

T 3008 EN

Type 42-20 and Type 42-25 Differential Pressure Regulators

Series 42 Self-operated Pressure Regulators (opening) · ANSI version



Application

Differential pressure regulator for extended heating systems and industrial applications

Differential pressure set points (Δp) from **0.75 to 145 psi/0.05 to 10 bar** · Valves **NPS ½ to 10**¹⁾/DN 15 to 250 · Pressure rating **Class 125 to 300** · Suitable for liquids and vapors²⁾ from **40 to 660 °F/5 to 350 °C**, for air and non-flammable gases up to **175 °F/80 °C**

The valve **opens** when the differential pressure **rises**.

The differential pressure to be controlled is transmitted to the spring-loaded operating diaphragm in the actuator and converted into a positioning force to move the valve plug. The regulators control the differential pressure according to the adjusted set point.

Special features

- **Type 42-20:** Fixed set point
- **Type 42-25:** Set point adjustable in wide range
- Low-noise, medium-controlled proportional regulator requiring little maintenance
- Single-seated valve with a plug balanced by a stainless steel bellows or a diaphragm (NPS 2½ to 10/DN 65 to 250)
- Suitable for circuit water, water/glycol mixtures, steam and air as well as other liquids, gases and vapors, provided these do not affect the characteristics of the operating diaphragm
- Valve body optionally made of cast iron A126B, cast steel A216 WCC or cast stainless steel A351 CF8M

Versions

Differential pressure regulators for installation in a bypass pipe or short-circuit pipe (see Fig. 4) · Flanged connections

- **Type 42-20** (Fig. 1) · Type 2422 Valve · Balanced by a bellows NPS ½ to 4/DN 15 to 100 · Balanced by a diaphragm NPS 2½ to 4/DN 65 to 100 · Type 2420 Actuator · Fixed set point, adjusted to $\Delta p = 3, 4, 6$ or $7 \text{ psi}/0.2, 0.3, 0.4$ or 0.5 bar
- **Type 42-25** · Type 2422 Valve · Balanced by a bellows NPS ½ to 10/DN 15 to 250 · Balanced by a diaphragm NPS 2½ to 10/DN 65 to 250 · Type 2425 Actuator · Set point adjustable within the range between 0.75 to $145 \text{ psi}/0.05$ to 10 bar

¹⁾ Valves larger than NPS 10/DN 250 on request

²⁾ Version balanced by a bellows only

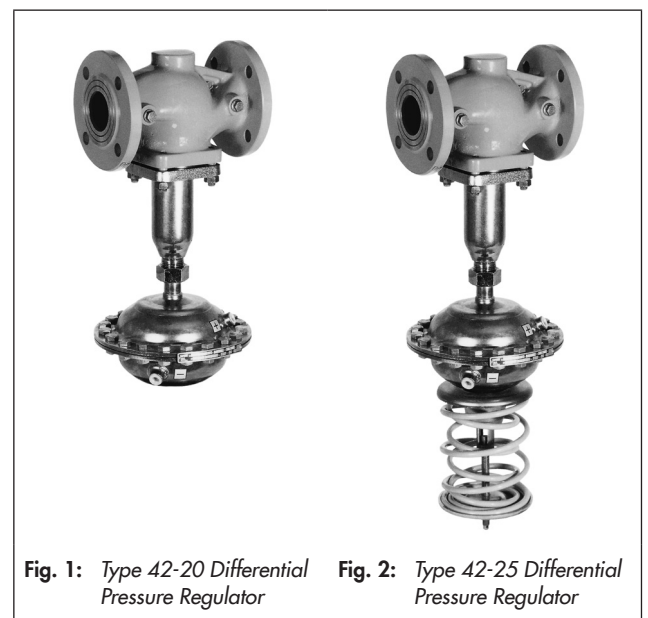


Fig. 1: Type 42-20 Differential Pressure Regulator

Fig. 2: Type 42-25 Differential Pressure Regulator

Accessories

Required accessories, such as compression-type fittings, needle valves, compensation chambers and control lines, are listed in Data Sheet ▶ T 3095.

