DATA SHEET

T 3007 EN

Series 42 Self-operated Regulators · Type 42-20 and Type 42-25 Differential Pressure Regulators

With Type 2420/Type 2425 Actuator (opening) and balanced Type 2422 Valve

CE

Application

Differential pressure regulator for extended heating systems and industrial applications.

Differential pressure set points Δp from **0.05 to 10 bar** · Valves **DN 15 to 250** [1] · Pressure rating **PN 16 to 40** · Suitable for liquids and vapors [2] from **5 to 350 °C** as well as for air and non-flammable gases up to **80 °C**

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

The regulators control the differential pressure according to the adjusted set point.

Special features

- **Type 42-25:** Set point adjustable in wide range
- **Type 42-20**: Fixed set point
- Low-noise, medium-controlled proportional regulator requiring little maintenance
- 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 available in cast iron, spheroidal graphite iron, cast steel, cast stainless steel or forged steel
- Single-seated valve with a plug balanced by a stainless steel bellows or a diaphragm (DN 65 to 250)

Versions

Differential pressure regulators for installation in a bypass pipe or short-circuit pipe (see Fig. 5) · Flanged connections

– **Type 42-20** (Fig. 2)· Type 2422 Valve · Balanced by a bellows DN 15 to 100 · Balanced by a diaphragm DN 65 to 100 · Type 2420 Actuator (opening) with fixed set point, adjusted to Δp = 0.2, 0.3, 0.4 or 0.5 bar

– **Type 42-25** (Fig. 1) · Type 2422 Valve · Balanced by a bellows DN 15 to 250 · Balanced by a diaphragm DN 65 to 250 · Type 2425 Actuator (opening) with set point adjustable within the range between 0.05 to 10 bar

Accessories

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

Fig. 1: *Type 42-25 Differential Pressure Regulator (adjustable set point)*

Fig. 2: *Type 42-20 Differential Pressure Regulator (fixed set point)*

Special versions

– ANSI and JIS versions on request
– Versions free of non-ferrous metal on request
– Actuator with two diaphragms
– Version for temperatures above 220 °C
– Version for deionized water
– Version for mineral oils which do not affect the characteristics of the FKM diaphragm; other oils on request
– Version for small flow rates · Valve with micro-trim with K_{VS} 0.001 to 0.04 or K_{VS} 0.1, 0.4 and 1 without pressure balancing
– Type 2422 Valve · DN 15 to 50 without pressure balancing
– Special set point 8 to 16 bar for valves ≤ DN 100 on request

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1) Valves larger than DN 250 on request
2) Version balanced by a bellows only

SAMSON AKTIENGESELLSCHAFT · Weismüllerstraße 3 · 60314 Frankfurt am Main, Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507 · samson@samsongroup.com · www.samsongroup.com

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Principle of operation (Fig. 3)

The medium flows through the valve in the direction indicated by the arrow. The position of the plug (3) determines the differential pressure over the cross-sectional area released between the plug 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). Regulators balanced by a bellows or a diaphragm only differ in the pressure balancing principle applied. Valves balanced by a diaphragm have a balancing diaphragm (5.1) instead of the balancing bellows (5). The downstream pressure p_2 acts on the bottom of the diaphragm and the upstream pressure p_1 on the top of the diaphragm. As a result, the forces created by the upstream and downstream pressures acting on the 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 (16). The valve begins to open as soon as the differential pressure exceeds the set point.

The set point of **Type 42-25** can be adjusted at the set point nut (SW 27, 17).

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

Control lines, which must be mounted on site, transfer the high pressure (+) and low pressure (–) in both regulator versions.

