actuator with two diaphragms and diaphragm rupture indicator



Actuator with leakage line connection

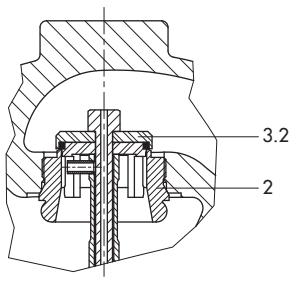


Metal bellows actuator

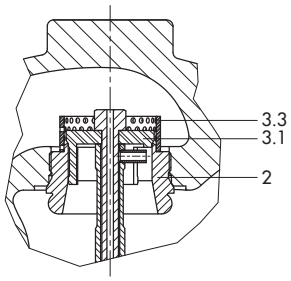
Fig. 2.2 · Type 2413 Actuators, different versions

1	Valve body	15	Condensation chamber
2	Seat (exchangeable)	16	Filler plug
3	Plug (metal-seated)	20	Diaphragm
4	Balancing bellows	21	Diaphragm rupture indicator
5	Plug stem	25	Leakage line connection G ¼
6	Set point adjuster	30	Metal bellows actuator
7	Positioning springs	31	Bellows with lower section
8	Bellows seal	32	Additional springs
10	Type 2413 Actuator	34	Bellows stem
11	Actuator stem	35	Bracket
12	Operating diaphragm with diaphragm plate		
13	Control line connection G ¼		
13.1	Screw joint with restriction		
14	Control line		

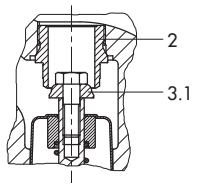
Fig. 2 · Functional diagrams of Type 41-23 Universal Pressure Reducing Valve



Metal-seated plug,
with flow divider St I



Soft-seated plug



Valve for low flow rates ($K_{VS} \leq 2.5$),
without balancing bellows

Fig. 3 · Type 41-23 Universal Pressure Reducing Valve, equipment

2 Seat
3.1 Metal-seated plug
3.2 Soft-seated plug
3.3 Flow divider

Table1 · Technical data · All pressures in bar (gauge)

Valve	**Type 2412**		
Nominal pressure	PN 16, PN 25 or PN 40		
Nominal size	DN 15 to 50	DN 65 to 80	DN 100
Max. perm. differential pressure Δp	25 bar	20 bar	16 bar
Max. permissible temperature	Refer to T 2500 EN for pressure-temperature diagram		
Valve plug	Metal seal: max. 350 °C · PTFE soft seal: max. 220 °C · EPDM, FPM soft seal: max. 150 °C NBR soft seal: max. 80 °C [1]		
Leakage rate acc. to IEC 60534-4	Metal seal: leakage class I ($\leq$ 0.05 % of K_{VS} coefficient) Soft seal: leakage class IV ($\leq$ 0.01 % of K_{VS} coefficient)		
Actuator with diaphragm	**Type 2413**		
Set point ranges	0.05 to 0.25 bar · 0.1 to 0.6 bar · 0.2 to 1.2 bar · 0.8 to 2.5 bar 2 to 5 bar · 4.5 to 10 bar · 8 to 16 bar		
Max. perm. temperature	Gases 350 °C, however, max. 80 °C at the actuator [1] · Liquids 150 °C, with condensation chamber max. 350 °C · Steam with condensation chamber max. 350 °C		
Actuator with metal bellows	**Type 2413**		
Effective area	33 cm²	62 cm²	
Set point ranges	10 to 22 bar · 20 to 28 bar	2 to 6 bar · 5 to 10 bar	

[1] Max. 60 °C for oxygen

Table 2 · Max. permissible pressure at the actuator

Set point ranges · Actuator with rolling diaphragm							Actuator with metal bellows			
0.05 to 0.25 bar	0.1 to 0.6 bar	0.2 to 1.2 bar	0.8 to 2.5 bar	2 to 5 bar	4.5 to 10 bar	8 to 16 bar	2 to 6 bar	5 to 10 bar	10 to 22 bar	20 to 28 bar
Max. permissible pressure above the set point adjusted at the actuator										
0.6 bar	0.6 bar	1.3 bar	2.5 bar	5 bar	10 bar	10 bar	6.5 bar	6.5 bar	8 bar	2 bar