Special versions

- Actuator with two diaphragms (Type 42-25)
- Actuator with FKM diaphragm, e.g. for mineral oils
- Special C_v/K_{vs} (reduced)
- Valve made of stainless steel (at least 1.4301)
- Valves larger than NPS 10/DN 250 on request
- Version for temperatures above $430 \text{ °F}/220 \text{ °C}$
- Check valve for deionized water (▶ T 3010)
- Version free of non-ferrous metal on request

- Special set point 8 to 16 bar for valves \leq DN 100 on request
- Version for small flow rates · Valve with micro trim with C_v 0.0012 to 0.05/ K_{VS} 0.001 to 0.04 or C_v 0.12, 0.5 and 1.2/ K_{VS} 0.1, 0.4 and 1 without pressure balancing

Principle of operation (see Fig. 3)

The medium flows through the valve in the direction indicated by the arrow. The position of the valve plug (3) determines the differential pressure over the cross-sectional area released between the plug (3) and seat (2).

The Type 2422 Valve is balanced. The forces acting on the valve plug created by the upstream and downstream pressures are balanced by a balancing bellows (5) or balancing diaphragm (5.1).

In valves balanced by a bellows, the upstream pressure p_1 acts on the outside of the metal bellows (5), while the down-

stream pressure p_2 acts on the inside of the bellows. In a valve balanced by a diaphragm, the downstream pressure p_2 acts on the inside and the upstream pressure p_1 on the outside of the balancing diaphragm (5.1). In both cases, the forces created by the upstream and downstream pressures acting on the valve plug are balanced out.

The differential pressure to be controlled is transferred to the operating diaphragm (13) where it is transformed into a positioning force. This force is used to move the plug (3) according to the force of the set point springs. The valve begins to open as soon as the differential pressure exceeds the set point.

In **Type 42-25**, the set point can be adjusted at the set point adjuster (17).

In **Type 42-20**, the set point springs (16) in the actuator determines the set point.

All versions have control lines to transfer the high pressure (+) and low pressure (-) to the actuator.

We offer a special version of Type 42-25 with an actuator with two diaphragms.