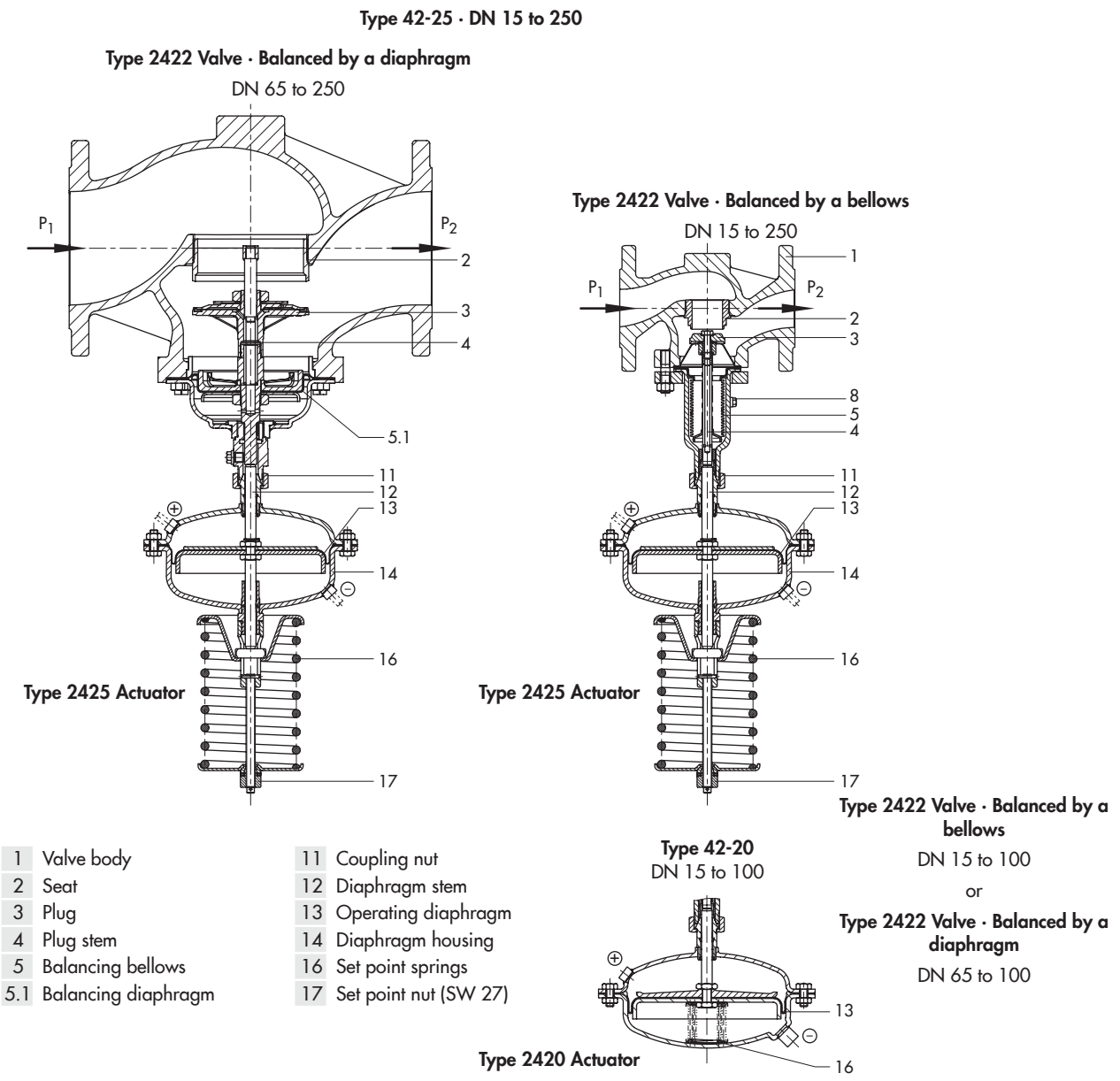


Fig. 3: *Functional diagram*

Type 42-25 Differential Pressure Regulator with two diaphragms

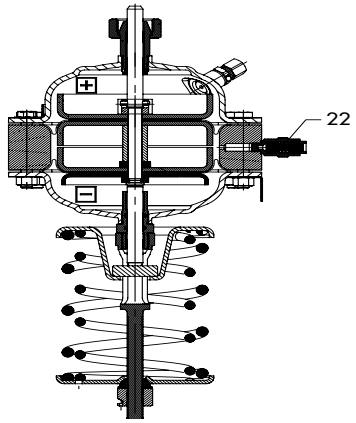
SAMSON offers a special version of Type 42-25 with an actuator with two diaphragms (see Fig. 4). The actuator with two diaphragms provides increased functional reliability.

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. A mechanical diaphragm rupture indicator (22) is located between the two diaphragms, which responds at approx. 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.



22 Diaphragm rupture indicator

Fig. 4: *Actuator with two diaphragms for Type 42-25 (special version)*

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.

