

Self-operated Pressure Regulators

Type 41-23 Universal Pressure Reducing Valve



JIS version

Application

Pressure regulators for set points from **5 to 2800 kPa/0.05 to 28 bar** Valve sizes **½B/15A to 4B/100A** · Pressure rating **JIS 10K and JIS 20K** · Suitable for liquids, gases, and vapors up to **350 °C**



The valve **closes** when the downstream 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 set point springs and actuator
- Spring-loaded, single-seated valve with upstream and downstream pressure balancing ¹⁾ by a stainless steel bellows
- Soft-seated plug for high shut-off requirements
- Standard low-noise plug · Special version with flow divider St I or St III (2½B to 4B/65A to 100A) for further noise level reduction (see Data Sheet ▶ T 8081)
- All wetted parts free of non-ferrous metal

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 sizes **½B/15A to 4B/100A** with metal-seated plug · Body made of A126B (FC250), cast steel A216 WCC (SCPH2) or cast stainless steel A351 CF8M (SCS14A)

Type 2413 Actuator with EPDM rolling diaphragm

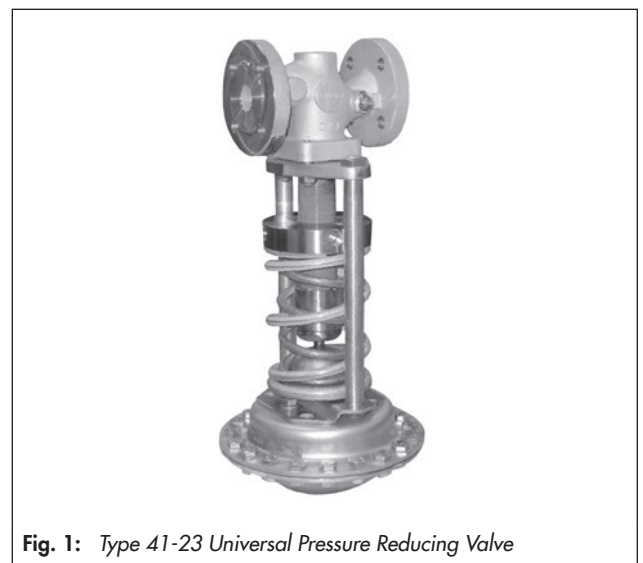
Version with additional features

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

Steam pressure reducing valve with compensation chamber for steam up to 330 °C

Pressure reducing valve for low flow rates · Valve with micro-flow trim ($C_V = 0.0012$ to $0.05/K_{VS} = 0.001$ to 0.04) or special C_V/K_{VS} coefficients (restricted cross-sectional area of flow)

¹⁾ With $C_V \leq 3/K_{VS} \leq 2.5$: without balancing bellows



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
- Actuator for remote set point adjustment (autoclave control)
- Bellows actuator for valves in ½B/15A to 4B/100A Set point ranges 200 to 600 kPa, 500 to 1000 kPa, 1000 to 2200 kPa, 2000 to 2800 kPa (2 to 6, 5 to 10, 10 to 22, 20 to 28 bar)
- Valve with flow divider ST 1 or ST 3 (2½B/65A to 4B/100A) 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)
- Free of oil and grease for high-purity applications
- Lubricants for ultrapure water or gas

- Stellite®-faced seat and plug for low-wear operation
- Wetted plastic parts conforming to FDA regulations (max. 60 °C)

Principle of operation (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 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 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.