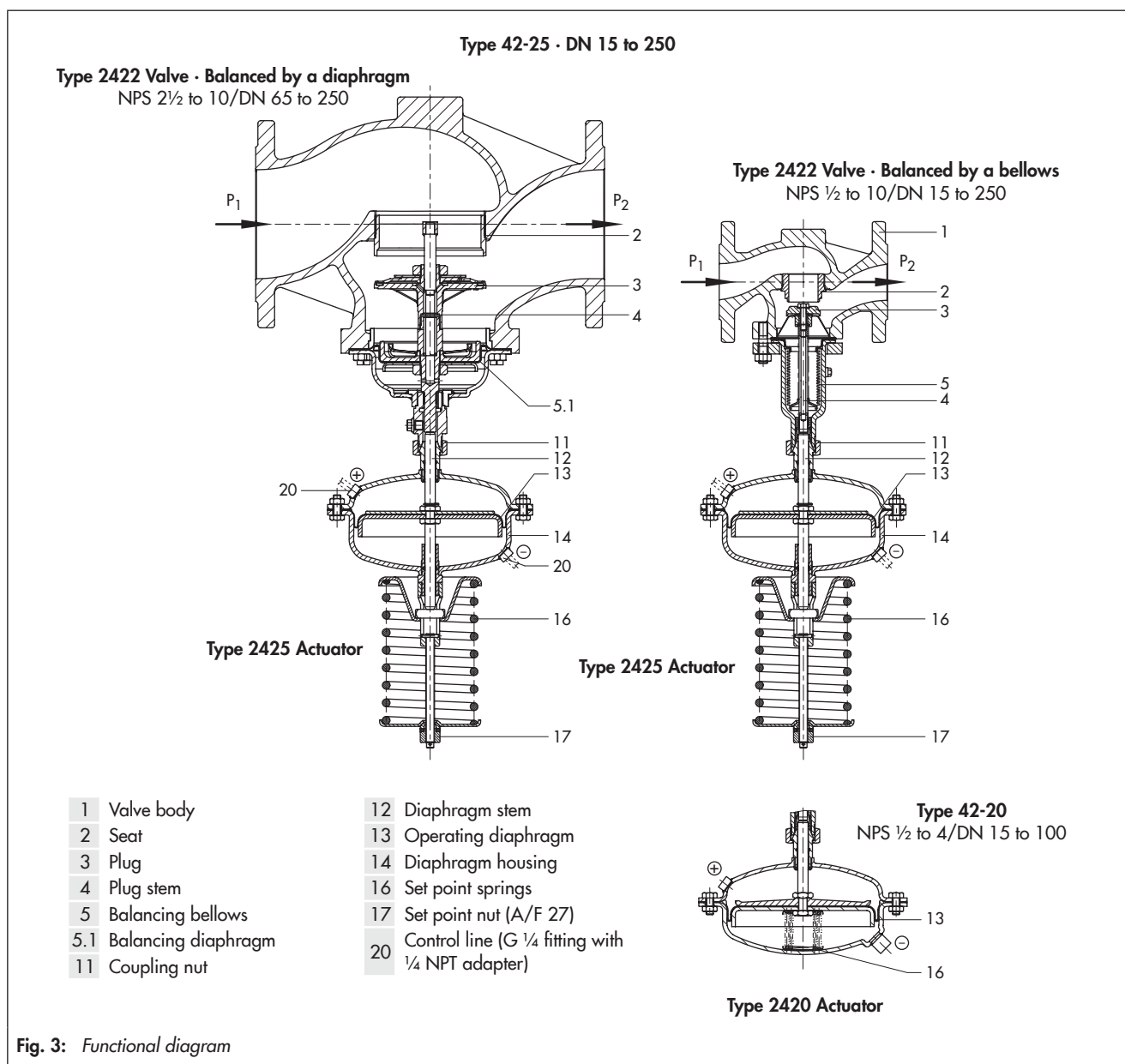


Fig. 3: Functional diagram

Type 42-25 Differential Pressure Regulator with two diaphragms

SAMSON offers a special version of Type 42-25 with an actuator with two diaphragms (see Fig. 5). The actuator with two diaphragms provides increased functional reliability.

An actuator with two diaphragms is always required when an FKM diaphragm is to be used. It is especially suitable for applications with thin oils (e.g. heat transfer oil).

The two diaphragms separate both diaphragm chambers connected to the high-pressure and low-pressure connections.

They generate a positioning force from the differential pressure. The two diaphragms separate both diaphragm chambers connected to the high-pressure and low-pressure connections. They generate a positioning force from the differential pressure. A mechanical diaphragm rupture indicator (22) is located between the two diaphragms, which responds at approx. 22 psi/1.5 bar. In the event of a diaphragm rupture, the pressure in the space between the two operating diaphragm starts to increase. This causes the pin in the diaphragm rupture indicator to be pushed outwards and a red ring appears, indicating the diaphragm rupture. The intact operating diaphragm takes on the control task of the ruptured diaphragm.

A pressure switch can be optionally mounted to the actuator to trigger an alarm.

We recommend replacing both diaphragms after a diaphragm rupture is indicated.

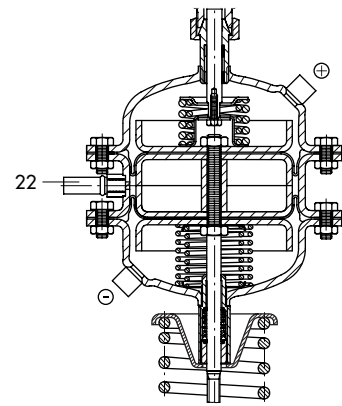
Installing the valve and mounting the actuator

Valve, actuator and control lines (accessories) are delivered unattached.

A coupling nut is used to attach the actuator to the valve. Preferably mount the actuator after the valve is installed.

The following points must be observed:

- Install the valve in horizontal pipelines.
- The direction of flow must match the direction indicated by the arrow on the body.
- Install a strainer (e.g. SAMSON Type 2 NI) upstream of the valve.



22 Diaphragm rupture indicator

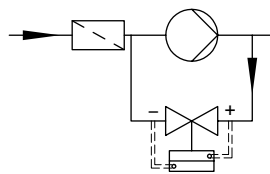
Fig. 5: Actuator with two diaphragms for Type 42-25 (special version)

Permissible mounting positions

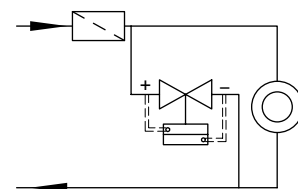
- Actuator suspended: standard installation, all versions, above 175 °F/80 °C and for applications with steam
- Actuator sideways: versions balanced by a bellows with fixed plug guide
- Actuator upright (actuator on top of the valve): all versions NPS ½ to 3/DN 15 to 80 and max. 175 °F/80 °C

Refer to ► EB 3007 for details.

