

# Self-operated Pressure Regulators

## Universal Excess Pressure Valve Type 41-73



ANSI version

### Application

Pressure regulators for set points from **0.075 to 400 psi (5 mbar to 28 bar)** · Valves in **NPS ½ to 4 (DN 15 to 100)** · Pressure rating **Class 125 to 300 (PN 16 to 40)** · Suitable for water, gases and vapors up to **660 °F (350 °C)**

The valve **opens** when the upstream pressure rises



### 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 easy set point adjustment over a nut
- Exchangeable actuator and positioning springs
- Spring-loaded, single-seated valve with upstream and downstream pressure balancing<sup>1)</sup> by a stainless steel bellow
- Plug with soft sealing for high sealing requirements
- Low-noise standard plug · Special version with flow divider St I for further noise level reduction (see Data Sheet T 8081 EN)

### Versions

Excess pressure valve for controlling the upstream pressure  $p_1$  to the adjusted set point. The valve opens when the upstream pressure rises.

#### Type 41-73 · Standard version

**Type 2417 Valve** · Valve in NPS ½ to 4 (DN 15 to 100) · Plug with metal sealing · Body made of either cast iron A126B, carbon steel A216 WCC or stainless carbon steel A351 CF8M

**Type 2413 Actuator** with EPDM rolling diaphragm and screw fitting · All wetted parts are free of non-ferrous metal

### Extended versions

**Millibar excess pressure valve** · NPS ½ to 3 (DN 15 to DN 80) · For pressure set points from 0.075 to 0.75 psi (5 to 50 mbar)

**Safety excess pressure valve** · With leakage line connection and seal or two diaphragms and diaphragm rupture indicator

### Special versions

- Control line kit for pressure tapping at the valve body (accessories)
- FPM rolling diaphragm for oils
- Free of oil and grease for oxygen with FPM diaphragm

<sup>1)</sup> For  $C_v \leq 1.2 / K_{vs} \leq 1$ : without balancing bellows



- EPDM diaphragm with PTFE protective foil
- Actuator for remote set point adjustment (autoclave control)
- Bellows actuator for valves DN 15 to 100 · Set point range NPS 3 (DN 80) · Set point ranges 30 to 85 psi, 75 to 150 psi, 150 to 300 psi, 300 to 400 psi (2 to 6 bar, 5 to 10 bar, 10 to 22 bar, 20 to 28 bar)
- Valve with flow divider St I for particularly low-noise operation with gases and vapors
- Version completely in stainless steel
- Stainless Cr steel seat and plug with PTFE soft sealing (max. 440 °F/max. 220 °C) · With EPDM soft sealing (max. 300 °F/max. 150 °C)
- Seat and plug armored for low-wear operation
- Free of lubricants for high-purity water/gas
- Free of oil and grease for high-purity applications
- Wetted plastic parts conforming to FDA regulations (max. 140 °F/max. 60 °C)

**Principle of operation** (see Fig. 2)

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

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

The upstream pressure  $p_1$  to be controlled is tapped upstream of the valve and transmitted via 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 positioning springs (7), which is adjustable at the set point adjuster (6). When the force resulting from the upstream pressure  $p_1$  rises above the adjusted set point, the valve opens proportionally to the change in pressure.

The fully balanced valves are equipped with 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.

The valves are available with flow divider St I. When the flow divider St I is retrofitted, the valve seat must be replaced.

