DATA SHEET

T 2512 EN

Type 41-23 Universal Pressure Reducing Valve

Self-operated Pressure Regulators · DIN version

Application

Pressure regulators for set points from **0.05** to **28 bar** · Nominal sizes **DN 15** to **100** · Pressure rating **PN 16** to **40** · Suitable for liquids, gases and vapors from **-50** to **350 °C**

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

Type 41-23 Universal Pressure Reducing Valve



Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Frictionless plug stem seal with stainless steel bellows
- Control line kit available for tapping the pressure directly at the valve body
- Wide set point range and convenient set point adjustment using a nut
- Exchangeable set point springs and actuator
- Spring-loaded, single-seated valve with upstream and downstream pressure balancing by a stainless steel bellows (K_{VS} ≤2.5: without balancing bellows)
- Soft-seated plug for strict shut-off requirements
- Low-noise plug (standard)
- All wetted parts free of non-ferrous metal

The universal pressure reducing valves consist of a Type 2412 Globe Valve and a Type 2413 Diaphragm or Bellows Actuator.

Versions

Pressure reducing valve to regulate the downstream pressure p_2 to the adjusted set point. The valve **closes** when the **downstream** pressure rises.

– **Type 41-23 · Standard version**
Type 2412 Valve · Valve DN 15 to 100 · Metal-seated plug · Body made of cast iron EN-GJL-250, spheroidal graphite iron EN-GJS-400-18-LT, cast steel 1.0619, forged steel or stainless steel 1.4408 · **Type 2413 Actuator** with EPDM rolling diaphragm

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Version with additional features

- **Pressure reducing valve for low flow rates**
  Valve with micro-flow trim (K_{VS} = 0.001 to 0.04) or special K_{VS} coefficients (restricted cross-sectional area of flow)
- **Steam pressure reducing valve**
  with compensation 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

Special versions

- Control line kit for tapping the pressure directly at the valve body (accessories)
- With internal parts made of FKM, e.g. for use with mineral oils
- Actuator for remote set point adjustment (autoclave control)
- Bellows actuator for valves DN 15 to 100 · Set point ranges 2 to 6 bar, 5 to 10 bar, 10 to 22 bar or 20 to 28 bar
- Valve with flow divider ST 1 or ST 3 (DN 65 to 100) for particularly low-noise operation with gases and vapors (▶ T 8081)
- Version entirely of stainless steel
- Stainless Cr steel seat and plug with PTFE soft seal (max. 220 °C) or with EPDM soft seal (max. 150 °C)
- Stellite®-faced seat and plug for low-wear operation
- Version for industrial gases
- Free of oil and grease for high-purity applications
- FDA version [1)]

[1)] This version is not suitable for direct contact with products manufactured in the food and pharmaceutical industries. It can only be used close to the product.

Design and principle of operation

⇨ See Fig. 1

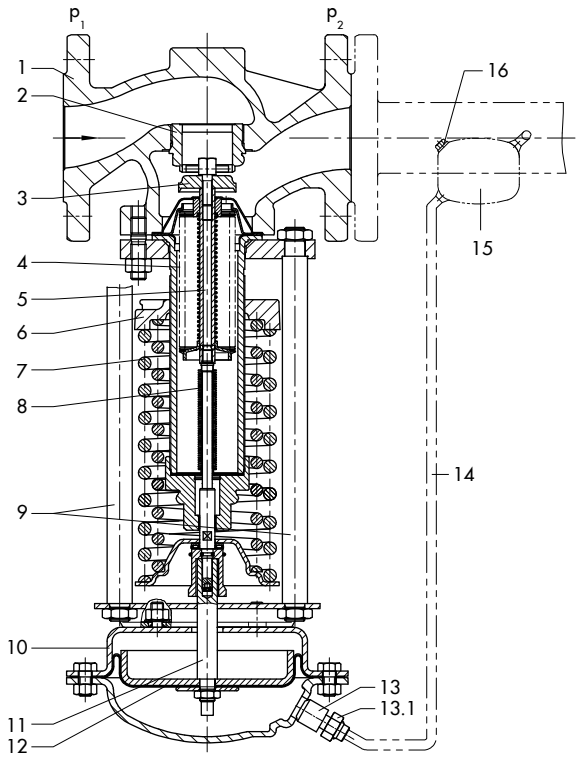
The medium flows through the valve (1) as indicated by the arrow. The position of the plug (3) determines the flow rate across the area released between plug and valve seat (2). The plug stem (5) with the plug is connected to the actuator stem (11) of the actuator (10).