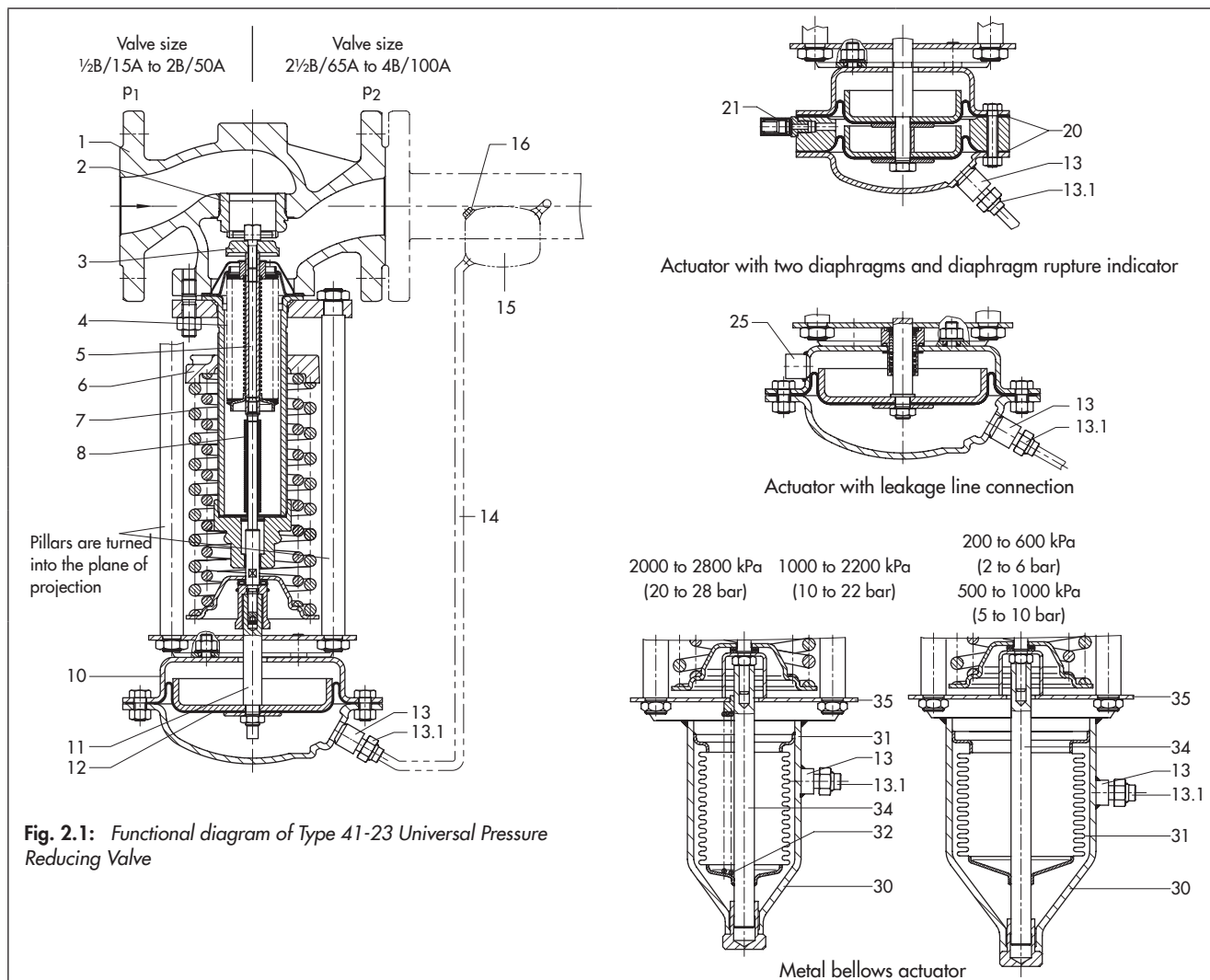


Fig. 2.1: Functional diagram of Type 41-23 Universal Pressure Reducing Valve

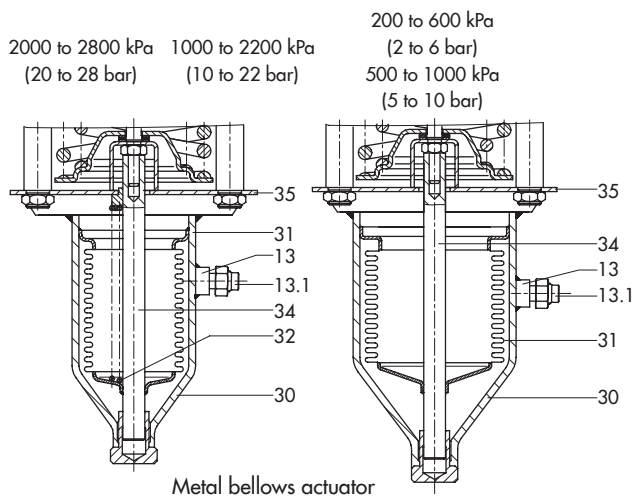


Fig. 2.2: Various versions of Type 2413 Actuator

- | | |
|--------------------------|---|
| 1 Valve body (Type 2412) | 10 Type 2413 Actuator |
| 2 Seat (exchangeable) | 11 Actuator stem |
| 3 Plug (with metal seal) | 12 Operating diaphragm with diaphragm plate |
| 4 Balancing bellows | 13 Control line connection |
| 5 Plug stem | 13.1 Screw joint with restriction |