Application



Installation in a bypass pipe



Installation in the short-circuit pipe

==== Control line to be attached on installing the regulator in the pipeline

Fig. 4: Sample applications

Table 1: Technical data

Type		42-25				42-20	
Nominal size		NPS ½ to 10/DN 15 to 250				NPS ½ to 4/DN 15 to 100	
Pressure rating		Class 125, 150 and 300					
Max. permissible temperature	Valve	See pressure-temperature diagram in ► T 3000					
	Actuator ¹⁾	With compensation chamber: steam and liquids up to 660 °F/350 °C ²⁾ Without compensation chamber: liquids up to 300 °F/150 °C, air and gases up to 175 °F/80 °C					
Set point ranges	psi	0.75 to 3.5 · 1.5 to 8.5 · 3 to 14.5 · 7 to 20 · 14.5 to 35 · 30 to 75 · 65 to 145				3, 4, 6 or 7	
	bar	0.05 to 0.25 · 0.1 to 0.6 · 0.2 to 1 · 0.5 to 1.5 · 1 to 2.5 · 2 to 5 · 4.5 to 10				0.2 · 0.3 · 0.4 · 0.5	
Actuator area A	in ²	12	25	50	100	25	50
	cm ²	80	160	320	640	160	320
Max. perm. operating pressure for actuator with two diaphragms	psi	580	580	360	360	-	
	bar	40	40	25	25	-	
Leakage class according to ANSI/FCI 70-2		≤0.05 % of C _v /K _{vS} coefficient					
Conformity		CE					

¹⁾ Higher temperatures on request

²⁾ Steam version only with valves balanced by a bellows

Table 2: Materials · Material numbers according to ASTM and DIN EN
Table 2.1: Materials for Type 2422 Valve

Type 2422 Valve · Balanced by a bellows			
Nominal size		NPS ½ to 10/DN 15 to 250	
Pressure rating		Class 125	Class 150 and 300
Valve body		Cast iron A126B	Cast steel A216 WCC Cast stainless steel A351 CF8M
Valve seat		Stainless steel 1.4104 or 1.4006	
Plug	Up to NPS 4/DN 100	Stainless steel 1.4104, 1.4112 or 1.4006 ¹⁾	
	NPS 6 to 10/DN 150 to 250	1.4404, with PTFE soft seal	
Plug stem		1.4301	
Metal bellows		1.4571 · NPS 6/DN 150 and larger: 1.4404	
Bottom section		P265GH	1.4571
Body gasket		Graphite on metal core	
Type 2422 Valve · Balanced by a diaphragm			
Nominal size		NPS 2½ to 4/DN 65 to 100	
Pressure rating		Class 125	Class 150
Valve body		Cast iron A126B	Cast steel A216 WCC
Valve seat		1.4408	
Plug		CW617N	
Pressure balancing		Diaphragm plate EN-JS1030 · EPDM balancing diaphragm, max. 300 °F/150 °C or NBR diaphragm, max. 175 °F/80 °C	
Nominal size		NPS 6 to 10/DN 150 to 250	
Pressure rating		Class 125	Class 150 and 300
Valve body		Cast iron A126B	Cast steel A216 WCC Cast stainless steel A351 CF8M
Valve seat		CC499K ²⁾	
Plug		CC499K ²⁾ · With EPDM soft seal, max. 300 °F/150 °C or with PTFE soft seal, max. 300 °F/150 °C	
Pressure balancing		Diaphragm plate EN-JS1030 (EN-GJ2-400-15) · EPDM balancing diaphragm Max. 300 °F/150 °C or NBR diaphragm, max. 175 °F/80 °C	