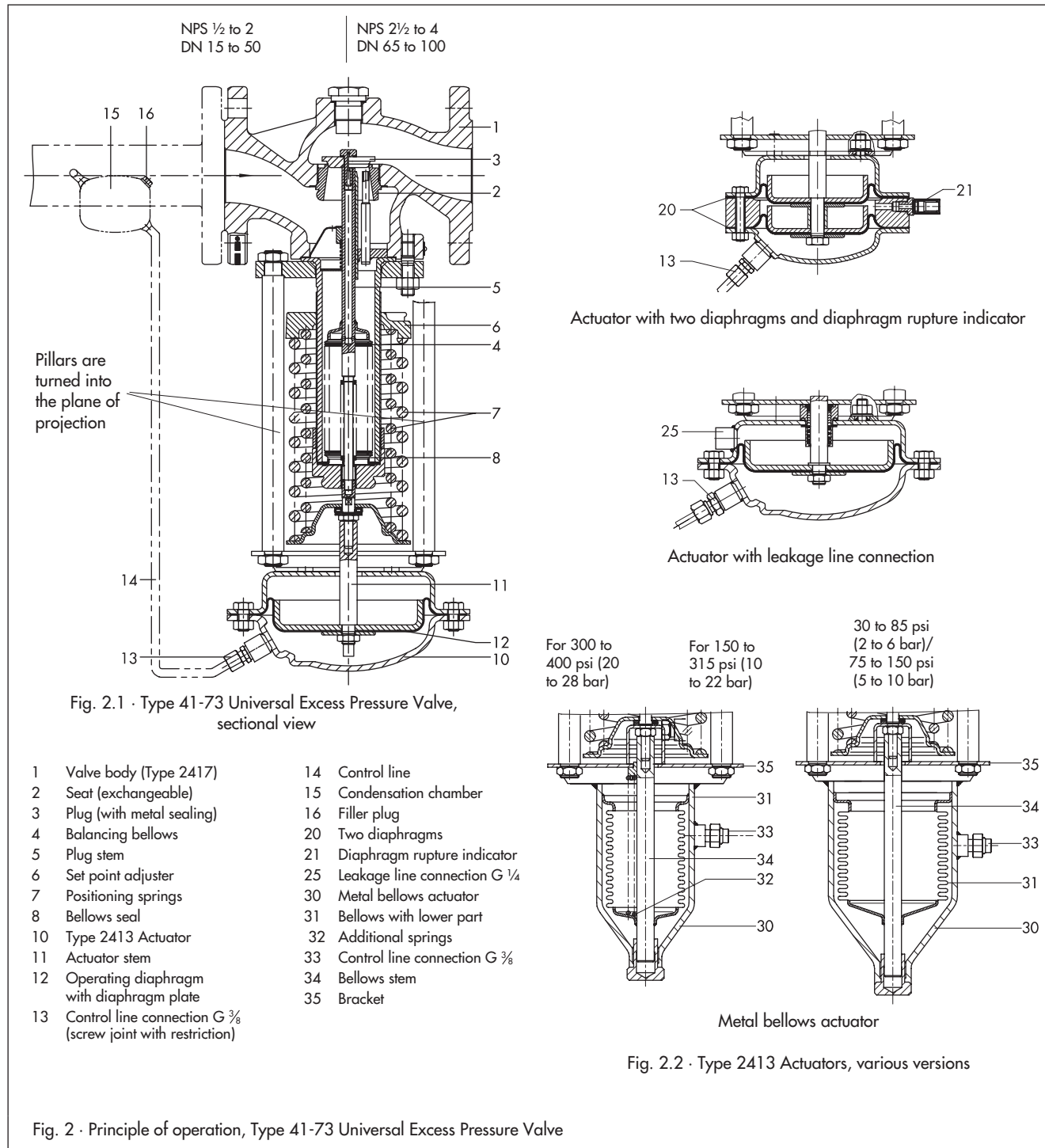
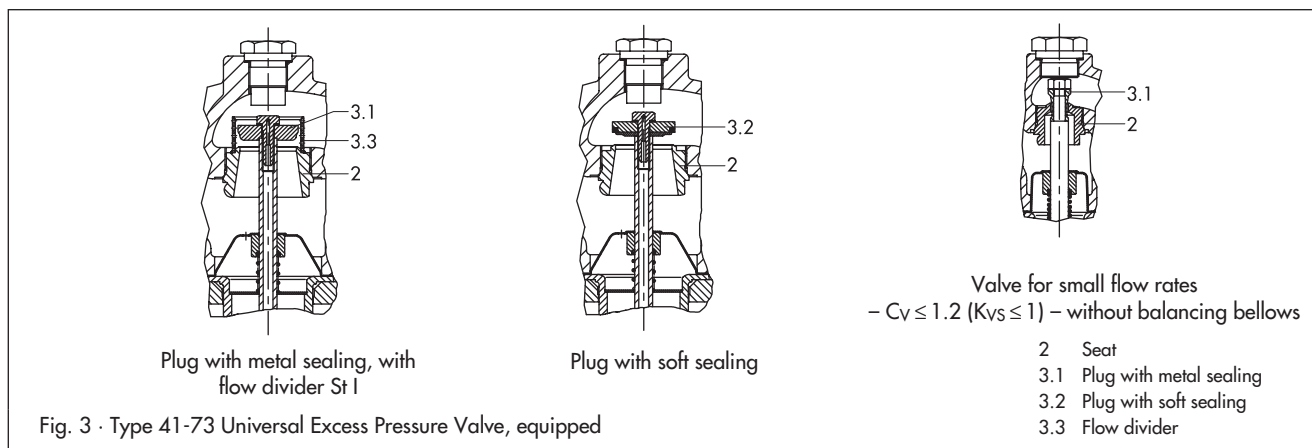