To control the pressure, the operating diaphragm (12) is tensioned by the set point springs (7) and the set point adjuster (6) so that the valve is opened by the force of the set point springs when it is relieved of pressure ($p_1 = p_2$).

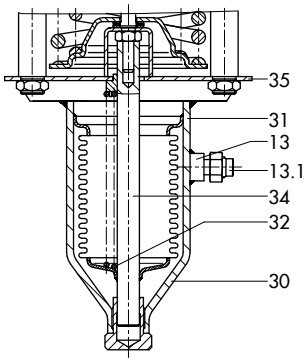
The downstream pressure p_2 to be controlled is tapped downstream of the valve and transmitted over the control line (14) to the operating diaphragm (12) where it is converted into a positioning force. This force is used to move the valve plug (3) according to the force of the set point springs (7). The spring force is adjustable at the set point adjuster (6). When the force resulting from the downstream pressure p_2 rises above the adjusted pressure set point, the valve closes proportionally to the change in pressure.

The fully balanced valve has a balancing bellows (4). The downstream pressure p_2 acts on the inside of the bellows, whereas 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 plug are balanced out.

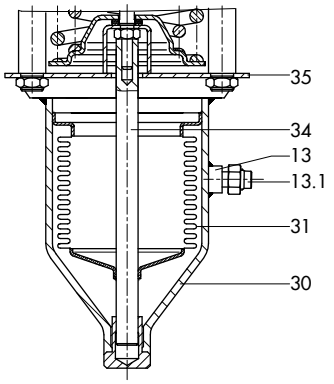
Sectional drawing of Type 41-23 Universal Pressure Reducing Valve



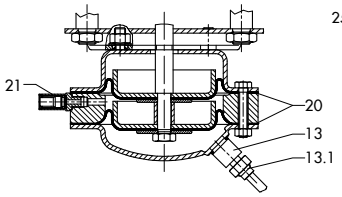
Various versions of Type 2413 Actuator



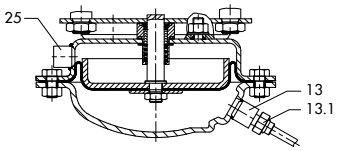
Bellows actuator:
10 to 22 bar · 20 to 28 bar



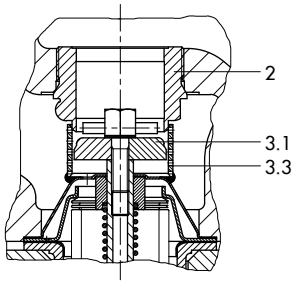
Bellows actuator:
2 to 6 bar · 5 to 10 bar



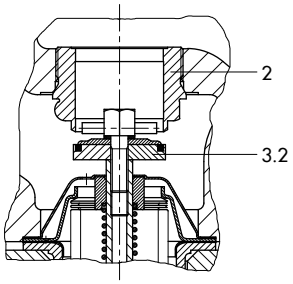
Diaphragm actuator with two diaphragms for increased safety



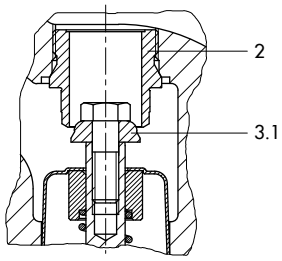
Diaphragm actuator with leakage line connection



