

# Self-operated Pressure Regulators

## Pressure Reducing Valve Type 41-23 • Valve closes when downstream pressure rises



### Application

Type 41-23 Pressure Reducing Valves regulate the fluid pressure downstream of the valve to a pre-adjusted set point value.

**Set points** from 0.075 psi to 400 psi (5 mbar to 28 bar)

**Nominal valve sizes** ½" to 4"

**Pressure ratings ANSI 125 to 300**

For liquids, gases and steam up to 660 °F (350 °C)

The regulators consist of a Type 2412 valve with a Type 2413 actuator complete with set point adjustment.

### Features

- Low-maintenance, medium-controlled, self-operated proportional regulators requiring no auxiliary energy
- Easy set point adjustment at the valve
- Field retrofit of actuator for simple change of set point range
- No packing - stainless steel bellows provides zero-leak and frictionless plug stem seal
- Spring-loaded, single-seated valve with upstream and downstream pressure balancing by means of a stainless steel bellows
- Plug with soft seal for high sealing requirements
- Low-noise standard plug – special version with a St I flow divider for further noise level reduction (see Data Sheet T 8081)
- All wetted parts are free of non-ferrous metal
- Control line kit available as accessory for direct pressure tapping at the valve body

### Standard version

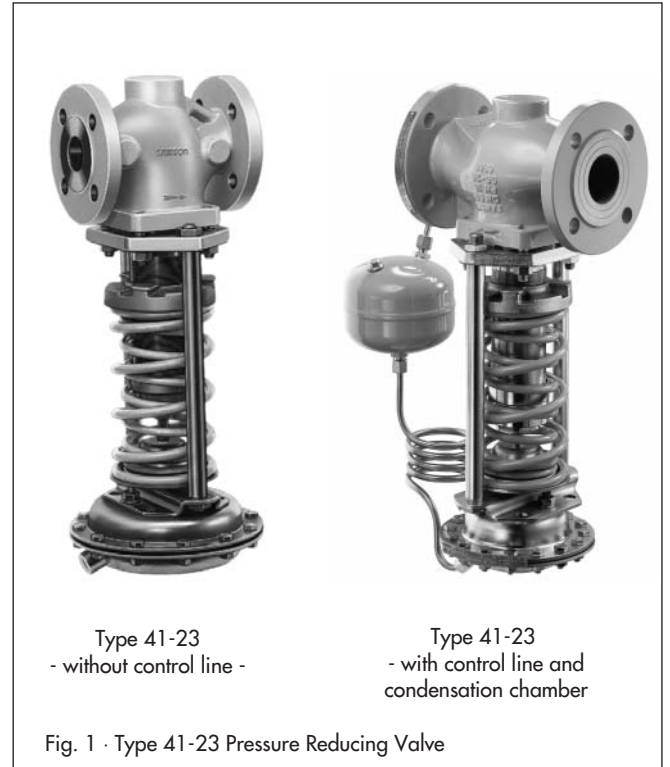
**Type 2412 Valve with Type 2413 Control Actuator**

- Sizes ½" to 4"
- ANSI Class 125 to 300
- Body made of ASTM materials cast iron A 126 Cl. B, cast carbon steel A 216 WCB or cast stainless steel A 351 CF8M
- Type 2413 Actuator with EPDM rolling diaphragm
- Plug with metal sealing

### Options

- **Low range pressure reducing valve** (only ½" to 2") for pressure set point values from 0.075 to 0.75 psi (5 to 50 mbar)
- **Valve with micro trim** ( $C_v = 0.0012$  to  $0.012$ ) or reduced  $C_v$
- **Condensation chamber** for steam and liquids to 650 °F (350 °C)
- **Safety pressure reducing valve** with leakage line connection and sealing or two diaphragms and diaphragm rupture indicator