| 6 Set point adjuster | 14 Control line |
| 7 Set point springs | 15 Compensation chamber |
| 8 Bellows seal | 16 Filler plug |

- | |
|--------------------------------|
| 20 Diaphragm |
| 21 Diaphragm rupture indicator |
| 25 Leakage line connection |
| 30 Metal bellows actuator |
| 31 Bellows with bottom section |
| 32 Additional springs |
| 34 Bellows stem |
| 35 Bracket |

Fig. 2: Type 41-23 Universal Pressure Reducing Valve

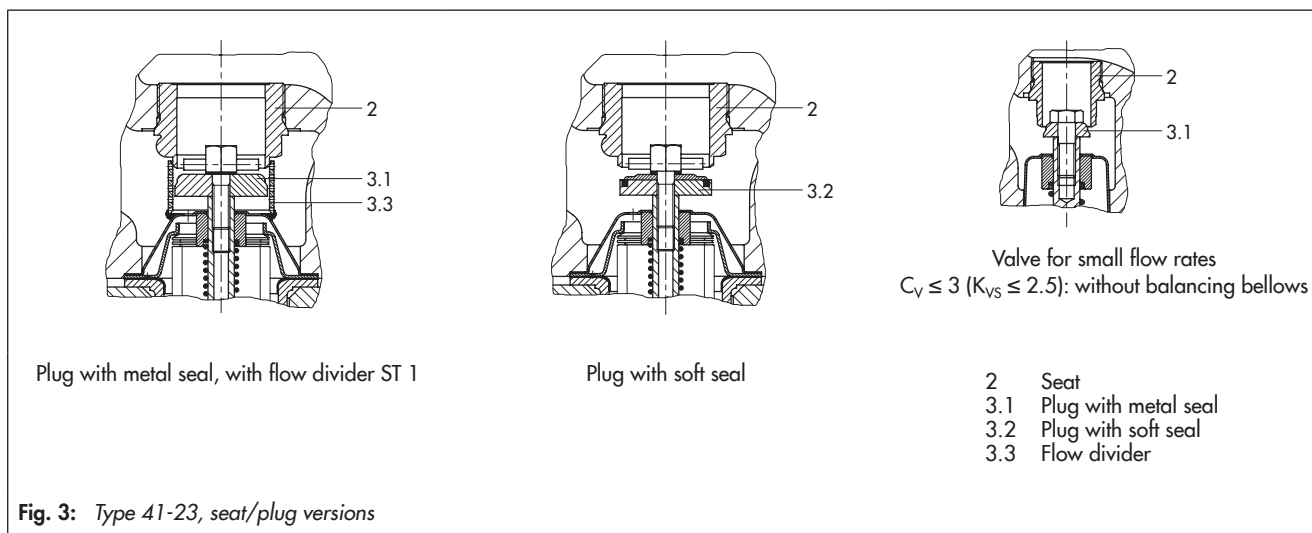


Table 1: Technical data · All pressures (gauge)

