

## T 2513-1 EN

### Type 41-23 Universal Pressure Reducing Valve Self-operated Pressure Regulators · 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 <sup>1)</sup> by a stainless steel bellows
- Soft-seated plug for high shut-off requirements
- Low-noise plug (standard)
- 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 ½B/15A to 4B/100A · Plug with metal seal · Body made of either cast iron 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 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)
- **Steam pressure reducing valve**  
With compensation chamber for steam up to  $330\text{ °C}$

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

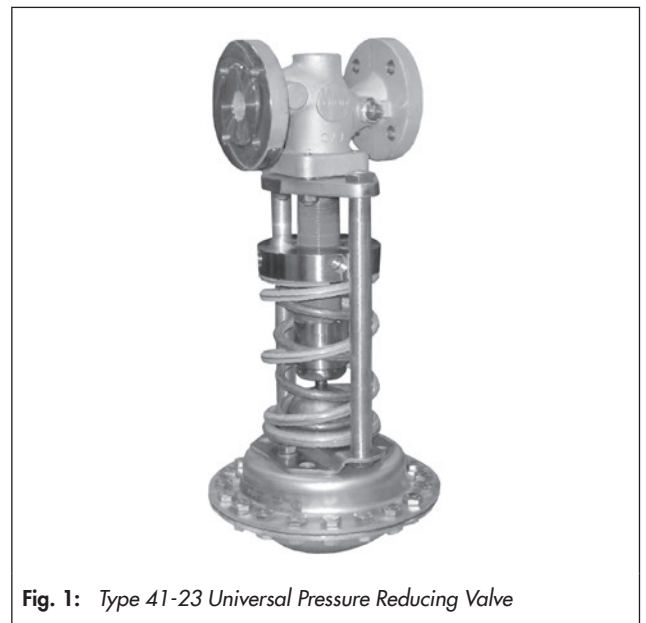


Fig. 1: Type 41-23 Universal Pressure Reducing Valve

##### – 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 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 bar, 5 to 10 bar, 10 to 22 bar, 20 to 28 bar)

- Version entirely of stainless steel
- Valve with flow divider ST 1 or ST 3 (2½B/65A to 4B/100A) for particularly low-noise operation with gases and vapors (► T 8081)
- 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
- Free of oil and grease for high-purity applications
- Lubricants for ultrapure water or gas
- Wetted plastic parts conforming to FDA regulations (max. 60 °C)

