

# Self-operated Pressure Regulators

## Type 41-73 Universal Excess Pressure Valve



### Application

Pressure regulators for set points from **0.05 to 28 bar** · Valve nominal sizes **DN 15 to 100** · Nominal pressure **PN 16 to 40**  
Suitable for liquids, gases and vapors up to **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 convenient set point adjustment using a nut
- Exchangeable actuator and set point springs
- Spring-loaded, single-seated valve with upstream and downstream pressure balancing <sup>1)</sup> by a stainless steel bellows
- Soft-seated plug for high shut-off requirements
- Low-noise standard plug
- All wetted parts free of non-ferrous metal

### 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 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 or CrNiMo steel 1.4408

**Type 2413 Actuator** with EPDM rolling diaphragm

#### Version with additional features

##### Excess pressure valve with increased safety

Actuator with leakage line connection and seal or two diaphragms and diaphragm rupture indicator · Valve with backup packing

#### 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
- EPDM diaphragm with PTFE protective facing



Fig. 1: Type 41-73 Universal Excess Pressure Valve

- 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 or 20 to 28 bar
- Valve with flow divider ST 1 for particularly low-noise operation with gases and vapors
- Version entirely of stainless steel
- Stainless Cr steel seat and plug with PTFE soft seal (max. 220 °C) · 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
- Wetted plastic parts conforming to FDA regulations (max. 60 °C)

<sup>1)</sup> With  $K_{VS} \leq 4$ : without balancing bellows

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

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 (3) is connected to the actuator stem (11) of the actuator (10).

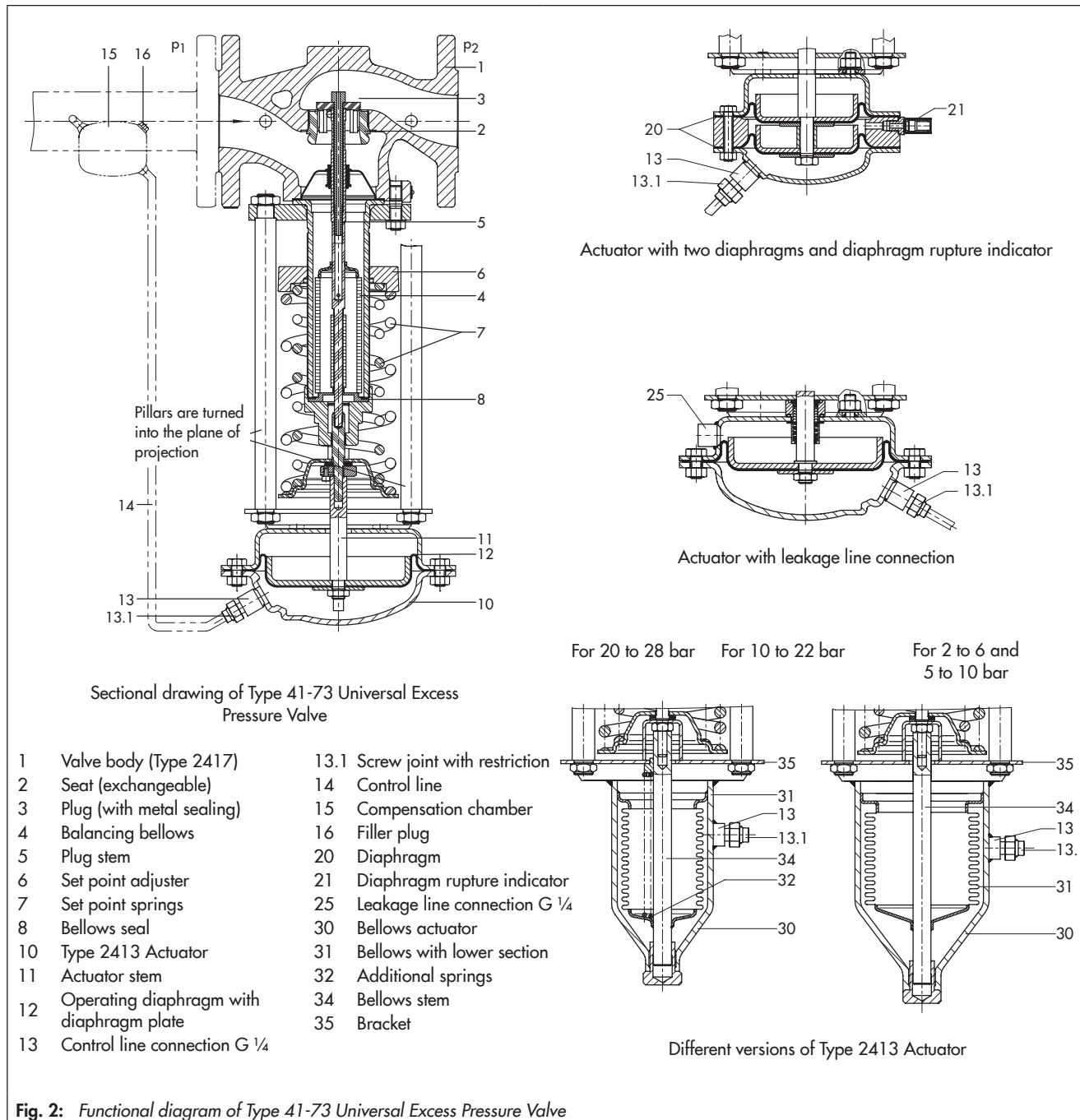
To control the pressure, the operating diaphragm (12) is tensioned by the set point springs (7) and the set point adjuster (6) so that the valve is closed by the force of the set point springs when it is relieved of pressure ( $p_1 = p_2$ ).