For **DIN version** see Technical Data Sheet T 2512 EN



- **Control line kit** for pressure tapping at the valve body
- **FKM diaphragms** for oils (ASTM I, II, III)
- **EPDM diaphragms** with PTFE protective foil
- **Actuator for remote adjustment** of set point (autoclave control)
- **Bellows actuator** for valves up to 2" · Set point ranges 75 to 145, 145 to 320, 290 to 400 psi (5 to 10, 10 to 22, 20 to 28 bar); bellows housing made of either AISI 304, AISI 316Ti or St 37.2, bellows made of AISI 316Ti
- **Valve with St I flow divider** for particularly low-noise operation with gases and steam
- **Stainless steel seat and plug with PTFE soft sealing** (max. 430 °F (220 °C)) · With EPDM soft sealing (max. 300 °F (150 °C))
- **Free of oil and grease** for super-clean applications
- **Seat and plug armoured** for better wear

**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 hence the free area 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 adjustment nut (6) so that the valve is opened by the force of the positioning spring when both pressures are balanced ( $p_1 = p_2$ ).

The downstream pressure  $p_2$  to be controlled is tapped downstream 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 adjust the valve plug (3) according to the force of the positioning springs (7) which is adjustable at the set point adjustment nut (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 valves are equipped with a balancing bellows (4). The downstream pressure  $p_2$  acts on the inner bellows surface, whereas the upstream pressure  $p_1$  act on the outer surface of the bellows. In this way, the forces produced by the upstream and downstream pressures acting on the plug are balanced.

The valves can be delivered with an St I flow divider. The valve seat must be exchanged if the flow divider is retro-fitted.