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

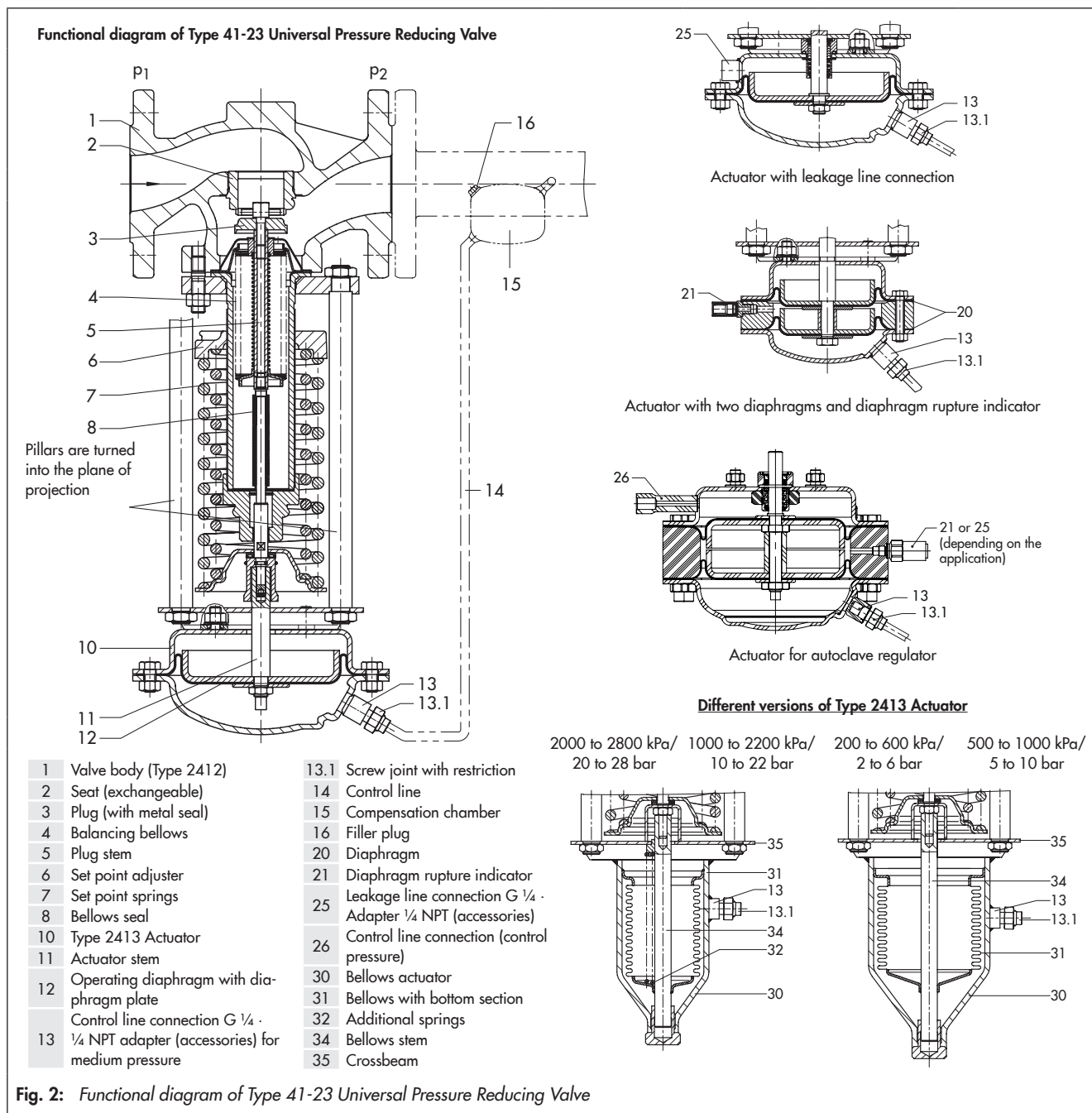
The medium flows through the valve (1) as indicated by the arrow. The position of the plug (3) determines the flow rate across the area released between plug and valve seat (2). The plug stem (5) with the plug (3) is connected to the actuator stem (11) of the actuator (10).

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 ( $p_1 = p_2$ ).

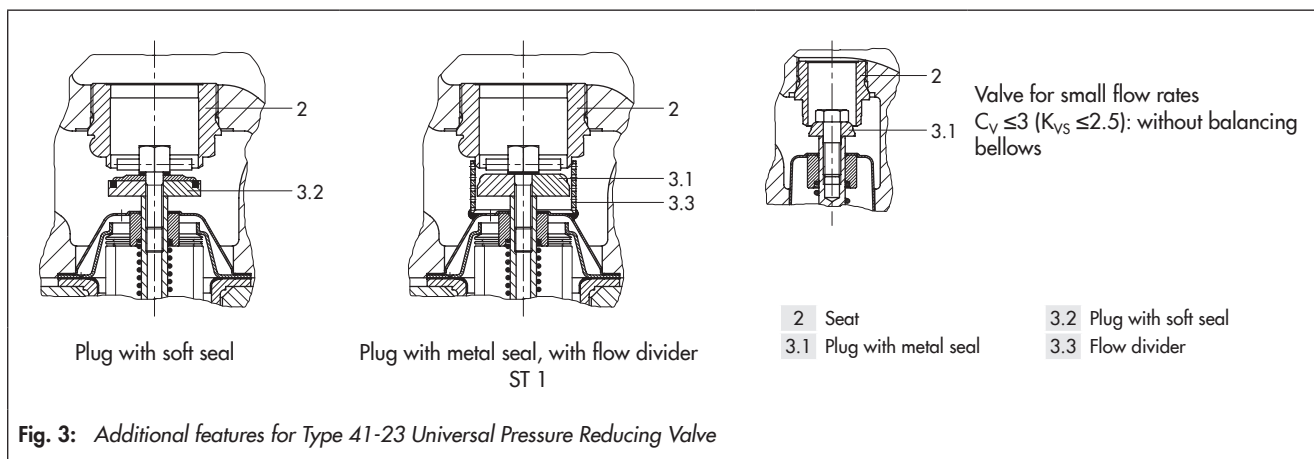
The downstream pressure  $p_2$  to be controlled is tapped downstream of the valve and transmitted over the control line (14) to the operating diaphragm (12) where it is converted into a positioning force. This force is used to move the valve plug (3) according to the force of the set point springs (7). 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 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.