Table 3 · Materials · Material numbers acc. to DIN EN

Valve	**Type 2412**					
Nominal pressure	PN 16	PN 25	PN 40			
Max. permissible temperature	300 °C	350 °C	350 °C	350 °C	350 °C	350 °C
Body	Cast iron EN-JL1040	Spheroidal graphite iron EN-JS1049	Cast steel 1.0619	Stainless steel 1.4408	Forged steel [1] 1.0460	Stainless forged steel [1] 1.4571
Seat	CrNi steel			CrNiMo steel	CrNi steel	CrNiMo steel
Plug	CrNi steel			CrNiMo steel	CrNi steel	CrNiMo steel
Seal for soft-seated plug	PTFE with 15 % glass fiber · EPDM · NBR · FPM					
Guide bushing	PTFE/graphite					
Balancing bellows and bellows seal	Stainless forged steel 1.4571					
Actuator	**Type 2413**					
Diaphragm cases	Sheet steel DD11 (StW22) [2]					
Diaphragm	EPDM with fabric reinforcement [3] · FPM for mineral oils · NBR · EPDM with protective PTFE foil					

[1] Only DN 15, 25, 40, 50 and 80 . [2] CrNi steel in stainless steel version . [3] Standard version; for details refer to "Special versions"

Installation

Standard installation: Install the regulator with the actuator suspended (pointing down). Install the horizontal pipeline with a slight downward slope on both sides of the valve for condensate drainage.

- Install the regulator with the direction of flow matching the arrow on the valve body.
- Adapt the control line (not included in the scope of delivery) to the conditions on site. A control line kit for pressure tapping directly at the valve body is available on request (accessories).

Type 41-23
Control line directly connected to the valve

Refer to EB 2512 EN for further details on installation.

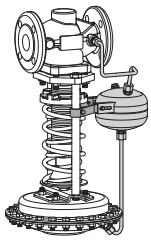
Accessories

Included in the scope of delivery:

- Screw joint with restriction for connection of $^{3}/_{8}$" control line

Additional accessories that can be ordered separately:

- Compression-type screw fittings e.g. for connection of 6 mm, 8 mm or 12 mm pipe
- Control line kit (optionally with or without condensation chamber) for direct attachment to the valve and actuator (pressure tapping directly at the valve body, for set points ≥ 0.8 bar).
- Condensation chamber for steam condensation and protection of the operating diaphragm against excessive temperatures. Required for steam and liquids at temperatures exceeding 150 °C.



Type 41-23
Control line kit and condensation chamber

Refer to Data Sheet T 2595 EN for details on the accessories.

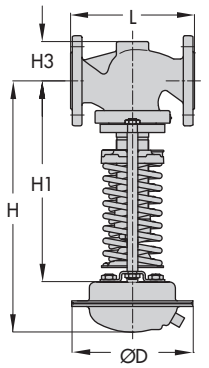
Ordering text

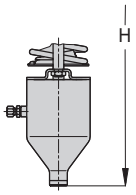
Universal Pressure Reducing Valve **Type 41-23**
Extended version …
DN …, PN ...
Body material ...
K_{VS} …
Set point range ... bar
Optionally, accessories … (refer to T 2595 EN)
Optionally, special version ...

Dimensions (see Table 4)