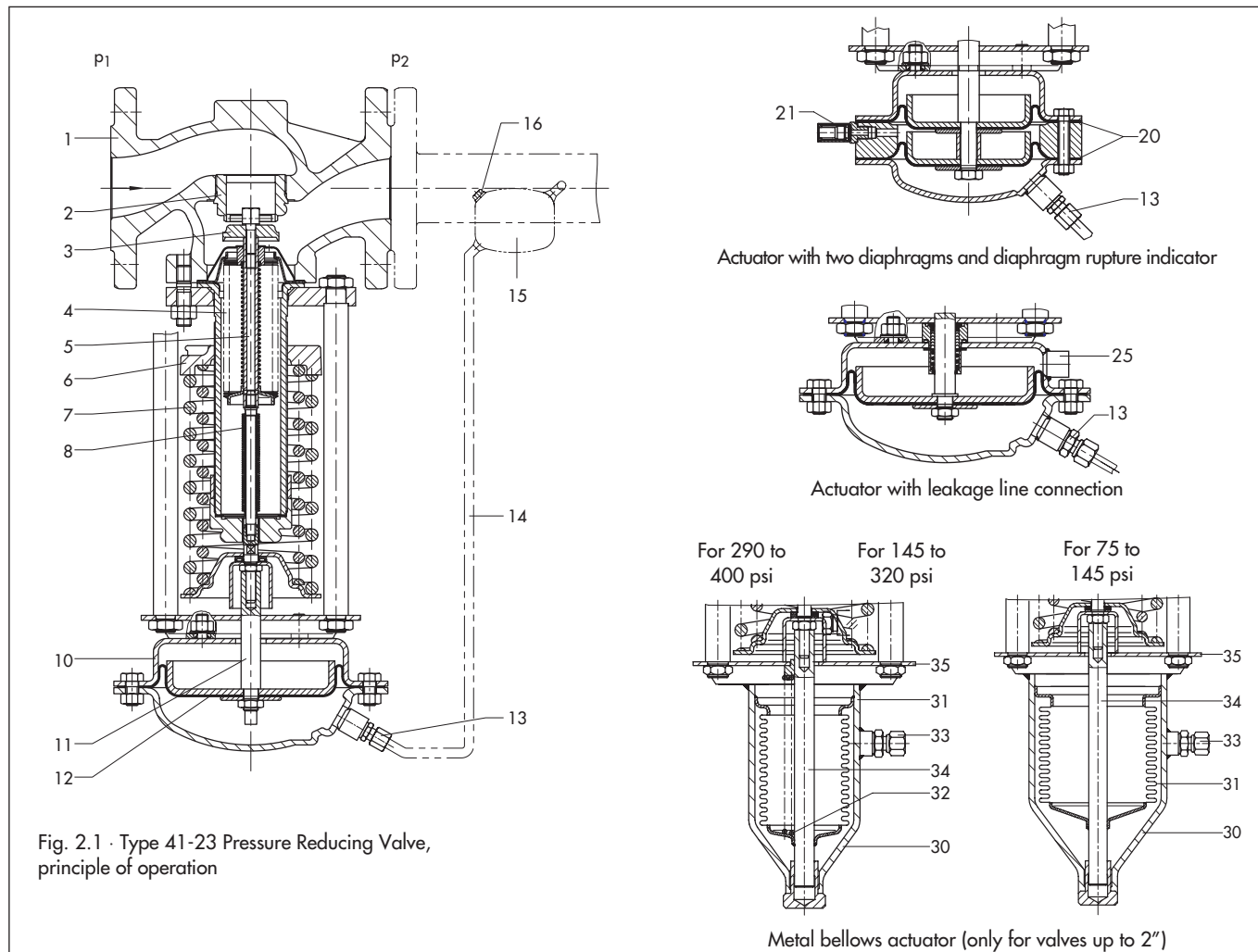


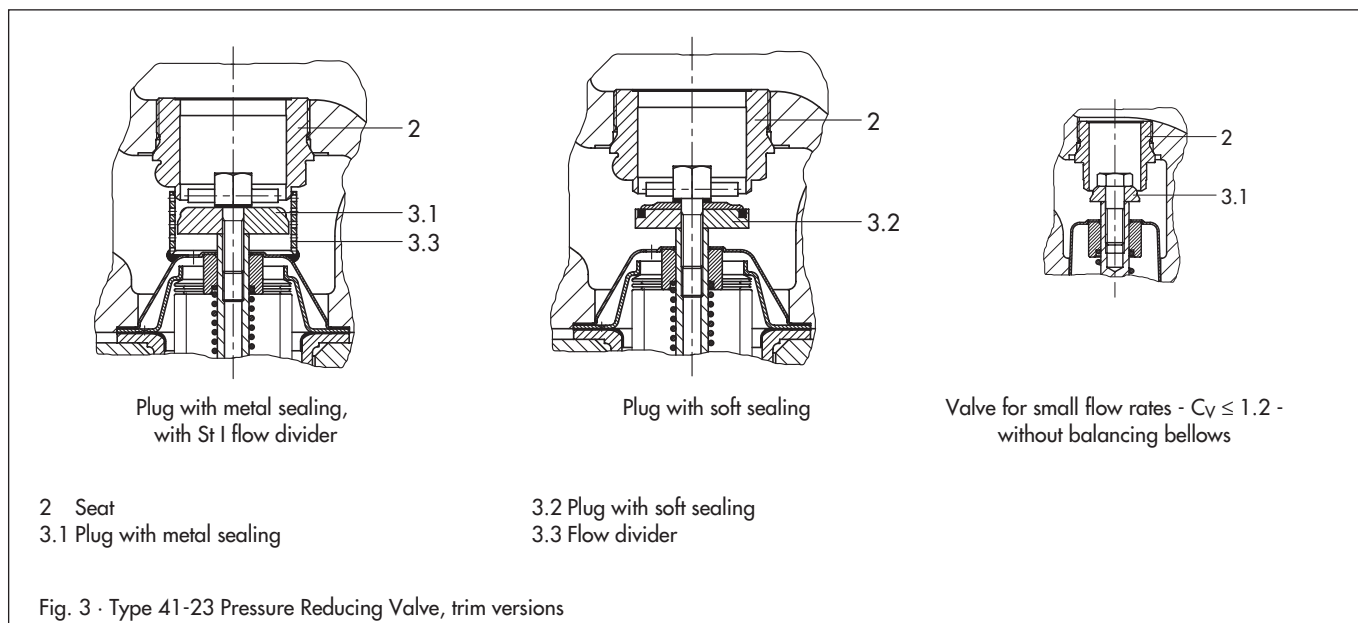
Fig. 2.1 · Type 41-23 Pressure Reducing Valve, principle of operation