**Fig. 2:** Functional diagram of Type 41-23 Universal Pressure Reducing Valve



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

Valve		Type 2412		
Pressure rating		JIS 10K or JIS 20K		
Valve size		½B to 2B/15A to 50A	2½B and 3B/65A and 80A	4B/100A
Max. perm. differential pressure Δp		25 bar/2500 kPa	20 bar/2000 kPa	16 bar/1600 kPa
Max. permissible temperature		See pressure-temperature diagram in ▶ T 2500		
Valve plug		Metal seal: max. 350 °C · PTFE soft seal: max. 220 °C · EPDM, FKM 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 <sub>v</sub> /K <sub>VS</sub> coefficient) Soft seal: Leakage class IV (≤0.01 % of C <sub>v</sub> /K <sub>VS</sub> coefficient)		
Conformity		CE EAC		
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		
Bellows actuator		Type 2413		
Actuator area		33 cm <sup>2</sup>		62 cm <sup>2</sup>
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						
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
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
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
60 kPa	60 kPa	130 kPa	250 kPa	500 kPa	1000 kPa	1000 kPa
Set point ranges · Metal bellows actuator						
2 to 6 bar	5 to 10 bar	10 to 22 bar	20 to 28 bar			
200 to 600 kPa	500 to 1000 kPa	100 to 2200 kPa	200 to 2800 kPa			
Max. perm. pressure above the set point adjusted at the actuator						
6.5 bar	6.5 bar	8 bar	2 bar			
650 kPa	650 kPa	800 kPa	200 kPa			

**Table 3: Materials**

Valve	Type 2412		
Pressure rating	JIS 10K	JIS 10K · JIS 20K	
Max. permissible temperature	300 °C	350 °C	
Bodies and Housings	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	CrNiMo steel		
Actuator	Type 2413		
	Diaphragm actuator	Bellows actuator	
Diaphragm cases	1.0332 <sup>1)</sup>	-	
Diaphragm	EPDM with fabric reinforcement <sup>2)</sup> · FKM for oils · NBR		-
Bellows housing	-	1.0460/1.4301 (stainless steel only)	
Bellows	-	CrNiMo steel	

<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 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.



For further details on installation refer to Mounting and Operating Instructions  
▶ EB 2512.

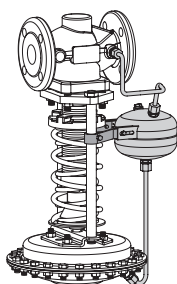
**Accessories**

**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
- 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.



For detailed information on accessories refer to Data Sheet  
▶ T 2595

**Ordering text**

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

Additional features ...

Valve size ...

Body material ...