Type 41-23 Universal Pressure Reducing Valve

Actuator with two diaphragms:
Height H + 50 mm





Type 2413 Actuator with metal bellows

Fig. 4 · Dimensions

Table 4 · Dimensions in mm and weights

Pressure reducing valve			**Type 41-23**								
Nominal size		**DN**	**15**	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**
Length L			130	150	160	180	200	230	290	310	350
Height H1			335			390			510		525
Height H3	Other materials		55			72			100		120
	Forged steel		53	–	70	–	92	98	–	128	–
Standard version with actuator with rolling diaphragm											
Set point ranges	**0.05** to **0.25** bar	Height H	445			500			620		635
		Actuator	∅ D = 380 mm, A = 640 cm²								
		Valve spring force F	1750 N								
	0.1 to **0.6** bar	Height H	445			500			620		635
		Actuator	∅ D = 380 mm, A = 640 cm²								
		Valve spring force F	4400 N								
	0.2 to **1.2** bar	Height H	430			480			600		620
		Actuator	∅ D = 285 mm, A = 320 cm²								
		Valve spring force F	4400 N								
	0.8 to **2.5** bar	Height H	430			485			605		620
		Actuator	∅ D = 225 mm, A = 160 cm²								
		Valve spring force F	4400 N								
	2 to **5** bar	Height H	410			465			585		600
		Actuator	∅ D = 170 mm, A = 80 cm²								
		Valve spring force F	4400 N								
	4.5 to **10** bar	Height H	410			465			585		600
		Actuator	∅ D = 170 mm, A = 40 cm²								
		Valve spring force F	4400 N								
	8 to **16** bar	Height H	410			465			585		600
		Actuator	∅ D = 170 mm, A = 40 cm²								
		Valve spring force F	8000 N								
Weight for version with **actuator with rolling diaphragm**											
	0.05 to **0.6** bar	Weight, based on cast iron [1], approx. kg	22.5	23.5		29.5	31.5	35	51	58	67
	0.2 to **2.5** bar		16	18		23.5	25.5	29	45	52	61
	2 to **16** bar		12	13		18.5	21	24	40	47	56
Version with **bellows actuator**											
Set point ranges	**2** to **6** bar	Height H	550			605			725		740
		Actuator	A = 62 cm²								
		Valve spring force F	4400 N								
	5 to **10** bar	Height H	550			605			725		740
		Actuator	A = 62 cm²								
		Valve spring force F	8000 N								
	10 to **22** bar	Height H	535			590			710		725
		Actuator	A = 33 cm²								
		Valve spring force F	8000 N								
	20 to **28** bar	Height H	535			590			710		725
		Actuator	A = 33 cm²								
		Valve spring force F	8000 N								
Weight for version with **bellows actuator**											
A = 33 cm²		Weight, based on cast iron [1], approx. kg	16.5	17.9	18	23.5	25.5	29	48	56	66
A = 62 cm²			20.9	21.5	22	27.5	29.5	33	54	65	75

[1] +10 % for cast steel, spheroidal graphite iron and forged steel

Table 5 · K_{VS} coefficients and x_{FZ} values · Terms for noise level calculation according to VDMA 24422 (edition 1989-01)

Nominal size	K_{VS} [1] Standard version	X_{FZ}	K_{VS} [1] Special version	X_{FZ}	K_{VS} I With flow divider	K_{VS} III With flow divider
DN 15			0.1 · 0.4 · 1	0.7 · 0.65 · 0.6		
			2.5	0.55		
	4	0.5			3	
DN 20			0.1 · 0.4 · 1	0.7 · 0.65 · 0.6		
			2.5	0.55		
			4	0.5		
	6.3	0.45			5	
DN 25			0.1 · 0.4 · 1	0.7 · 0.65 · 0.6		
			2.5	0.55		
	8	0.4	4 · 6.3	0.5 · 0.45	6	
DN 32			6.3 · 8	0.45 · 0.4	5.6	
	16	0.4			12	
DN 40			6.3 · 8	0.45 · 0.4	5.6	
	20	0.4	16	0.4	15	
DN 50			8	0.4	6	
	32	0.4	16 · 20	0.45 · 0.4	25	
DN 65			20 · 32	0.4	15 · 25	10 · 20
	50	0.4			38	25
DN 80			32	0.4	25	20
	80	0.35	50	0.4	60	40
DN 100			50	0.4	38	25
	125	0.35			95	60

[1] For K_{VS} 0.001 to 0.04: valve with micro-flow trim (DN 15 to 25 only) without balancing bellows

Valve-specific correction terms

ΔL_G · For gases and vapors:
Values as specified in the diagram

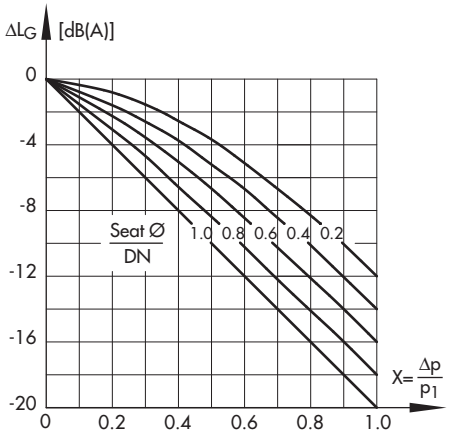


Fig. 5 · Diagram, ΔL_G for gases and vapors

ΔL_F · For liquids:

$$\Delta L_F = -10 \cdot (x_F - x_{FZ}) \cdot y$$

$$\text{with } X_F = \frac{\Delta p}{p_1 - p_v} \text{ and } y = \frac{K_V}{K_{VS}}$$

Terms for valve sizing according to IEC 60534, parts 2-1 and 2-2:

$F_L = 0.95$ $x_T = 0.75$

x_{FZ} · Acoustical valve coefficient

K_{VS} I, K_{VS} III · When a flow divider St I or St III has been installed to reduce the noise level

Specifications subject to change without notice

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