Fig. 2.2 · Type 2413 Actuators, different versions

- 1 Valve body Type 2412
- 2 Seat (exchangeable)
- 3 Plug (with metal sealing)
- 4 Balancing bellows
- 5 Plug stem
- 6 Set point adjustment nut
- 7 Positioning springs
- 8 Bellows seal
- 10 Type 2413 Actuator
- 11 Actuator stem
- 12 Operating diaphragm with diaphragm plate
- 13 Control line connection  $\frac{3}{8}$ " (screw joint with restriction)
- 14 Control line
- 15 Condensation chamber
- 16 Filler plug

- 20 Two diaphragms
- 21 Diaphragm rupture indicator
- 25 Leakage line connection  $\frac{1}{2}$ "
- 30 Metal bellows actuator
- 31 Bellows with lower part of body
- 32 Additional springs
- 33 Control line connection  $\frac{3}{8}$ "
- 34 Bellows stem
- 35 Bracket

Fig. 2 · Type 41-23 Pressure Reducing Valve



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

Valve	Type 2412		
Pressure rating	ANSI 125	ANSI 250	ANSI 150 and 300
Nominal size	1" to 4"	½" to 2"	½" to 4"
End connection	Flat face flanges	Female NPT thread	Raised face flanges
Temperature range	See Fig. 4 · Pressure-Temperature Diagram (according to ANSI B16 series)		
Valve plug	Metal sealing, max. 660 °F (350 °C) Soft sealing, PTFE, max. 430 °F (220 °C) Soft sealing, EPDM, max. 300 °F (150 °C) Soft sealing, NBR, max. 140 °F (60 °C)		
Max. perm. diff. pressure	½" to 2"	360 psi (25 bar)	
	2½" to 3"	290 psi (20 bar)	
	4"	230 psi (16 bar)	
Leakage rate	Metal sealing: Leakage rate $\leq 0.05\%$ of $C_v$ value Soft sealing: Leakage rate Class IV		
Terms for control valve sizing according to ISA S75.01 and S75.02	$F_L = 0.95$ $X_T = 0.75$		
Actuator	Type 2413		
Set point ranges	0.075 to 0.3 psi <sup>1) 2)</sup>	5 to 30 mbar <sup>1) 2)</sup>	
	0.15 to 0.3 psi <sup>1)</sup>	10 to 30 mbar <sup>1)</sup>	
	0.375 to 0.5 psi <sup>1)</sup>	25 to 50 mbar <sup>1)</sup>	
	1.5 to 8.5 psi	0.1 to 0.6 bar	
	3 to 18 psi	0.2 to 1.2 bar	
	10 to 35 psi	0.8 to 2.5 bar	
	30 to 75 psi	2 to 5 bar	
	65 to 145 psi 115 to 230 psi	4.5 to 10 bar 8 to 16 bar	
Maximum permissible pressure at the actuator	1.5 · max. set point value		
Max. perm. temperature	Gases 660 °F (350 °C), however, max. 175 °F (80 °C) 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)		

1) Only for low range pressure reducing valve

2) Only ½" to 1"