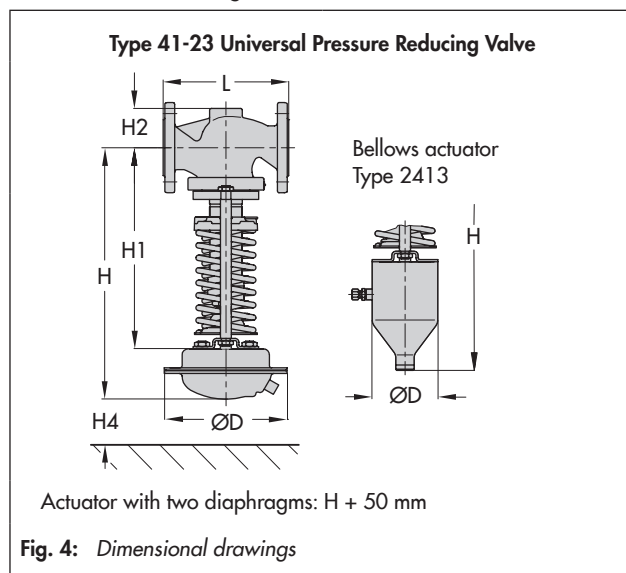
K<sub>Vs</sub>/C<sub>V</sub> coefficient ...

Set point range ... kPa/bar

Accessories ... (▶ T 2595)

Optionally, special version ...

**Dimensional drawings (see Table 4)**



**Table 4: Dimensions and weights**

<b>Type 41-23 Universal Pressure Reducing Valve</b>									
<b>Valve size</b>		<b>½B/15A</b>	<b>¾B/20A</b>	<b>1B/25A</b>	<b>1½B/40A</b>	<b>2B/50A</b>	<b>2½B/65A</b>	<b>3B/80A</b>	<b>4B/100A</b>
Length L	<b>JIS 10K</b>	184 mm	184 mm	184 mm	222 mm	254 mm	276 mm	298 mm	352 mm
	<b>JIS 20K</b>	191 mm	194 mm	197 mm	235 mm	267 mm	292 mm	318 mm	368 mm
Height H1		335 mm			390 mm		517 mm		540 mm
Height H2		55 mm			72 mm		100 mm		120 mm
Height H4		100							
<b>Actuator with rolling diaphragm</b>									
<b>Set point range</b>	<b>Dimension</b>	<b>Dimensions in mm</b>							
5 to 25 kPa 0.05 to 0.25 bar	Height H	445 mm			500 mm		627 mm		650 mm
	Actuator	Ø D = 380 mm, A = 640 cm <sup>2</sup>							
10 to 60 kPa 0.1 to 0.6 bar	Height H	445 mm			500 mm		627 mm		650 mm
	Actuator	Ø D = 380 mm, A = 640 cm <sup>2</sup>							
20 to 120 kPa 0.2 to 1.2 bar	Height H	430 mm			480 mm		607 mm		635 mm
	Actuator	Ø D = 285 mm, A = 320 cm <sup>2</sup>							
80 to 250 kPa 0.8 to 2.5 bar	Height H	430 mm			485 mm		612 mm		635 mm
	Actuator	Ø D = 225 mm, A = 160 cm <sup>2</sup>							
200 to 500 kPa 2 to 5 bar	Height H	410 mm			465 mm		592 mm		615 mm
	Actuator	Ø D = 170 mm, A = 80 cm <sup>2</sup>							
450 to 1000 kPa 4.5 to 10 bar	Height H	410 mm			465 mm		592 mm		615 mm
	Actuator	Ø D = 170 mm, A = 40 cm <sup>2</sup>							
800 to 1600 kPa 8 to 16 bar	Height H	410 mm			465 mm		592 mm		615 mm
	Actuator	Ø D = 170 mm, A = 40 cm <sup>2</sup>							
<b>Weight <sup>1)</sup>, approx.</b>									
5 to 60 kPa/0.05 to 0.6 bar		24.8 kg	25.9 kg	34.7 kg	38.5 kg	56.1 kg	63.8 kg	73.7 kg	
20 to 250 kPa/0.2 to 2.5 bar		20.6 kg	22.8 kg	31.1 kg	34.9 kg	52.5 kg	60.2 kg	70.1 kg	
200 to 1600 kPa/2 to 16 bar		13.2 kg	14.3 kg	23.1 kg	26.4 kg	44.0 kg	51.7 kg	61.6 kg	
<b>Special version · Metal bellows actuator</b>									
200 to 600 kPa 2 to 6 bar	Height H	550 mm			605 mm		732 mm		755 mm
	Actuator	Ø D = 120 mm, A = 62 cm <sup>2</sup>							
500 to 1000 kPa 5 to 10 bar	Height H	550 mm			605 mm		732 mm		755 mm
	Actuator	Ø D = 120 mm, A = 62 cm <sup>2</sup>							
1000 to 2200 kPa 10 to 22 bar	Height H	535 mm			590 mm		717 mm		740 mm
	Actuator	Ø D = 90 mm, A = 33 cm <sup>2</sup>							
2000 to 2800 kPa 20 to 28 bar	Height H	535 mm			590 mm		717 mm		740 mm
	Actuator	Ø D = 90 mm, A = 33 cm <sup>2</sup>							
<b>Weight <sup>1)</sup>, approx.</b>									
A = 33 cm <sup>2</sup>		18.2 kg	19.3 kg	19.8 kg	28.1 kg	31.9 kg	48.4 kg	61.6 kg	71.5 kg
A = 62 cm <sup>2</sup>		22.6 kg	23.7 kg	24.2 kg	32.5 kg	36.3 kg	60.5 kg	68.2 kg	78.1 kg