Valve	Type 2412		
Pressure rating	JIS 10K or JIS 20K		
Nominal size	½B to 2B/15A to 50A	2½B and 3B/65A and 80A	4B/100A
Max. permissible differential pressure	25 bar/2500 kPa	20 bar/2000 kPa	16 bar/1600 kPa
Temperature ranges	See T 2500 · 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		
Leakage class according to IEC 60534-4	Metal seal: Leakage class I (≤ 0.05 % of C_v/K_{vs} coefficient) Soft seal: Leakage class IV (≤ 0.01 % of C_v/K_{vs} coefficient)		
Compliance	CE · ENEC		
Diaphragm actuator	Type 2413		
Set point ranges	5 to 25 kPa · 10 to 60 kPa · 20 to 120 kPa 80 to 250 kPa · 200 to 500 kPa · 450 to 1000 kPa · 800 to 1600 kPa		
	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. 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		
Metal bellows actuator	Type 2413		
Effective area	33 cm ²	62 cm ²	
Set point ranges	10 to 22 bar/1000 to 2200 kPa 20 to 28 bar/2000 to 2800 kPa	2 to 6 bar/200 to 600 kPa 5 to 10 bar/500 to 1000 kPa	

Table 2: Max. perm. pressure at actuator

Set point ranges										
Actuator with rolling diaphragm							Metal 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
5 to 25 kPa	10 to 60 kPa	20 to 120 kPa	80 to 250 kPa	200 to 500 kPa	450 to 1000 kPa	800 to 1600 kPa	200 to 600 kPa	500 to 1000 kPa	100 to 220 kPa	200 to 280 kPa
Max. perm. 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
60 kPa	60 kPa	130 kPa	250 kPa	500 kPa	1000 kPa	1000 kPa	650 kPa	650 kPa	800 kPa	200 kPa

Table 3: Materials

Valve	Type 2412		
Pressure rating	JIS 10K	JIS 10K · JIS 20K	JIS 10K · JIS 20K
Max. permissible temperature	300 °C	350 °C	350 °C
Body	Cast iron A126B (FC250)	Cast steel A216 WCC (SCPH2)	Cast stainless steel A351 CF8M (SCS14A)
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	Graphite		
Balancing bellows and bellows seal	Cast stainless steel 1.4571 (SUS316Ti)		
Actuator	Type 2413		
Diaphragm cases	Sheet steel DD11 ¹⁾ (SPHD)		
Diaphragm	EPDM with fabric insert ²⁾ · FKM for oils · NBR · EPDM with PTFE protective facing		

¹⁾ In corrosion-resistant version (CrNi steel)

²⁾ 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.

For further details on installation refer to ► EB 2512.

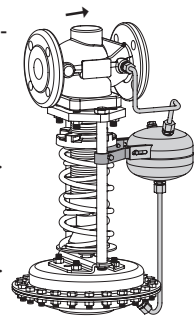
The direction of flow must match the arrow on the valve body.

- 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.



Type 41-23 · Standard version

- 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 ≥80 kPa/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.



Type 41-23 with control line connection and compensation chamber

For detailed information on accessories refer to Data Sheet ► T 2595 EN.

Accessories

Included in the scope of delivery:

- Screw joint with restriction for 3/8" control line.

To be ordered separately:

- Adapter G 1/4 to 1/4 NPT, various screw fittings.