¹⁾ Optionally with soft seal with standard C_v/K_{vS} coefficients

²⁾ Special version 1.4409

Table 2.2: Materials for Type 2420/Type 2425 Actuator

Type 2420/Type 2425 Actuator			
Valve body	Cast iron A126B	Cast steel A216 WCC	Cast stainless steel A351 CF8M
Diaphragm cases	DD 11		1.4301
Diaphragm	EPDM ¹⁾ with fabric reinforcement		
Guide bushing	DU bushing		PTFE
Seals	EPDM/PTFE ¹⁾		

¹⁾ Special version, e.g. for mineral oils: FKM

Table 3: C_V/K_{VS} coefficients, x_{FZ} values and max. permissible differential pressures

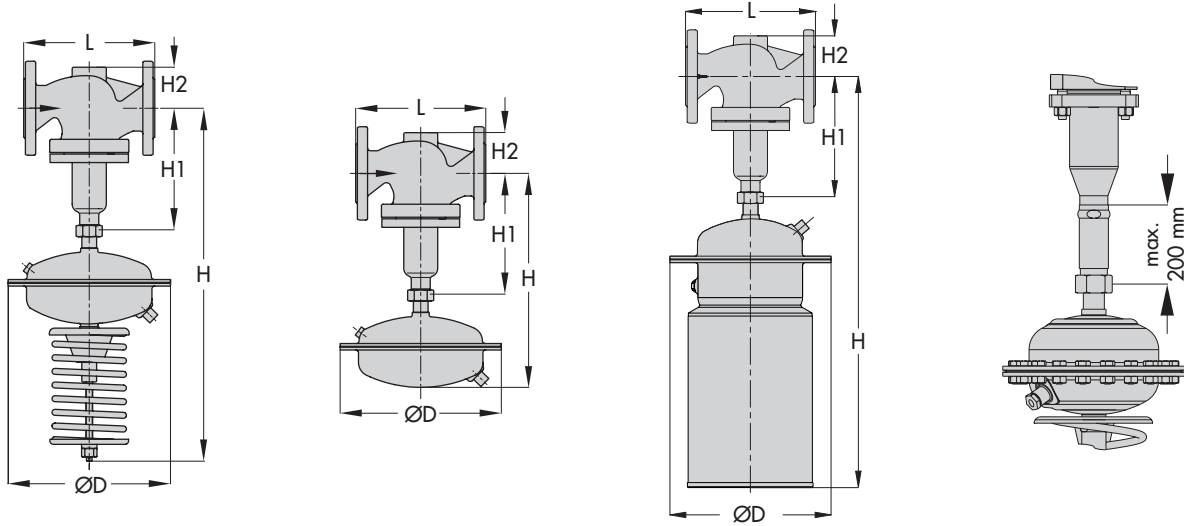
Terms for control valve sizing according to IEC 60534, Parts 2-1 and 2-2: $F_L = 0.95$, $X_T = 0.75$

Type 2422 Valve - Balanced by a bellows												
Nominal size	NPS	1/2 ¹⁾	3/4 ¹⁾	1 ¹⁾	1 1/2	2	2 1/2	3	4	6	8	10
	DN	15	20	25	40	50	65	80	100	150	200	250
Valve travel		0.4"/10 mm					0.6"/16 mm			0.9"/22 mm		
K_{VS}/C_V : standard	C_V	5	7.5	9.4	23	37	60	94	145	330	490	590
	K_{VS}	4	6.3	8	20	32	50	80	125	280	420	500
Max. perm. differential pressure Δp		360 psi/25 bar					290 psi/20 bar		230 psi/16 bar	175 psi/12 bar	145 psi/10 bar	
Reduced C_V / K_{VS} coefficient	C_V	-	-	5	9.4	20	37		94	145	330	
	K_{VS}	-	-	4	8	16	32		80	125	280	
Max. perm. differential pressure Δp		360 psi/25 bar							290 psi/20 bar	230 psi/16 bar	175 psi/12 bar	
x_{FZ} value		0.65	0.6	0.55	0.45	0.4		0.35			0.3	

¹⁾ Special valve version with micro-trim: C_V 0.0012 to 0.05/ K_{VS} 0.001 to 0.04 or C_V 0.12, 0.5 and 1.2/ K_{VS} 0.1, 0.4 and 1 without pressure balancing