**Table 2 · Materials**

<b>Pressure rating</b>	ANSI 125	ANSI 250	ANSI 150 or 300	
<b>Max. permissible temperature</b>	450 °F (230 °C)	400 °F (205 °C)	660 °F (350 °C)	
<b>Valve</b>	<b>Type 2412</b>			
<b>Body</b>	Cast iron ASTM A 126 Cl.B		Cast carbon steel ASTM A 216 WCB	Cast stainless steel ASTM A 351 CF8M
<b>Seat</b>	Stainless steel			Stainless steel
<b>Plug</b>	AISI 410 WN 1.4006			AISI 316Ti WN 1.4571
<b>Seal ring for soft sealing</b>	PTFE with 15 % glass fiber · EPDM · NBR			
<b>Guide bushing</b>	PTFE with graphite			
<b>Balancing bellows and bellows stem</b>	Stainless steel AISI 316Ti WN 1.4571			
<b>Actuator</b>	<b>Type 2413</b>			
<b>Diaphragm cases</b>	Sheet steel A283 Gr.C	Sheet steel St 34-2		AISI 304 WN 1.4301
<b>Diaphragm</b>	EPDM with fabric reinforcement <sup>1)</sup> · FKM for oils · NBR · EPDM with PTFE protective foil			

<sup>1)</sup> Standard version; further details in “Special versions”

**Table 3 · Cv and Kvs values**

Size	Seat bore inches	Cv <sup>1)</sup>		Cv I With flow divider	Seat bore mm	Kvs <sup>1)</sup>		Kvs I With flow divider
		Standard version	Special version			Standard version	Special version	
½"	0.24	–	0.12 · 0.5 <sup>1)</sup>	–	6	–	0.1 · 0.4 <sup>1)</sup>	–
	0.87	5	3	3.6	22	4	2.5	3
¾"	0.24	–	0.12 · 0.5 <sup>1)</sup>	–	6	–	0.1 · 0.4 <sup>1)</sup>	–
	0.87	–	3 · 6 · 7.5	–	22	–	2.5 · 5 · 6.3	–
1"	0.24	–	0.12 · 0.5 <sup>1)</sup>	–	6	–	0.1 · 0.4 <sup>1)</sup>	–
	0.87	–	3 · 5 · 7.5	–	22	–	2.5 · 4 · 6.3	–
1½"	1.6	–	9.4	–	40	–	8	–
		23	–	18		20	–	15
2"	1.6	–	20	–	40	–	16	–
		37	–	30		32	–	25
2½"	2.6	–	23	–	65	–	20	–
		60	–	44		50	–	38
3"	2.6	–	37	–	65	–	32	–
		94	–	70		80	–	60
4"	3.5	–	60	–	89	–	50	–
		145	–	110		125	–	95

<sup>1)</sup> For Cv = 0.0012 to 0.012 (Kvs = 0.001 to 0.01): valve without balancing bellows

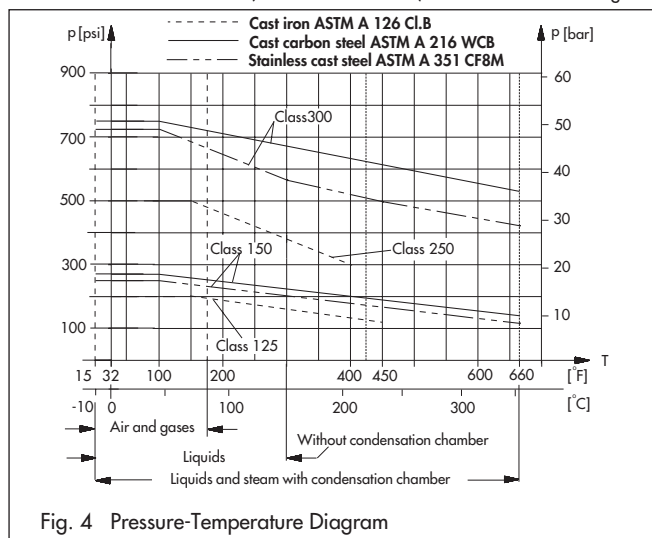


Fig. 4 Pressure-Temperature Diagram

**Pressure-Temperature Diagram**

The range of application of the valves is limited by the pressure-temperature rating of the body material and ANSI class. The diagram in Fig. 4 is for reference only. For exact values, consult ANSI standards B16.1, B16.4 and B16.34.