Dimensions – see Table 4 –

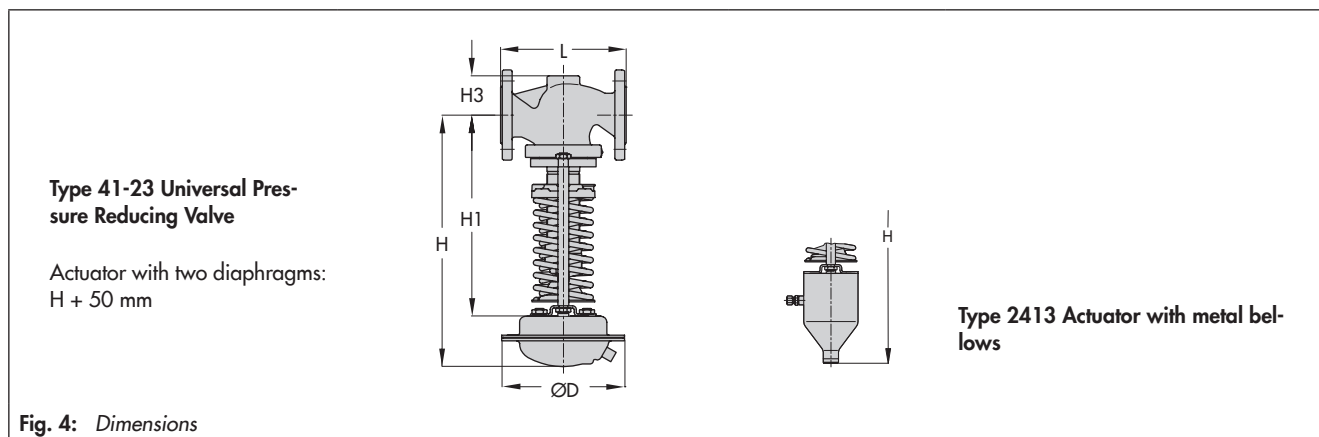


Table 4: Dimensions and weights

Type 41-23 Universal Pressure Reducing Valve									
Nominal size		½B/15A	¾B/20A	1B/25A	1½B/40A	2B/50A	2½B/65A	3B/80A	4B/100A
Length L	JIS 10K	184 mm	184 mm	184 mm	222 mm	254 mm	276 mm	298 mm	352 mm
	JIS 20K	191 mm	194 mm	197 mm	235 mm	267 mm	292 mm	318 mm	368 mm
Height H1		335 mm			390 mm		510 mm		525 mm
Height H3		55 mm			72 mm		100 mm		120 mm
Actuator with rolling diaphragm									
Set point range	Dimension	Dimensions in mm							
5 to 25 kPa 0.05 to 0.25 bar	Height H	445 mm			500 mm		620 mm		635 mm
	Actuator	ØD = 380 mm, A = 640 cm ²							
10 to 60 kPa 0.1 to 0.6 bar	Height H	445 mm			500 mm		620 mm		635 mm
	Actuator	ØD = 380 mm, A = 640 cm ²							
20 to 120 kPa 0.2 to 1.2 bar	Height H	430 mm			480 mm		600 mm		620 mm
	Actuator	ØD = 285 mm, A = 320 cm ²							
80 to 250 kPa 0.8 to 2.5 bar	Height H	430 mm			485 mm		605 mm		620 mm
	Actuator	ØD = 225 mm, A = 160 cm ²							
200 to 500 kPa 2 to 5 bar	Height H	410 mm			465 mm		585 mm		600 mm
	Actuator	ØD = 170 mm, A = 80 cm ²							
450 to 1000 kPa 4.5 to 10 bar	Height H	410 mm			465 mm		585 mm		600 mm
	Actuator	ØD = 170 mm, A = 40 cm ²							
800 to 1600 kPa 8 to 16 bar	Height H	410 mm			465 mm		585 mm		600 mm
	Actuator	ØD = 170 mm, A = 40 cm ²							
Weight ¹⁾ , approx.									
5 to 60 kPa/0.05 to 0.6 bar		23 kg	24 kg		31.5 kg	35 kg	51 kg	58 kg	67 kg
20 to 250 kPa/0.2 to 2.5 bar		16 kg	18 kg		25.5 kg	29 kg	45 kg	52 kg	61 kg
200 to 1600 kPa/2 to 16 bar		12 kg	13 kg		21 kg	24 kg	40 kg	47 kg	56 kg
Special version - Metal bellows actuator									
200 to 600 kPa 2 to 6 bar	Height H	550 mm			605 mm		725 mm		740 mm
	Actuator	A = 62 cm ²							
500 to 1000 kPa 5 to 10 bar	Height H	550 mm			605 mm		725 mm		740 mm
	Actuator	A = 62 cm ²							
1000 to 2200 kPa 10 to 22 bar	Height H	535 mm			590 mm		710 mm		725 mm
	Actuator	A = 33 cm ²							
2000 to 2800 kPa 20 to 28 bar	Height H	535 mm			590 mm		710 mm		725 mm
	Actuator	A = 33 cm ²							
Weight ¹⁾ , approx.									
A = 33 cm ²		16.5 kg	17.9 kg	18 kg	25.5 kg	29 kg	48 kg	56 kg	66 kg
A = 62 cm ²		20.9 kg	21.5 kg	22 kg	29.5 kg	33 kg	54 kg	65 kg	75 kg