The upstream pressure  $p_1$  to be controlled is tapped upstream of the valve and transmitted 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).

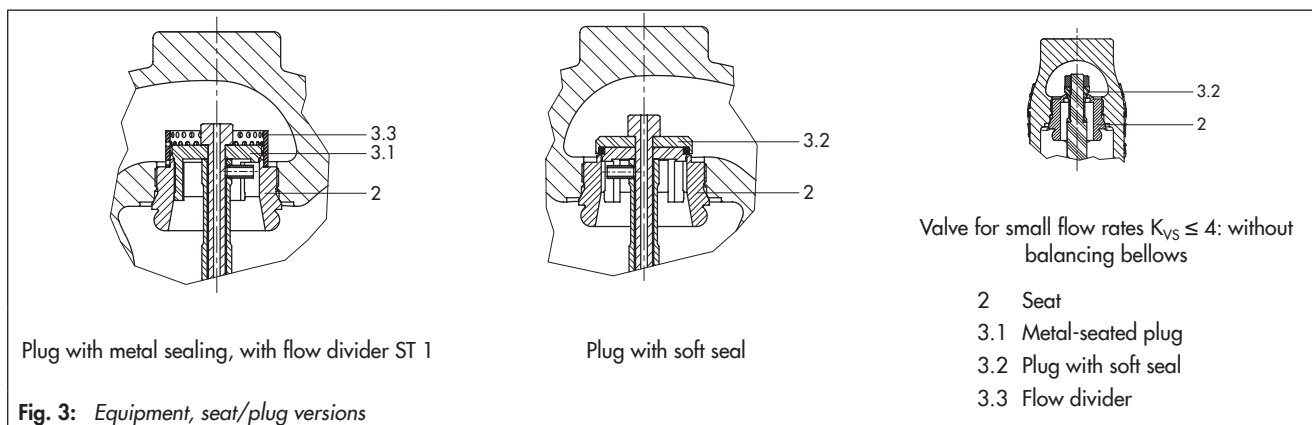
When the force resulting from the upstream pressure  $p_1$  rises above the adjusted set point, the valve opens proportionally to the change in pressure.

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.

The valves can be supplied with flow divider ST 1. The valve seat must be replaced on retrofitting the flow divider ST 1.