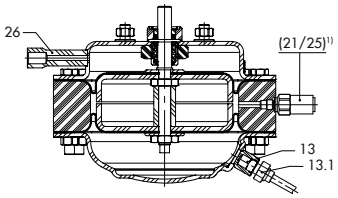
Plug with metal seal, with flow divider ST 1



Plug with soft seal



Valve for small flow rates K_{VS} ≤2.5: without balancing bellows



Diaphragm actuator with two diaphragms for autoclave regulator
(overview of diaphragm actuator connections)

Fig. 1: *Functional diagram of Type 41-23 Universal Pressure Reducing Valve*

1 Valve body (Type 2412)
2 Seat (exchangeable)
3 Plug
3.1 Plug with metal seal
3.2 Plug with soft seal
3.3 Flow divider
4 Balancing bellows
5 Plug stem
6 Set point adjuster
7 Set point springs
8 Bellows seal
10 Actuator housing of Type 2413
11 Actuator stem
12 Operating diaphragm with diaphragm plate
13 Control line connection G ¼
13.1 Screw joint with restriction
14 Control line
15 Compensation chamber
16 Filler plug
20 Diaphragm
21 Diaphragm rupture indicator G ¼
25 Leakage line connection G ¼
30 Bellows actuator
31 Bellows with bottom section
32 Additional springs
34 Bellows stem
35 Crossbeam

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

Valve		**Type 2412**		
Nominal size		DN 15 to 50	DN 65 to 80	DN 100
Pressure rating		PN 16, 25 or 40		
Max. perm. differential pressure Δp		16 bar [2] · 25 bar	16 bar [2] · 20 bar	16 bar
Max. perm. temperature [1]	Valve	See ▶ T 2500 · Pressure-temperature diagram		
	Valve plug	▶ T 2595 · Process medium and permissible medium temperature		
Leakage class according to DIN EN 60534-4		Metal seal: **Leakage rate I** (≤0.05 % of K_{VS}) Soft seal: **Leakage rate IV** (≤0.01 % of K_{VS})		
Conformity		CE		

[1] FDA version: Max. permissible temperature 60 °C

[2] For PN 16 only

Table 2: *Technical data of diaphragm or bellows actuator · All pressures in bar (gauge)*

Diaphragm actuator	**Type 2413**				
Actuator area	640 cm²	320 cm²	160 cm²	80 cm²	40 cm²
Set point range	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]	2 to 5 bar	4.5 to 10 bar 8 to 16 bar
Max. perm. temperature [3]	▶ T 2595 · Process medium and permissible medium temperature				
Set point spring	1750 N	4400 N			8000 N
Bellows actuator	**Type 2413**				
Actuator area	33 cm²		62 cm²		
Set point range	10 to 22 bar 20 to 28 bar		2 to 6 bar [1] 5 to 10 bar		
Max. perm. temperature [3]	▶ T 2595 · Process medium and permissible medium temperature				
Set point spring	8000 N				

[1] Set point spring 4400 N

[2] Version with actuator with two diaphragms: 1 to 2.5 bar

[3] FDA version: Max. permissible temperature 60 °C

Table 3: *Max. perm. pressure at actuator*

	Set point ranges	**Max. perm. pressure above the set point adjusted at the actuator**
Diaphragm actuator	0.05 to 0.25 bar · 0.1 to 0.6 bar	0.6 bar
	0.2 to 1.2 bar	1.3 bar
	0.8 to 2.5 bar	2.5 bar
	2 to 5 bar	5 bar
	4.5 to 10 bar · 8 to 16 bar	10 bar
Bellows actuator	2 to 6 bar · 5 to 10 bar	6.5 bar
	10 to 22 bar	8 bar
	20 to 28 bar	2 bar

Table 4: *Weights · Compensation chambers (standard version) made of steel*

Order no.	Designation	Weight, approx.
1190-8788	Compensation chamber 0.7 l	1.6 kg
1190-8789	Compensation chamber 1.5 l	2.6 kg
1190-8790	Compensation chamber 2.4 l	3.7 kg