Fig. 2 · Principle of operation, Type 41-73 Universal Excess Pressure Valve



**Table 1 · Technical data** · All pressures specified as gauge pressure

Valve		Type 2417		
Pressure rating	Class	125, 150 or 300		
	PN	16, 25 or 40		
Nominal size	NPS	½ to 2	2½ and 3	4
	DN	15 to 50	65 and 80	100
Max. perm. differential pressure $\Delta p$	psi	360 <sup>1)</sup>	290 <sup>1)</sup>	230
	bar	25 <sup>1)</sup>	20 <sup>1)</sup>	16
Temperature ranges		See Fig. 6 · Pressure-temperature diagram		
Valve plug		Metal sealing: max. 660 °F (350 °C) · PTFE soft sealing: max. 430 °F (220 °C) · EPDM, FPM soft sealing: max. 300 °F (150 °C) · NBR soft sealing: max. 140 °F (60 °C)		
Leakage rate (standard version)		Metal sealing: Leakage rate $I \leq 0.05$ % of $C_v/K_{vs}$ · Soft sealing: Leakage rate IV		
Actuator with diaphragm		Type 2413		
Set point ranges	0.075 to 0.42 psi <sup>2)</sup> · 0.35 to 0.75 psi <sup>2)</sup> · 0.75 to 3.5 psi · 1.5 to 8.5 psi · 3 to 17 psi · 10 to 35 psi · 30 to 75 psi · 65 to 145 psi · 115 to 230 psi			
	5 to 30 mbar <sup>2)</sup> · 25 to 50 mbar <sup>2)</sup> · 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. pressure at actuator		1.5 times max. set point of the actuator used <sup>3)</sup>		
Max. perm. temperature		Gases 660 °F (350 °C), however, max. 175 °F (80 °C) <sup>5)</sup> at the actuator · Liquids 300 °F (150 °C), with condensation chamber max. 660 °F (350 °C) · Steam with condensation chamber max. 660 °F (350 °C)		
Actuator with bellows		Type 2413		
Effective area		5.1 sq.in (33 cm <sup>2</sup> )	9.6 sq.in (62 cm <sup>2</sup> )	
Max. perm. pressure at actuator		435 psi (30 bar)	220 psi (15 bar)	
Set point ranges		150 to 315 psi (10 to 22 bar) 300 to 400 psi (20 to 28 bar)	30 to 85 psi (2 to 6 bar) <sup>4)</sup> 75 to 150 psi (5 to 10 bar)	
Set point spring		8000 N		

<sup>1)</sup> For millibar excess pressure valve, max. perm. differential pressure  $\Delta p$ : 150 psi (10 bar) · <sup>2)</sup> For millibar excess pressure valve only ·

<sup>3)</sup> Millibar excess pressure valve: max. 7.25 psi (0.5 bar) · <sup>4)</sup> Set point spring 4400 N · <sup>5)</sup> For oxygen max. 140 °F (60 °C)

**Table 2 · Materials**

Valve		Type 2417		
Pressure rating		Cl 125 (PN 16)	Cl 150 (PN 25) · Cl 300 (PN 40)	Cl 150 (PN 25) · Cl 300 (PN 40)
Max. perm. temperature		570 °F (300 °C)	660 °F (350 °C)	
Body		Cast iron A126B	Carbon steel A216 WCC	Stainl. carbon steel A351 CF8M
Seat		CrNi steel		CrNiMo steel
Plug		CrNi steel		CrNiMo steel
Seal ring for soft seal		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) <sup>1)</sup>		
Diaphragm		EPDM with fabric insert <sup>2)</sup> · FPM for oils · NBR · EPDM with PTFE protective foil		