**Fig. 2:** Functional diagram of Type 41-73 Universal Excess Pressure Valve



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

| Valve                                       | Type 2417   |                          |        |
|---|---|--------------------------|--------|
| Nominal pressure                            | PN 16, 25 or 40   |                          |        |
| Nominal size                                | DN 15 to 50   | DN 65 to 80              | DN 100 |
| Max. perm. differential pressure $\Delta p$ | 25 bar  | 20 bar                   | 16 bar |
| Max. permissible temperature                | See pressure-temperature diagram in ▶ T 2500  |                          |        |
| Valve plug                                  | Metal seal: 350 °C · PTFE soft seal: 220 °C · EPDM or FKM soft seal: 150 °C · NBR soft seal: 80 °C  |                          |        |
| Leakage class according to IEC 60534-4      | Metal seal: leakage rate I ( $\leq 0.05$ % of $K_{VS}$ )<br>Soft seal: leakage rate IV ( $\leq 0.01$ % of $K_{VS}$ )                                    |                          |        |
| Compliance                                  | CE · ENEC   |                          |        |
| Diaphragm actuator                          | Type 2413   |                          |        |
| Set point ranges                            | 0.05 to 0.25 bar · 0.1 to 0.6 bar · 0.2 to 1.2 bar<br>0.8 to 2.5 bar <sup>1)</sup> · 2 to 5 bar · 4.5 to 10 bar · 8 to 16 bar                           |                          |        |
| Max. permissible temperature                | Gases 350 °C, however, max. 80 °C at the actuator · Liquids 150 °C, with compensation chamber max. 350 °C · Steam with compensation chamber max. 350 °C |                          |        |
| Bellows actuator                            | Type 2413   |                          |        |
| Actuator area                               | 33 cm <sup>2</sup>  | 62 cm <sup>2</sup>       |        |
| Set point ranges                            | 10 to 22 bar · 20 to 28 bar   | 2 to 6 bar · 5 to 10 bar |        |

<sup>1)</sup> Version with actuator with two diaphragms: 1 to 2.5 bar

**Table 2: Max. permissible pressure at actuator**

| Set point range · Actuator with rolling diaphragm                      |                |                |                |            |               |             | Bellows actuator |             |              |              |
|--|----------------|----------------|----------------|------------|---------------|-------------|------------------|-------------|--------------|--------------|
| 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 according to DIN EN**

| Valve                              | Type 2412   |   |                   |                        |
|------------------------------------|---|---|-------------------|------------------------|
| Pressure rating                    | PN 16   | PN 25                                     | PN 40             |                        |
| Max. permissible temperature       | 300 °C  | 350 °C                                    | 350 °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 |
| Seat                               | CrNi steel  |   |                   | CrNiMo steel           |
| Plug                               | CrNi steel  |   |                   | CrNiMo steel           |
| Seal for soft-seated plug          | PTFE with 15 % glass fiber · EPDM · NBR · FKM   |   |                   |                        |
| Guide bushing                      | PTFE/graphite   |   |                   |                        |
| Balancing bellows and bellows seal | Stainless steel 1.4571  |   |                   |                        |
| Actuator                           | Type 2413   |   |                   |                        |
| Diaphragm cases                    | Sheet steel DD11 (StW22) <sup>2)</sup>  |   |                   |                        |
| Diaphragm                          | EPDM with fabric insert <sup>3)</sup> · FKM for mineral oils · NBR · EPDM with PTFE protective facing |   |                   |                        |

<sup>1)</sup> In corrosion-resistant version (CrNi steel)

<sup>2)</sup> Standard version; see Special versions for others

## 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 correspond with the arrow on the valve body.
- 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 pressure tapping directly at the valve body (see Accessories) is available.

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

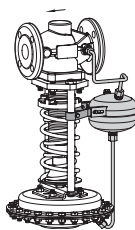
## Accessories

Included in the scope of delivery:

- Screw joint with restriction for  $\varnothing 6$  mm control line.

## To be ordered separately:

- Compression-type fittings for e.g. 6, 8 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  $\geq 0.8$  bar).
- Compensation chamber for condensation and to protect the operating diaphragm against extreme temperatures. A compensation chamber is required for liquids above  $150^\circ\text{C}$  as well as for steam.



For further details on accessories, refer to ► T 2595.