Table 5: *K_{VS} coefficients and x_{FZ} values · Terms for noise level calculation according to VDMA 24422 (edition 1.89)*

Nominal size	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100
K_{VS} [1] (standard version)	4	6.3	8	16	20	32	50	80	125
x_{FZ}	0.5	0.45	0.4					0.35	
K_{VS} [1] (special version)	0.1 · 0.4 · 1 · 2.5	0.1 · 0.4 · 1 · 2.5 · 4	0.1 · 0.4 · 1 · 2.5 · 4 · 6.3	6.3 · 8	6.3 · 8 · 16	8 · 16 · 20	20 · 32	32 · 50	50
K_{VS}-1 [1] (with flow divider ST 1)	3	5	6	12	15	6 · 25	25 · 38	25 · 60	38 · 95
K_{VS}-3 [1] (with flow divider ST 3)	–						25	40	60

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

Table 6: *Materials · Material numbers according to DIN EN*

Valve		Type 2412					
Pressure rating		PN 16	PN 25	PN 40			
Max. permissible temperature [4]		300 °C	350 °C				
Body		Cast iron EN-GJL-250	Spheroidal graphite iron EN-GJS-400-18-LT	Cast steel 1.0619	Stainless steel 1.4408	Forged steel 1.0460 [1]	Forged stainless steel 1.4401/1.4404 [1]
Seat		CrNi steel			CrNiMo steel	CrNi steel	CrNiMo steel
Plug	Material	CrNi steel			CrNiMo steel	CrNi steel	CrNiMo steel
	Seal	PTFE with 15 % glass fiber · EPDM · NBR · FKM					
Guide bushing		Graphite					
Balancing bellows and bellows seal		CrNiMo steel					
Actuator		**Type 2413**					
		Diaphragm actuator				**Bellows actuator**	
Diaphragm cases		1.0332 [2]				–	
Diaphragm		EPDM with fabric reinforcement [3] · FKM, e.g. for mineral oils · NBR				–	
Bellows housing		–				1.0460/1.4301 (stainless steel only)	
Bellows		–				CrNiMo steel	

[1] DN 15, 25, 40, 50 and 80 only

[2] In corrosion-resistant version (CrNi steel)

[3] Standard version; see Special versions for others

[4] FDA version: Max. permissible temperature 60 °C

Table 7: *Weights in kg*

Type 41-23	Nominal size	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100
Set point ranges		**Version with Type 2413 Diaphragm Actuator**								
0.05 to 0.6 bar	Weight[1] (approx. kg)	24.8	25.9		32.5	34.7	38.5	56.1	63.8	73.7
0.2 to 2.5 bar		20.6	22.8		28.9	31.1	34.9	52.5	60.2	70.1
2 to 16 bar		13.2	14.3		20.4	23.1	26.4	44.0	51.7	61.6
		Version with Type 2413 Bellows Actuator								
2 to 10 bar	Weight[1] (approx. kg)	22.6	23.7	24.2	30.3	32.5	36.3	60.5	68.2	78.1
10 to 28 bar		18.2	19.3	19.8	25.9	28.1	31.9	48.4	61.6	71.5

[1] Based on PN 16; +10 % for PN 25 and 40

Table 8: *Type 2412 Valve · Dimensions in mm*

Nominal size		DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100
Length L		130	150	160	180	200	230	290	310	350
Height H1		335			390			517		540
Height H2	Forged steel	53	–	70	–	92	98	–	128	–
	Other materials	44			72			98		118
Height H4		100								

Table 9: *Type 41-23, version with Type 2413 Diaphragm Actuator · Dimensions in mm*