**St I Flow Divider**

When a flow divider St I is installed, the rated Cv value is reduced to CvI. Flow characteristic differences between valves with and without flow dividers do not occur until the valve has passed through approx. 80 % of its travel range.

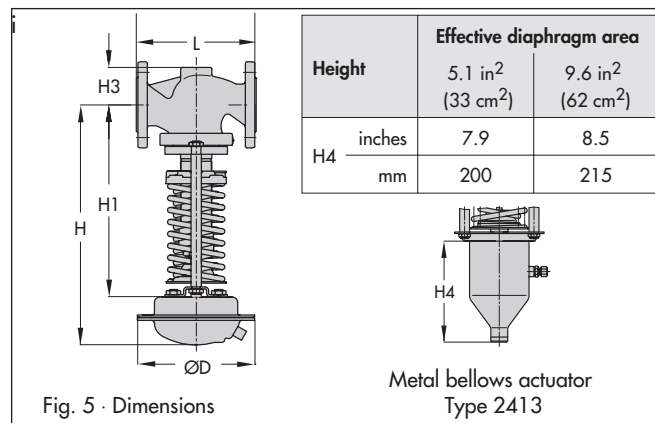
**Valve specific correction terms**

For valve correction terms for calculating noise levels, please refer to Associated Information Sheet number T 2500.

**Table 4a · Dimensions in inches and weights in lbs**

Pressure reducing valve		Type 41-23							
Nominal valve size		1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"
Set point range in psi	ANSI 125 and 150	7.25	7.25	7.25	8.75	10.0	10.87	11.75	13.87
	ANSI 250	6.0	6.0	6.0	8.0	9.25	-	-	-
	ANSI 300	7.50	7.62	7.75	9.25	10.50	11.50	12.50	14.50
	Height H1	12.4			14.6		19.7		20.3
	Height H3	2.2			2.8		3.9		4.7
0.075 to 0.45	Height H	16.7					24.0		24.6
	Actuator	∅ D = 14.9, A = 100 in <sup>2</sup>							
	Operating spring force F	56 lbf							
0.15 to 0.45	Height H	18.9					24.0		24.6
	Actuator	∅ D = 14.9, A = 100 in <sup>2</sup>							
	Operating spring force F	56 lbf							
0.35 to 0.75	Height H	16.7			18.9		24.0		24.6
	Actuator	∅ D = 14.9, A = 100 in <sup>2</sup>							
	Operating spring force F	101 lbf							
0.75 to 3.5	Height H	16.7			18.9		24.0		24.6
	Actuator	∅ D = 14.9, A = 100 in <sup>2</sup>							
	Operating spring force F	393 lbf							
1.5 to 8.5	Height H	16.7			18.9		24.0		24.6
	Actuator	∅ D = 14.9, A = 100 in <sup>2</sup>							
	Operating spring force F	990 lbf							
3 to 18	Height H	16.1			18.3		23.2		24.0
	Actuator	∅ D = 11.2, A = 50 in <sup>2</sup>							
	Operating spring force F	990 lbf							
10 to 35	Height H	16.1			18.3		23.2		24.0
	Actuator	∅ D = 8.9, A = 25 in <sup>2</sup>							
	Operating spring force F	990 lbf							
30 to 75	Height H	15.4			17.5		22.6		23.2
	Actuator	∅ D = 6.7, A = 12.5 in <sup>2</sup>							
	Operating spring force F	990 lbf							
65 to 145	Height H	15.4			17.5		22.6		23.2
	Actuator	∅ D = 6.7, A = 6.2 in <sup>2</sup>							
	Operating spring force F	990 lbf							
115 to 230	Height H	15.4			17.5		22.6		23.2
	Actuator	∅ D = 6.7, A = 6.2 in <sup>2</sup>							
	Operating spring force F	1800 lbf							
0.075 to 18	Weight for cast steel ANSI 150 <sup>1)</sup> approx. lb	51	53	73	80	121	136	158	
3 to 35		39	41	58	68	107	124	146	
30 to 230		29	32	51	58	97	114	136	