## Ordering text

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

Additional features ...

DN ...

Body material ..., PN ...

Kvs ...

Set point range ... bar

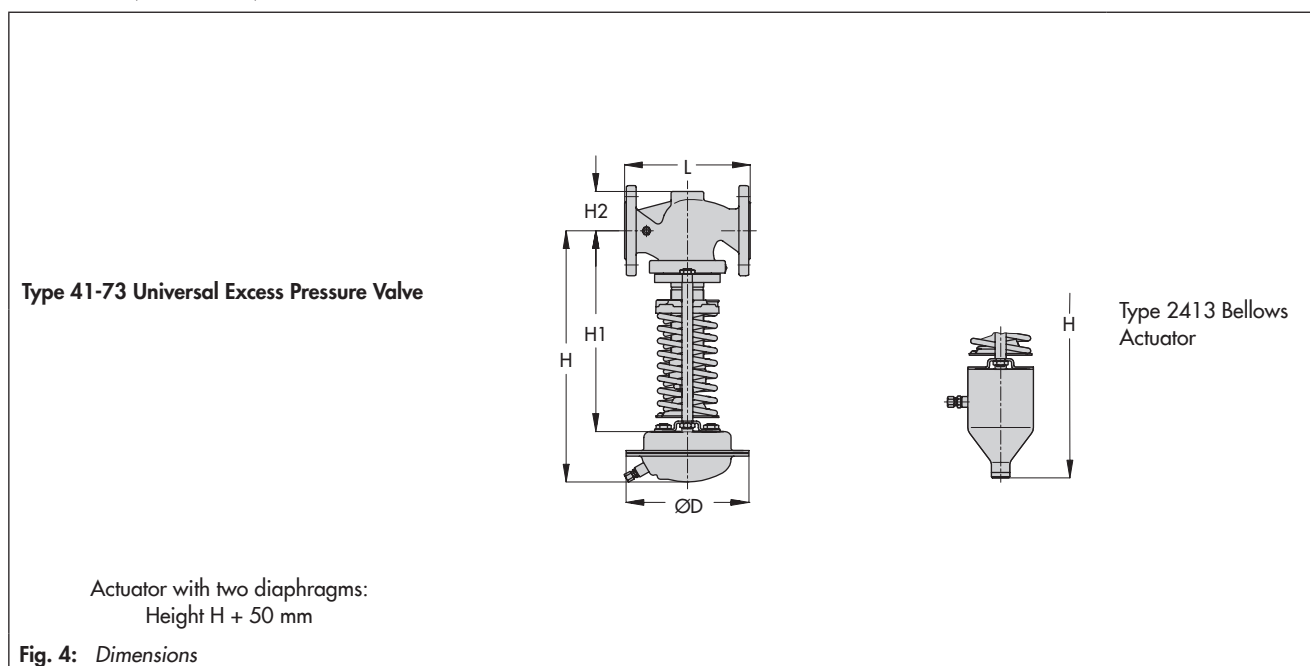
Optionally, accessories ... (► T 2595)

Optionally, special version ...

**Table 4:** Weight · Compensation chambers (standard version)

| Order no. | Designation                           | Weight (approx.) |
|-----------|---------------------------------------|------------------|
| 1190-8788 | Compensation chamber<br>0.7 l · Steel | 1.6 kg           |
| 1190-8789 | Compensation chamber<br>1.5 l · Steel | 2.6 kg           |
| 1190-8790 | Compensation chamber<br>2.4 l · Steel | 3.7 kg           |