Type 2422 Valve - Balanced by a diaphragm							
Nominal size	NPS	2 1/2	3	4	6	8	10
	DN	65	80	100	150	200	250
Valve travel		0.6"/15 mm			1.4"/35 mm		
K_{VS}/C_V coefficient	C_V	60	95	150	445	760	930
	K_{VS}	50	80	125	380	650	800
Max. perm. differential pressure Δp		175 psi/12 bar		145 psi/10 bar	175 psi/12 bar	145 psi/10 bar	
x_{FZ} value		0.4	0.35			0.3	

Dimensional drawings for Type 42-25 and Type 42-20 balanced by a bellows · Dimensions and weights (see Table 4)



Type 42-25 · Type 2422 Valve balanced by a bellows with Type 2425 Actuator

Type 42-20 · Type 2422 Valve balanced by a bellows with Type 2420 Actuator

Type 42-24 · Type 2422 Valve balanced by a bellows with Type 2424 Actuator and metal cover

Extension piece

Type 42-25 with two diaphragms: add approx. 2.2"/55 mm to the overall height H.

Table 4: Dimensions and weights for Type 42-20 and Type 42-25 · Balanced by a bellows

Nominal size	NPS	1/2	3/4	1	1 1/2	2	2 1/2	3	4	6	8	10	
	DN	15	20	25	40	50	65	80	100	150	200	250	
Length L	Class 125 and 150	inch	7.25			8.75	10	10.9	11.75	13.9	17.75	21.4	26.5
		mm	184			222	254	276	298	352	451	543	673
	Class 300	inch	7.5	7.6	7.75	9.25	10.5	11.5	12.5	14.5	18.6	22.4	27.9
		mm	190	194	197	235	267	292	318	368	473	568	708
Height H1	inch	8.9					11.8		14	23.2	28.7		
	mm	225					300		355	590	730		
Height H2	Cast steel	inch	1.73			2.83		3.93		4.65	6.9	9.6	10.6
		mm	44			72		98		118	175	245	270
	Forged steel	inch	2.1	-	2.76	3.62	3.86	-	5.05	-			
		mm	53	-	70	92	98	-	128	-			
Type 42-20 Differential Pressure Regulator													
Set points 3, 4, 6, 7 psi/0.2, 0.3, 0.4, 0.5 bar	Type 2420 Actuator												
	Height H	15.4"/390 mm					18.3"/465 mm		20.5"/520 mm				
	Actuator	Ø D = 8.9"/225 mm · A = 25 in ² /160 cm ² 2)					Ø D = 11.2"/285 mm · A = 50 in ² /320 cm ²						
	Weight 3)	lb	25	27	29	44	50	84	95	126	-		
kg		11.5	12	13	20	22.5	38	43	57	-			
Type 42-25 Differential Pressure Regulator													
Set points 0.75 to 3.5 psi/ 0.05 to 0.25 bar	Type 2425 Actuator												
	Height H	24.6"/625 mm					27.6"/700 mm		29.7"/755 mm	44.1"/1120 mm	49.6"/1260 mm		
	Actuator	Ø D = 11.2"/285 mm · A = 50 in ² /320 cm ² 1)					Ø D = 11.2"/285 mm · A = 100 in ² /640 cm ²		Ø D = 15.4"/390 mm · A = 100 in ² /640 cm ²				
	Weight 3)	lb	46	47	50	65	71	111	113	143	408	937	1069
kg		21	21.5	22.5	29.5	32	46	51	65	185	425	485	

1) Optionally with actuator 100 in²/640 cm²

2) Optionally with actuator 50 in²/320 cm²

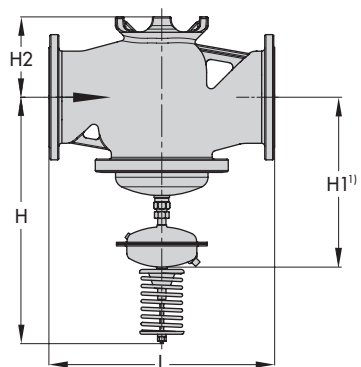
3) The weight applies to the version with the material specifications A126B. Add +10 % for all other materials.