<sup>1)</sup> In stainless steel version, CrNi steel · <sup>2)</sup> Standard version; further details in "Special versions"

**Table 3 · C<sub>V</sub> (K<sub>VS</sub>) coefficients and z values**

Nominal size NPS · DN	Seat Ø		C <sub>V</sub> · K <sub>VS</sub> <sup>2)</sup>				C <sub>V</sub> I · K <sub>VS</sub> I <sup>1)</sup>		z <sup>1)</sup>
	inch	mm	Standard version		Special version		With flow divider		
			C <sub>V</sub>	K <sub>VS</sub>	C <sub>V</sub>	K <sub>VS</sub>	C <sub>V</sub> I	K <sub>VS</sub> I	
½ · 15	0.47	12			0.12 <sup>2)</sup> · 0.5 <sup>2)</sup> · 1.2 <sup>2)</sup>	0.1 · 0.4 · 1	–	–	0.65
	0.87	22	5	4	3	2.5	3.5	3	
¾ · 20	0.47	12			0.12 <sup>2)</sup> · 0.5 <sup>2)</sup> · 1.2 <sup>2)</sup>	0.1 · 0.4 · 1			0.6
	0.87	22	7.5	6.3	3 · 5	2.5 · 4	–	–	
1 · 25	0.47	12			0.12 <sup>2)</sup> · 0.5 <sup>2)</sup> · 1.2 <sup>2)</sup>	0.1 · 0.4 · 1	–	–	0.55
	0.87	22	9.4	8	3 · 5 · 7.5	2.5 · 4 · 6.3	7	6	
1½ · 40	1.5	38			9.4 · 20	8 · 16			0.45
			23	20			17	15	
2 · 50	1.5	38			20	16			0.4
			37	32			30	25	
2½ · 65	2.5	64			23 · 37	20 · 32			0.4
			60	50			45	38	
3 · 80	2.5	64			37	32			0.35
			94	80			70	60	
4 · 100	3.5	89			60	50			0.35
			145	125			110	95	

<sup>1)</sup> Terms for noise level calculation according to VDMA 24422 (edition 1.89)

<sup>2)</sup> For K<sub>VS</sub> ≤ 1.2/K<sub>VS</sub> ≤ 1: Valve without balancing bellows

**Valve-specific correction terms**

ΔL<sub>G</sub> · For gases and vapors:

Values as specified in the diagram in Fig. 4

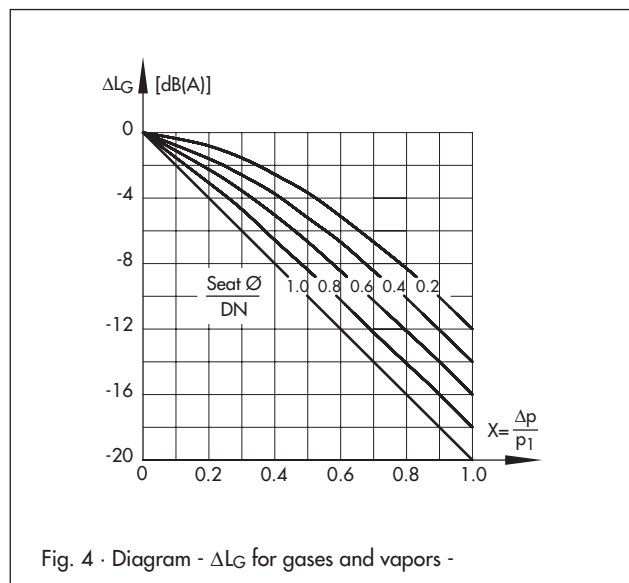


Fig. 4 · Diagram - ΔL<sub>G</sub> for gases and vapors -

ΔL<sub>F</sub> · For liquids:

$$\Delta L_F = -10 \cdot (X_F - z) \cdot y$$

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

Terms for control valve sizing according to DIN EN 60534, Parts 2-1 and 2-2:

$$F_L = 0.95 \quad X_T = 0.75$$

z · Acoustical valve coefficient

C<sub>V</sub> I, K<sub>VS</sub> I · For installation of a flow divider St I 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.