Nominal size			DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100
Set point ranges	0.05 to 0.25 bar	Height H[2][3]	445			500			627		650
		Actuator	ØD = 380 mm, A = 640 cm²								
		Valve spring force F	1750 N								
	0.1 to 0.6 bar	Height H[2][3]	445			500			627		650
		Actuator	ØD = 380 mm, A = 640 cm²								
		Valve spring force F	4400 N								
	0.2 to 1.2 bar	Height H[2][3]	430			480			607		635
		Actuator	ØD = 285 mm, A = 320 cm²								
		Valve spring force F	4400 N								
	0.8 to 2.5 bar[1]	Height H[2][3]	430			485			612		635
		Actuator	ØD = 225 mm, A = 160 cm²								
		Valve spring force F	4400 N								
	2 to 5 bar	Height H[2][3]	410			465			592		615
		Actuator	ØD = 170 mm, A = 80 cm²								
		Valve spring force F	4400 N								
	4.5 to 10 bar	Height H[2][3]	410			465			592		615
		Actuator	ØD = 170 mm, A = 40 cm²								
		Valve spring force F	4400 N								
	8 to 16 bar	Height H[2][3]	410			465			592		615
		Actuator	ØD = 170 mm, A = 40 cm²								
		Valve spring force F	8000 N								

[1] Actuator with two diaphragms: 1 to 2.5 bar

[2] Actuator with two diaphragms for autoclave regulator: H = +50 mm

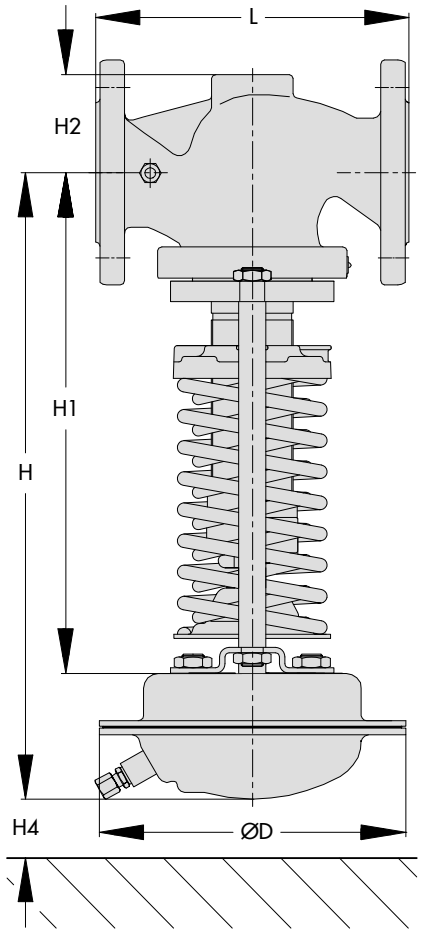
[3] Actuator with two diaphragms for increased safety: H = +32 mm

Table 10: *Type 41-23, version with Type 2413 Bellows Actuator · Dimensions in mm*

Nominal size			DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100
Set point ranges	2 to 6 bar	Height H	550			605			732		755
		Actuator	ØD = 120 mm, A = 62 cm²								
		Valve spring force F	4400 N								
	5 to 10 bar	Height H	550			605			732		755
		Actuator	ØD = 120 mm, A = 62 cm²								
		Valve spring force F	8000 N								
	10 to 22 bar	Height H	535			590			717		740
		Actuator	ØD = 90 mm, A = 33 cm²								
		Valve spring force F	8000 N								
	20 to 28 bar	Height H	535			590			717		740
		Actuator	ØD = 90 mm, A = 33 cm²								
		Valve spring force F	8000 N								