## Dimensions (see Table 5)



**Table 5: Dimensions in mm and weights in kg**

| Excess pressure valve   |   | Type 41-73  |                                      |       |       |       |       |       |       |        |     |
|---|---|---|--------------------------------------|-------|-------|-------|-------|-------|-------|--------|-----|
| Valve 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   |       |       | 510   |       | 525    |     |
| Height H2   |   | 44  |                                      |       | 72    |       |       | 98    |       | 118    |     |
| Standard version with Type 2413 Actuator with rolling diaphragm |   |   |                                      |       |       |       |       |       |       |        |     |
| Set point ranges  | 0.05 to 0.25 bar                                      | Height H  | 445                                  |       |       | 500   |       |       | 620   |        | 635 |
|   |   | Actuator  | ØD = 380 mm, A = 640 cm <sup>2</sup> |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 1750 N                               |       |       |       |       |       |       |        |     |
|   | 0.1 to 0.6 bar  | Height H  | 445                                  |       |       | 500   |       |       | 620   |        | 635 |
|   |   | Actuator  | ØD = 380 mm, A = 640 cm <sup>2</sup> |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 4400 N                               |       |       |       |       |       |       |        |     |
|   | 0.2 to 1.2 bar  | Height H  | 430                                  |       |       | 480   |       |       | 600   |        | 620 |
|   |   | Actuator  | ØD = 285 mm, A = 320 cm <sup>2</sup> |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 4400 N                               |       |       |       |       |       |       |        |     |
|   | 0.8 to 2.5 bar <sup>2)</sup>                          | Height H  | 430                                  |       |       | 485   |       |       | 605   |        | 620 |
|   |   | Actuator  | ØD = 225 mm, A = 160 cm <sup>2</sup> |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 4400 N                               |       |       |       |       |       |       |        |     |
|   | 2 to 5 bar  | Height H  | 410                                  |       |       | 465   |       |       | 585   |        | 600 |
|   |   | Actuator  | ØD = 170 mm, A = 80 cm <sup>2</sup>  |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 4400 N                               |       |       |       |       |       |       |        |     |
|   | 4.5 to 10 bar   | Height H  | 410                                  |       |       | 465   |       |       | 585   |        | 600 |
|   |   | Actuator  | ØD = 170 mm, A = 40 cm <sup>2</sup>  |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 4400 N                               |       |       |       |       |       |       |        |     |
| 8 to 16 bar   | Height H  | 410   |                                      |       | 465   |       |       | 585   |       | 600    |     |
|   | Actuator  | ØD = 170 mm, A = 40 cm <sup>2</sup>                   |                                      |       |       |       |       |       |       |        |     |
|   | Valve spring force F                                  | 8000 N  |                                      |       |       |       |       |       |       |        |     |
| Weight for version with rolling diaphragm                       |   |   |                                      |       |       |       |       |       |       |        |     |
| SP ranges   | 0.05 to 0.6 bar                                       | Weight, based on cast iron <sup>1)</sup> , 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 Type 2413 Bellows Actuator                         |   |   |                                      |       |       |       |       |       |       |        |     |
| Set point ranges  | 2 to 6 bar  | Height H  | 550                                  |       |       | 605   |       |       | 725   |        | 740 |
|   |   | Actuator  | A = 62 cm <sup>2</sup>               |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 4400 N                               |       |       |       |       |       |       |        |     |
|   | 5 to 10 bar   | Height H  | 550                                  |       |       | 605   |       |       | 725   |        | 740 |
|   |   | Actuator  | A = 62 cm <sup>2</sup>               |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 8000 N                               |       |       |       |       |       |       |        |     |
|   | 10 to 22 bar  | Height H  | 535                                  |       |       | 590   |       |       | 710   |        | 725 |
|   |   | Actuator  | A = 33 cm <sup>2</sup>               |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 8000 N                               |       |       |       |       |       |       |        |     |
|   | 20 to 28 bar  | Height H  | 535                                  |       |       | 590   |       |       | 710   |        | 725 |
|   |   | Actuator  | A = 33 cm <sup>2</sup>               |       |       |       |       |       |       |        |     |
|   |   | Valve spring force F                                  | 8000 N                               |       |       |       |       |       |       |        |     |
| Weight for version with bellows actuator                        |   |   |                                      |       |       |       |       |       |       |        |     |
| A = 33 cm <sup>2</sup>  | Weight, based on cast iron <sup>1)</sup> , approx. kg | 16.5  | 17.9                                 | 18    | 23.5  | 25.5  | 29    | 48    | 56    | 66     |     |
| A = 62 cm <sup>2</sup>  |   | 20.9  | 21.5                                 | 22    | 27.5  | 29.5  | 33    | 54    | 65    | 75     |     |