Table 4: Dimensions and weights for Type 42-20 and Type 42-25 · Balanced by a bellows

Nominal size		NPS	½	¾	1	1½	2	2½	3	4	6	8	10		
		DN	15	20	25	40	50	65	80	100	150	200	250		
1.5 to 8.5 psi/ 0.1 to 0.6 bar	Height H	24.6"/625 mm					27.6"/700 mm			29.7"/ 755 mm	44.1"/ 1120 mm	49.6"/1260 mm			
	Actuator	ØD = 8.9"/225 mm · A = 25 in ² /160 cm ² ¹⁾					ØD = 11.2"/285 mm · A = 50 in ² /320 cm ²			ØD = 15.4"/390 mm · A = 100 in ² /640 cm ² ²⁾					
	Weight ³⁾	lb	35.3	36.3	38.5	54	60	111	113	143	408	937	1069		
		kg	16	16.5	17.5	24.5	27	46	51	65	185	425	485		
3 to 14.5 psi/ 0.2 to 1 bar	Height H	24.6"/625 mm					27.6"/700 mm			29.1"/ 740 mm	44.1"/ 1120 mm	49.6"/1260 mm			
	Actuator	ØD = 8.9"/225 mm · A = 25 in ² /160 cm ² ²⁾								ØD = 15.4"/390 mm · A = 100 in ² /640 cm ²					
	Weight ³⁾	lb	35	36	39	54	60	93	104	135	408	937	1069		
		kg	16	16.5	17.5	24.5	27	42	47	61	185	425	485		
7 to 20 psi/ 0.5 to 1.5 bar	Height H	24.6"/625 mm					30"/700 mm			29.7"/ 755 mm	42.1"/ 1070 mm	47.6"/1210 mm			
	Actuator	ØD = 8.9"/225 mm · A = 25 in ² /160 cm ² ²⁾								ØD = 11.2"/285 mm · A = 50 in ² /320 cm ²					
	Weight ³⁾	lb	35	36	39	54	60	93	104	135	386	915	1047		
		kg	16	16.5	17.5	24.5	27	42	47	61	175	415	475		
14.5 to 35 psi/ 1 to 2.5 bar	Height H	24.6"/625 mm					27.6"/700 mm			29.7"/ 755 mm	42.1"/ 1070 mm	47.6"/1210 mm			
	Actuator	ØD = 8.9"/225 mm · A = 25 in ² /160 cm ²													
	Weight ³⁾	lb	35	36	38	54	59	93	104	135	386	915	1047		
		kg	16	16.5	17.5	24.5	27	42	47	61	175	415	475		
30 to 75 psi/ 2 to 5 bar	Height H	24.6"/625 mm					27.6"/700 mm			29.7"/ 755 mm	42.1"/ 1070 mm	47.6"/1210 mm			
	Actuator	ØD = 6.7"/170 mm · A = 12 in ² /80 cm ²								ØD = 8.9"/225 mm · A = 25 in ² /160 cm ²					
	Weight ³⁾	lb	35	36	39	54	60	93	104	135	375	904	1036		
		kg	16	16.5	17.5	24.5	27	42	47	61	170	410	470		
65 to 145 psi/ 4.5 to 10 bar	Height H	24.6"/625 mm					27.6"/700 mm			29.7"/ 755 mm	On request				
	Actuator	ØD = 6.7"/170 mm · A = 12 in ² /80 cm ²													
	Weight ³⁾	lb	35.3	36.3	38.5	54	59.5	92.6	103.6	134.5					
		kg	16	16.5	17.5	24.5	27	42	47	61					

¹⁾ Optionally with actuator 100 in²/640 cm²
²⁾ Optionally with actuator 50 in²/320 cm²
³⁾ The weight applies to the version with the material specifications A126B. Add +10 % for all other materials.

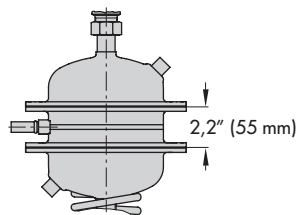
**Dimensional drawing of Type 42-25 and Type 42-20
balanced by a diaphragm ·
Dimensions and weights (see Table 5)**



Type 2422 Valve balanced by a diaphragm with Type 2425/2420
Actuator (Type 2425 in diagram)

¹⁾ Type 42-20 only

Dimensional drawing of actuator with two diaphragms



Type 42-25 with two diaphragms (special version).
Add approx. 2.2"/55 mm to the total height H.