Dimensional drawings

Type 41-23 with diaphragm actuator



Type 41-23 with bellows actuator

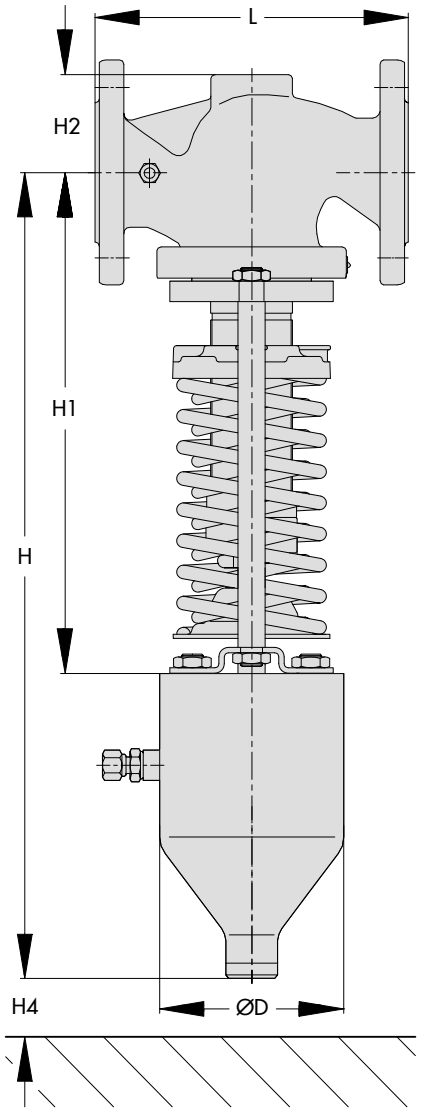


Fig. 2: *Dimensions of Type 41-23*

Installation

Normally, the valve is installed with the actuator suspended downwards. Install pipelines horizontally with a slight downward slope on both sides of the valve for drainage of the condensate.



- The direction of flow must match the arrow on the valve body.
- Adapt the control line to the conditions on site. The control line is not included in the scope of delivery. A control line kit is available for tapping the pressure directly at the valve body (see section Accessories).

i Note

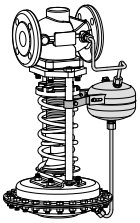
For further details on installation in ▶ EB 2512.

Accessories

Included in the scope of delivery:

- Screw joint with restriction for control line with 6 mm diameter

To be ordered separately:



- **Compression-type fittings** for e.g. 8 mm or 10 mm pipe
- **Control line kit** optionally with or without compensation chamber. For direct attachment to the valve and actuator (pressure tapped directly at the valve body, for set points ≥0.8 bar).
- **Compensation chamber** for condensation and to protect the operating diaphragm against extreme temperatures. A compensation chamber is required for liquids above 150 °C as well as for steam.

i Note

For further details on accessories in ▶ T 2595.

Valve-specific correction terms

- ΔL_G for gases and vapors:

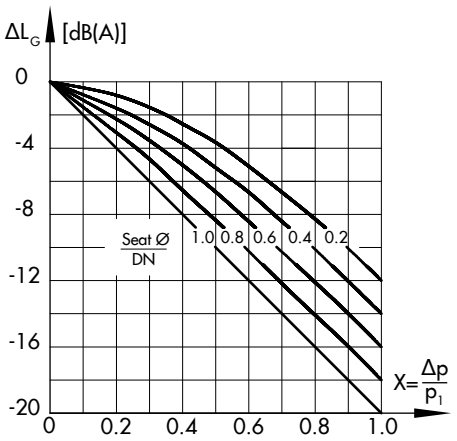


Fig. 3: *Diagram · ΔL_G for gases and vapors*

- **ΔL_F** · For liquids:
  $\Delta L_F = -10 \cdot (x_F - x_{FZ}) \cdot y$

  with $x_F = \frac{\Delta p}{p_1 - p_V}$ and $y = \frac{K_V}{K_{VS}}$

  Terms for control 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}-1, K_{VS}-3** · When a flow divider ST 1 or ST 3 is installed as a noise-reducing component
  Flow characteristic differences between valves with and valves without flow dividers do not occur until the valve has passed through approx. 80 % of its travel range

Ordering text

Type 41-23 Universal Pressure Reducing Valve

Additional features …

DN …

Body material …

PN …

K_{VS} coefficient …

Set point range … bar

Optionally, accessories … (▶ T 2595)

Optionally, special version …

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