<sup>1)</sup> +10 % for all other materials

<sup>2)</sup> Version with actuator with two diaphragms: 1 to 2.5 bar

**Table 6:**  $K_{VS}$  coefficients and  $x_{FZ}$  values · Terms for noise level calculation according to VDMA 24422 (edition 1.89)

| Nominal size | $K_{VS}^{1)}$    |          | $K_{VS}^{1)}$    |            | $K_{VS} 1$<br>With flow divider |
|--------------|------------------|----------|------------------|------------|---------------------------------|
|              | Standard version | $x_{FZ}$ | Special version  | $x_{FZ}$   |                                 |
| DN 15        |                  |          | 1                | 0.6        | 3                               |
|              | 4                | 0.5      |                  |            |                                 |
| DN 20        |                  |          | 1                | 0.6        | 5                               |
|              | 6.3              | 0.45     | 4                | 0.5        |                                 |
| DN 25        |                  |          | 1                | 0.6        | 6                               |
|              | 8                | 0.4      | 4                | 0.5        |                                 |
| DN 32        |                  |          | 4 · 8            | 0.5 · 0.4  | 12                              |
|              | 16               | 0.4      |                  |            |                                 |
| DN 40        |                  |          | 4 · 8            | 0.5 · 0.45 | 15                              |
|              | 20               | 0.4      |                  |            |                                 |
| DN 50        |                  |          | 4 · 8            | 0.5 · 0.4  | 25                              |
|              | 32               | 0.4      |                  |            |                                 |
| DN 65        |                  |          | 32 <sup>2)</sup> | 0.4        | 38                              |
|              | 50               | 0.4      |                  |            |                                 |
| DN 80        |                  |          | 32 <sup>2)</sup> | 0.4        | 42                              |
|              | 80               | 0.35     |                  |            |                                 |
| DN 100       |                  |          | 80               | 0.4        | 66                              |
|              | 125              | 0.35     |                  |            |                                 |

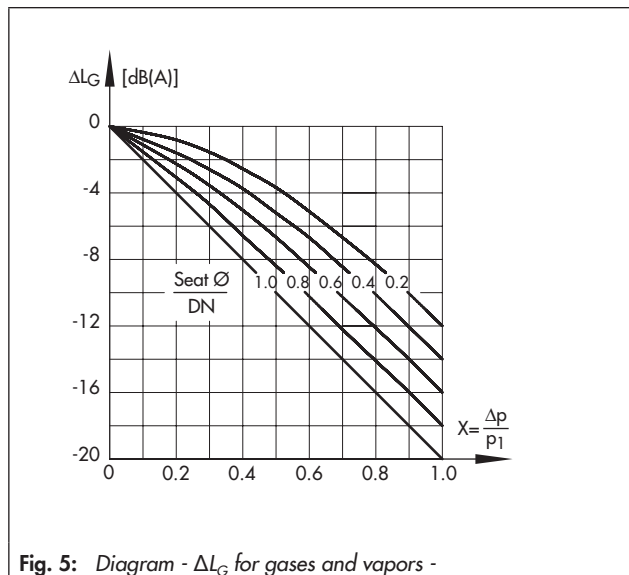
1)  $K_{VS} \leq 4$ : valve without balancing bellows

2) Max. permissible  $\Delta p$ : 25 bar

### Valve-specific correction terms

$\Delta L_G$  · For gases and vapors:

Values as specified in the diagram



**Fig. 5:** Diagram -  $\Delta L_G$  for gases and vapors -

$\Delta L_F$  · For liquids:

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

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

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

$$F_L = 0.95; \quad x_T = 0.75$$

$x_{FZ}$  · Acoustical valve coefficient

$K_{VS} 1$  · When a flow divider ST 1 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.

Specifications subject to change without notice



SAMSON AG · MESS- UND REGELTECHNIK  
Weismüllerstraße 3 · 60314 Frankfurt am Main, Germany  
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507  
samson@samson.de · www.samson.de

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