<sup>1)</sup> +10 % for cast steel ANSI 300



**Installation**

- Horizontal pipeline with a slight downward slope on either side (for condensate discharge)
- Direction of flow must coincide with the arrow on the valve body
- The actuator must be suspended downwards as depicted
- Pressure tap approx. 3.3 ft (1 m) downstream from the valve. The control line (pipe 3/8") is to be provided by the customer
- A larger pipe cross-section (expansion piece) downstream of the valve may be installed to compensate for case with high steam expansion
- A strainer is recommended to be installed upstream of the valve to protect the valve internals from damage by foreign matter.
- Shutoff valves are recommended to isolate the regulator during maintenance

**Table 4b · Dimensions in mm and weights in kg.**

Pressure reducing valve		Type 41-23							
Nominal size		½"	¾"	1"	1½"	2"	2½"	3"	4"
Set point range in bar	ANSI 125 and 150	184	184	184	222	254	276	298	352
	ANSI 250	152	152	152	203	235	-	-	-
	ANSI 300	191	194	197	235	267	292	318	368
	Height H1	315			370		500		515
	Height H3	55			72		100		120
0.005 to 0.03	Height H	425				610		625	
	Actuator	∅ D = 380, A = 640 cm <sup>2</sup>							
	Operating spring force F	250 N							
0.01 to 0.03	Height H	480				610		625	
	Actuator	∅ D = 380, A = 640 cm <sup>2</sup>							
	Operating spring force F	250 N							
0.025 to 0.05	Height H	425			480		610		625
	Actuator	∅ D = 380, A = 640 cm <sup>2</sup>							
	Operating spring force F	450 N							
0.05 to 0.25	Height H	425			480		610		625
	Actuator	∅ D = 380, A = 640 cm <sup>2</sup> mm							
	Operating spring force F	1750 N							
0.1 to 0.6	Height H	425			480		610		625
	Actuator	∅ D = 380 mm, A = 640 cm <sup>2</sup>							
	Operating spring force F	4400 N							
0.2 to 1.2	Height H	410			460		590		610
	Actuator	∅ D = 285 mm, A = 320 cm <sup>2</sup>							
	Operating spring force F	4400 N							
0.8 to 2.5	Height H	410			465		595		610
	Actuator	∅ D = 225 mm, A = 160 cm <sup>2</sup>							
	Operating spring force F	4400							
2 to 5	Height H	390			445		575		590
	Actuator	∅ D = 170 mm, A = 80 cm <sup>2</sup>							
	Operating spring force F	4400 N							
4.5 to 10	Height H	390			445		575		590
	Actuator	∅ D = 170 mm, A = 40 cm <sup>2</sup>							
	Operating spring force F	4400 N							
8 to 16	Height H	390			445		575		590
	Actuator	∅ D = 170 mm, A = 40 cm <sup>2</sup>							
	Operating spring force F	8000 N							
0.005 to 1.2	Weight for cast steel ANSI 150 <sup>1)</sup> approx. kg	23	24	33	36	55	62	72	
0.2 to 2.5		18	19	26	31	49	56	66	
2 to 16		13	15	23	26	44	52	62	

<sup>1)</sup> +10 % for cast steel ANSI 300

**Accessories**

- Fitting for connection of the control line 3/8" to the filler plug.
- 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 of ≥ 30 psi (2 bar)).

**Ordering information**

Pressure Reducing Valve Type 41-23  
 Nominal size ... Body material ...  
 ANSI Class ... End connection ...  
 Set point range ... psi (bar)  
 Optionally, accessories ... /special version ...

Specifications subject to change without notice.



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