**Table 4 · Dimensions and weights**

Excess pressure valve			Type 41-73							
Nominal size NPS (DN)			½ (15)	¾ (20)	1 (25)	1½ (40)	2 (50)	2½ (65)	3 (80)	4 (100)
Length L	Cl 125	inch	–	–	7.25	8.75	10.0	10.87	11.75	13.87
		mm	–	–	184	222	254	276	298	352
	Cl 150	inch	7.25	7.25	7.25	8.75	10.0	10.87	11.73	13.88
		mm	184	184	184	222	254	276	298	352
	Cl 300	inch	7.50	7.63	7.75	9.25	10.50	11.50	12.50	14.50
		mm	191	194	197	235	267	292	318	368
Height H1	inch		13.19			15.35		20.08		20.67
	mm		335			390		510		525
Height H3	inch		2.17			2.83		3.94		4.73
	mm		55			72		100		120
Set point ranges		Dimensions		Dimensions in inches and mm ( )						
0.075 to 0.42 <sup>2)</sup>	0.005 to 0.03	Height H		17.63" (425)						
		Actuator		Ø D = 19.29" (490 mm), A = 186 in <sup>2</sup> (1200 cm <sup>2</sup> )						
0.35 to 0.75 <sup>2)</sup>	0.025 to 0.05	Height H		17.63" (425 mm)		19.9" (480 mm)		24" (610 mm)		
		Actuator		Ø D = 19.3" (490 mm), A = 186 in <sup>2</sup> (1200 cm <sup>2</sup> )						
0.75 to 3.5	0.05 to 0.25	Height H		16.73 (425 mm)		18.9" (480 mm)		24" (610 mm)		24.6" (625)
		Actuator		Ø D = 15" (380 mm), A = 100 in <sup>2</sup> (640 cm <sup>2</sup> )						
1.5 to 8.5	0.1 to 0.6	Height H		16.73" (425 mm)		18.9" (480 mm)		24" (610 mm)		24.6" (625)
		Actuator		Ø D = 15" (380 mm), A = 100 in <sup>2</sup> (640 cm <sup>2</sup> )						
3 to 17	0.2 to 1.2	Height H		16.14" (410 mm)		18.11" (460 mm)		23.23" (590 mm)		241" (610)
		Actuator		Ø D = 11.2" (285 mm), A = 50 in <sup>2</sup> (320 cm <sup>2</sup> )						
10 to 35	0.8 to 2.5	Height H		16.14" (410 mm)		18.31" (465 mm)		23.43" (595 mm)		24" (610)
		Actuator		Ø D = 8.86" (225 mm), A = 25 in <sup>2</sup> (160 cm <sup>2</sup> )						
30 to 75	2 to 5	Height H		15.35" (390 mm)		17.52" (445 mm)		22.64" (575 mm)		23.23" (590)
		Actuator		Ø D = 6.69" (170 mm), A = 12 in <sup>2</sup> (80 cm <sup>2</sup> )						
65 to 150	4.5 to 10	Height H		15.35" (390 mm)		17.52" (445 mm)		22.64" (575 mm)		23.23" (590)
		Actuator		Ø D = 6.69" (170 mm), A = 6 in <sup>2</sup> (40 cm <sup>2</sup> )						
115 to 230	8 to 16	Height H		15.35" (390 mm)		17.52" (445 mm)		22.64" (575 mm)		23.23" (590)
		Actuator		Ø D = 6.69" (170 mm), A = 6 in <sup>2</sup> (40 cm <sup>2</sup> )						
0.075 to 0.75	0.005 to 0.05	Weight for Class 150 <sup>1)</sup> , approx.	lb	63	65	82.7	90.4	125.7	141	–
			kg	28.5	29	37.5	41	57	64	–
1.5 to 8.3	0.05 to 0.6		lb	51	53	73	80	121	130	158
			kg	23	24	33	36	55	59	72
3 to 35	0.2 to 2.5		lb	39	41	58	68	107	124	146
			kg	18	19	26	31	49	56	66
30 to 230	2 to 16		lb	29	32	51	58	97	114	136
			kg	14	15	23	27	44	52	62