Permissible mounting positions

– Actuator suspended: standard installation, balanced by a bellows or diaphragm, all versions. Steam control only for version with balanced by a bellows.
– Actuator sideways: versions balanced by a bellows with fixed plug guide or all versions balanced by a diaphragm
– Actuator upright (actuator on top of the valve): all versions balanced by a diaphragm, versions balanced by a bellows DN 15 to 80 and at the same time max. 80 °C

Refer to ▶ **EB 3007** for more 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. 5: *Sample applications*

Table 1: *Technical data*

Type		**42-25**				**42-20**	
Valve size		**DN 15 to 250**				**DN 15 to 100**	
Pressure rating		PN 16, 25, 40					
Max. permissible temperature	Valve	See pressure-temperature diagram in ▶ T 3000					
	Actuator [1]	With compensation chamber: steam and liquids up to 220 °C [2] Without compensation chamber: liquids up to 150 °C, air and gases up to 80 °C					
Set point ranges		0.05 to 0.25 bar · 0.1 to 0.6 bar · 0.2 to 1 bar · 0.5 to 1.5 bar · 1 to 2.5 bar · 2 to 5 bar · 4.5 to 10 bar				0.2 bar · 0.3 bar · 0.4 bar · 0.5 bar	
Actuator area A		80 cm²	160 cm²	320 cm²	640 cm²	160 cm²	320 cm²
Max. perm. operating pressure for actuator with two diaphragms		40 bar	40 bar	25 bar	25 bar	–	
Conformity		CE					
Leakage class according to IEC 60534-4		≤0.05 % of K_{VS} coefficient					

[1] Max. 350 °C (660 °F) with extension piece
[2] Steam version only with valves balanced by a bellows

Table 2: *Materials · Material numbers according to DIN EN*

Table 2.1: *Materials for Type 2422 Valve*

Type 2422 Valve · Balanced by a bellows						
Valve size		**DN 15 to 250**				
Pressure rating		**PN 16**	**PN 25**	**PN 16, 25 and 40**		
Valve body		Cast iron EN-GJL-250	Spheroidal graphite iron EN-GJS-400-18-LT [4]	Cast steel 1.0619	Forged stainless steel 1.4404 [1]	Cast stainless steel 1.4408
Valve seat		Stainless steel 1.4104 or 1.4006			1.4404	
Plug	Up to DN 100 [2]	Stainless steel 1.4404				
	DN 125 to 250	1.4404, plug with PTFE seal			1.4404, with PTFE soft seal	
Plug stem		1.4301				
Metal bellows		1.4571 · DN 125: 1.4404				
Bottom section		P265GH			1.4571	
Body gasket		Graphite on metal core				
Type 2422 Valve · Balanced by a diaphragm						
Valve size		**DN 65 to 100**				
Pressure rating		**PN 16**		**PN 25**		
Valve body		Cast iron EN-GJL-250		Spheroidal graphite iron EN-GJS-400-18-LT		
Valve seat		1.4408				
Plug		CW617N				
Diaphragm cases		1.0619				
Pressure balancing		Diaphragm plate 1.4301 · EPDM balancing diaphragm, max. 150 °C or NBR diaphragm, max. 80 °C				
Valve size		**DN 125 to 250**				
Pressure rating		**PN 16**	**PN 16 and 25**	**PN 16, 25 and 40**	**–**	**PN 16, 25 and 40**
Valve body		Cast iron EN-GJL-250	Sph. graphite iron EN-GJS-400-18-LT [4]	Cast steel 1.0619	–	Cast stainless steel 1.4408
Valve seat		CC499K [3]				
Plug		CC499K [3] · With EPDM soft seal, max. 150 °C or with PTFE soft seal, max. 150 °C				
Pressure balancing		Diaphragm plate EN-JS1030 · EPDM balancing diaphragm, max. 150 °C or NBR diaphragm, max. 80 °C				

[1] DN 15, 25, 40 and 50 only
[2] Optionally with soft seal with standard K_{VS} coefficients
[3] Special version 1.4409
[4] Up to max. DN 150

Table 2.2: *Materials for Type 2420/Type 2425 Actuator*

Type 2420/Type 2425 Actuator		
Valve body	Cast iron, spheroidal graphite iron, cast steel 1.0619	Forged stainless steel, cast steel
Diaphragm cases	1.0332	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 using an actuator with two diaphragms