¹⁾ Based on JIS 10K: +10 % for JIS 20K

Ordering text

Type 41-23 Universal Pressure Reducing Valve (JIS version)

Additional features ...

Valve size ...

Body material ...

C_v coefficient (K_{vS} coefficient) ...

Set point range ... kPa (bar)

Optionally, special version ..., accessories (► T 2595)

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

Valve size	Standard			Special version			With flow divider			
	C_V	K_{VS}	x_{fz}	C_V	K_{VS}	x_{fz}	C_V 1	K_{VS} 1	C_V 3	K_{VS} 3
1/2B 15A				0.12 · 0.5 · 1.2	0.1 · 0.4 · 1	0.7 · 0.65 · 0.6				
				3	2.5	0.55				
	5	4	0.5				3.5	3		
3/4B 20A				0.12 · 0.5 · 1.2	0.1 · 0.4 · 1	0.7 · 0.65 · 0.6				
				3	2.5	0.55				
				5	4	0.5				
	7.5	6.3	0.45				6	5		
1B 25A				0.12 · 0.5 · 1.2	0.1 · 0.4 · 1	0.7 · 0.65 · 0.6				
				3	2.5	0.55				
	9.4	8	0.4	3 · 5 · 7.5	4 · 6.3	0.5 · 0.45	7.2	6		
1 1/2B 40A				7.5 · 9.4	6.3 · 8	0.45 · 0.4				
	23	20	0.4	20	16	0.4	17	15		
2B 50A				9.4	8	0.4	7.2	6		
	37	32	0.4	20 · 23	16 · 20	0.45 · 0.4	30	25		
2 1/2B 65A				23 · 37	20 · 32	0.4	30	25		
	60	50	0.4				45	38	30	25
3B 80A				37	32	0.4	30	25		
	94	80	0.35	60	50	0.4	70	60	46	40
4B 100A				60	50	0.4	45	38		
	145	125	0.35				110	95	70	60

1) With C_V 0.0012 to 0.05/ K_{VS} 0.001 to 0.04: valve with micro-trim (1/2B | 15A to 1B | 25A only) without balancing bellows

Valve-specific correction terms

ΔL_G · For gases and vapors:

Values as specified in the diagram

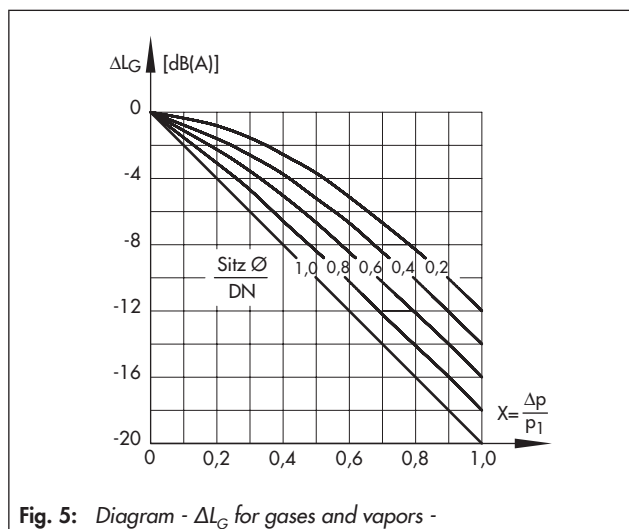


Fig. 5: Diagram - ΔL_G for gases and vapors -

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 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

C_V 1 (K_{VS} 1), C_V 3 (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.

Specifications subject to change without notice



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