<sup>1)</sup> +10 % for Class 300

<sup>2)</sup> Millibar excess pressure valve

**Type 41-73  
Universal Excess Pressure  
Valve**

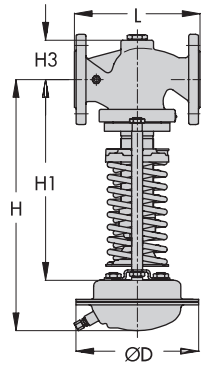
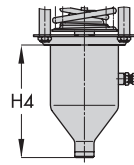


Fig. 5 · Dimensions



**Type 2413  
Actuator with metal  
bellows**

**Diaphragm area · Height**

Diaphragm area	<b>5.1 in<sup>2</sup> (33 cm<sup>2</sup>)</b>	<b>9.6 in<sup>2</sup> (62 cm<sup>2</sup>)</b>
H4	7.9 in (200 mm)	8.5 in (215 mm)

**Weight**

NPS 1/2 to 2 (DN 15 to 50)	17.6 lb (8 kg)	37.5 lb (17 kg)
NPS 2 1/2 to 4 (DN 65 to 100)	26.5 lb (12 kg)	39.7 lb (18 kg)

**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.

Millibar excess pressure valves are to be installed standing upright with the actuator pointing upwards.

For further details on installation, refer to Mounting and Operating Instructions EB 2517 EN.

The direction of medium flow must correspond with the arrow on the valve body.

- Valve and actuator are delivered separately.
- The control line must be adapted to match the onsite conditions and is not delivered with the valve; on customer request, a control line kit for the direct pressure tapping at the valve body (see accessories) is available.

**Pressure-temperature diagram – ASTM materials –**

The range of application of the valves and the permissible pressures and temperatures are limited by the pressure-temperature diagram and the nominal pressure ratings.

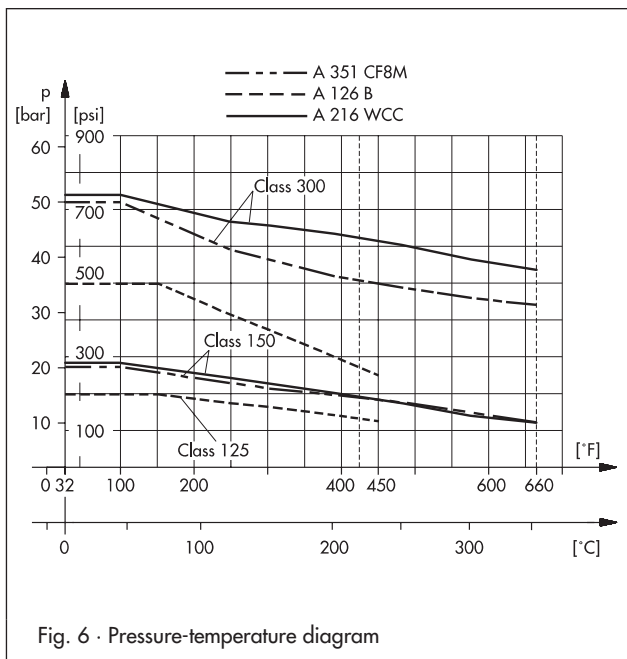


Fig. 6 · Pressure-temperature diagram

**Accessories**

- Screw joints for connection of the control line 3/8" to the filler neck (included in the scope of delivery and in the price). Other screw joints are available on request.
- Condensation chamber for steam condensation and protection of the operating diaphragm against extreme temperatures. This chamber is necessary for steam and liquids above 300 °F (150 °C).
- Control line kit - optionally with or without condensation chamber - for direct attachment to the valve and actuator (pressure tapped directly at the valve body, for set points ≥ 10 psi (≥ 0.8 bar)).

Detailed information on accessories can be found in Data Sheet T 2595 EN.

**Ordering text**

Universal Excess Pressure Valve **Type 41-73**

- Extended version ...
- Nominal size NPS (DN) ...
- Body material ..., Class (PN) ...
- C<sub>v</sub> coefficient (K<sub>vS</sub> coefficient) ...
- Set point range ... psi (bar)
- Optionally, accessories ...
- Optionally, special version ...

Specifications subject to change without notice.