<sup>1)</sup> Based on JIS 10K: +10 % for JIS 20K

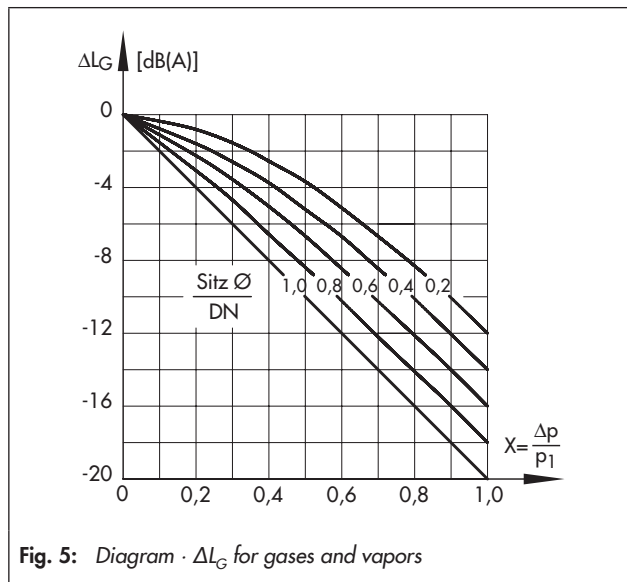
**Table 5:**  $C_V/K_{VS}$  coefficients and  $x_{FZ}$  values · Terms for noise level calculation according to VDMA 24422 (edition 1.89)

Valve size	Standard			Special version			With flow divider			
	$C_V$	$K_{VS}$	$x_{FZ}$	$C_V^{1)}$	$K_{VS}^{1)}$	$x_{FZ}$	$C_V$ ST 1	$K_{VS}$ -ST 1	$C_V$ ST 3	$K_{VS}$ -ST 3
<b>½B 15A</b>				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		
<b>¾B 20A</b>				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		
<b>1B 25A</b>				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		
<b>1½B 40A</b>				7.5 · 9.4	6.3 · 8	0.45 · 0.4				
	23	20	0.4	20	16	0.4	17	15		
<b>2B 50A</b>				9.4	8	0.4	7.2	6		
	37	32	0.4	20 · 23	16 · 20	0.45 · 0.4	30	25		
<b>2½B 65A</b>				23 · 37	20 · 32	0.4	30	25		
	60	50	0.4				45	38	30	25
<b>3B 80A</b>				37	32	0.4	30	25		
	94	80	0.35	60	50	0.4	70	60	46	40
<b>4B 100A</b>				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 (½B | 15A to 1B | 25A only) without balancing bellows

### Valve-specific correction terms

–  $\Delta L_G$  · For gases and vapors: values according to Fig. 5



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

–  $\Delta L_F$  · For liquids:

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

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

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
- $C_V$ -ST 1/ $K_{VS}$ -ST 1,  $C_V$ -ST 3/ $K_{VS}$ -ST 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.