Table 5: Dimensions and weights for Type 42-20 and Type 42-25 · Balanced by a diaphragm

Nominal size	NPS	2½	3	4	6	8	10	
	DN	65	80	100	150	200	250	
Length L	Class 125 and 150	inch	10.9	11.75	13.9	17.75	21.4	26.5
		mm	276	298	352	451	543	673
	Class 300	inch	11.5	12.5	14.5	18.6	22.4	27.9
		mm	292	318	368	473	568	708
Height H2	inch	3.1		4.6	6.9	10.2		
	mm	98		118	175	260		

Type 42-20 Differential Pressure Regulator							
Height H1 ¹⁾		14"/355 mm		14.8"/375 mm			
Actuator		ØD = 11.2"/285 mm · A = 50 in ² /320 cm ²					
Weight, approx.		84 lb/38 kg	95 lb/43 kg	113 lb/51 kg			
Type 42-25 Differential Pressure Regulator							
0.75 to 3.5 psi/ 0.05 to 0.25 bar	Height H	23.2"/590 mm		24"/610 mm	33"/840 mm	35.8"/910 mm	
	Actuator	ØD = 15.4"/390 mm · A = 100 in ² /640 cm ²					
	Weight, approx. kg	93 lb/42 kg	104 lb/47 kg	121 lb/55 kg	209 lb/95 kg	551 lb/250 kg	595 lb/270 kg
1.5 to 8.5 psi/ 0.1 to 0.6 bar	Height H	23.2"/590 mm		24"/610 mm	33"/840 mm	35.8"/910 mm	
	Actuator	ØD = 11.2"/285 mm · A = 50 in ² /320 cm ² ²⁾			ØD = 15.4"/390 mm · A = 100 in ² /640 cm ²		
	Weight, approx. kg	93 lb/42 kg	104 lb/47 kg	121 lb/55 kg	209 lb/95 kg	551 lb/250 kg	595 lb/270 kg
3 to 14.5 psi/ 0.2 to 1 bar	Height H	23.2"/590 mm		24"/610 mm	31.1"/790 mm	33.9"/860 mm	
	Actuator	ØD = 8.9"/225 mm · A = 25 in ² /160 cm ² ³⁾			ØD = 11.2"/285 mm · A = 50 in ² /320 cm ² ²⁾		
	Weight, approx. kg	93 lb/42 kg	104 lb/47 kg	121 lb/55 kg	209 lb/95 kg	551 lb/250 kg	595 lb/270 kg
7 to 20 psi/ 0.5 to 1.5 bar	Height H	23.2"/590 mm		24"/610 mm	31.1"/790 mm	33.9"/860 mm	
	Actuator	ØD = 8.9"/225 mm · A = 25 in ² /160 cm ² ³⁾			ØD = 11.2"/285 mm · A = 50 in ² /320 cm ² ²⁾		
	Weight, approx. kg	93 lb/42 kg	104 lb/47 kg	121 lb/55 kg	209 lb/95 kg	551 lb/250 kg	595 lb/270 kg
14.5 to 35 psi/ 1 to 2.5 bar	Height H	23.2"/590 mm		24"/610 mm	31.1"/790 mm	33.9"/860 mm	
	Actuator	ØD = 8.9"/225 mm · A = 25 in ² /160 cm ² ³⁾					
	Weight, approx. kg	93 lb/42 kg	104 lb/47 kg	121 lb/55 kg	209 lb/95 kg	551 lb/250 kg	595 lb/270 kg
30 to 75 psi/ 2 to 5 bar	Height H	23.2"/590 mm		24"/610 mm	31.1"/790 mm	33.9"/860 mm	
	Actuator	ØD = 225 mm · A = 160 cm ² ³⁾					
	Weight, approx. kg	93 lb/42 kg	104 lb/47 kg	121 lb/55 kg	209 lb/95 kg	551 lb/250 kg	595 lb/270 kg

¹⁾ Type 42-25, all set points

²⁾ Optionally with actuator 100 in²/640 cm²

³⁾ Optionally with actuator 50 in²/320 cm²

Ordering text**Type 42-25 or Type 42-20** Differential Pressure Regulator

NPS/DN ...

Valve balanced by a bellows/diaphragm

Class/PN ...

Body material ...

Set point or set point range ... psi/bar

Accessories ...

Special version