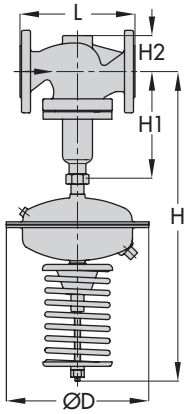
Table 3: *K_{VS} coefficients, x_{FZ} values and max. permissible differential pressures Δp*
Terms for control valve sizing according to IEC 60534, Parts 2-1 and 2-2: $F_L = 0.95$, $X_T = 0.75$

Type 2422 Valve · Unbalanced							
Valve size DN	**15**	**20**	**25**	**32**	**40**	**50**
Valve travel	10 mm					
K_{VS} coefficient	4.0	4.0 · 6.3	4.0 · 6.3 · 8.0	16	20	32
Max. permissible differential pressure Δp	14 bar			6 bar		4 bar
x_{FZ} value	0.65	0.6	0.55		0.45	0.4
Reduced K_{VS} coefficient	0.1 · 0.4 · 1.0 · 2.5 or 0.001 to 0.04 (micro trim)			–		
Max. permissible differential pressure Δp	25 bar			–		
x_{FZ} value	0.65			–		

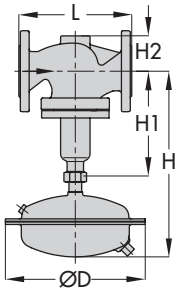
Type 2422 Valve · Balanced by a bellows													
Valve size DN	**15**	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
Valve travel	10 mm						16 mm			22 mm			
Standard K_{VS} coefficient	4	6.3	8	16	20	32	50	80	125	190	280	420	500
Max. perm. differential pressure Δp	25 bar						20 bar		16 bar		12 bar	10 bar	
Reduced K_{VS} coefficient	–		4	6.3	8	16	32		80	80	125	280	
Max. perm. differential pressure Δp	25 bar								20 bar		16 bar	12 bar	
x_{FZ} value	0.65	0.6	0.55		0.45	0.4	0.35					0.3	

Type 2422 Valve · Balanced by a diaphragm							
Valve size DN	**65**	**80**	**100**	**125**	**150**	**200**	**250**
Valve travel	15 mm			35 mm			
K_{VS} coefficient	50	80	125	250	380	650	800
Max. permissible differential pressure Δp	12 bar		10 bar	12 bar		10 bar	
x_{FZ} value	0.4	0.35				0.3	

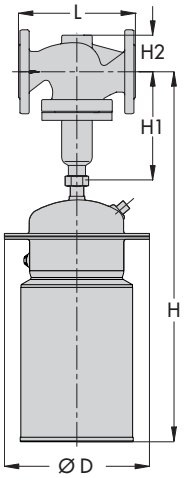
Dimensional drawings for Type 42-25 and Type 42-20 balanced by a bellows · Dimensions and weights (see Table 4)



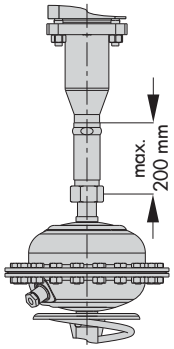
Type 42-25 · Type 2422 Valve balanced by a bellows with Type 2425 Actuator



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. 55 mm to the total height H.

Ordering text

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

DN ..., valve balanced by a bellows/diaphragm

PN ..., body material ...

Set point or set point range ... bar

Optionally, accessories ...

Optionally, special version

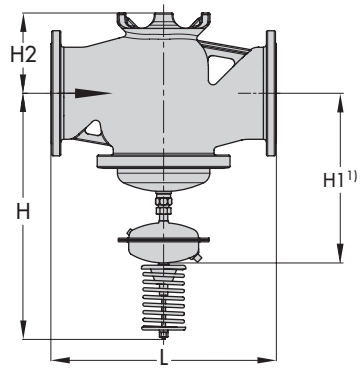
Table 4: *Dimensions and weights for Type 42-20 and Type 42-25 · Balanced by a bellows*

Dimensions in mm · Weights in kg

Valve size	**DN**	**15**	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
Length L		130	150	160	180	200	230	290	310	350	400	480	600	730
Height H1		225						300		355	460	590	730	
Height H2	Forged steel	53	–	70	–	92	98	–						
	Other materials	44			72			100		120	145	175	235	260
Type 42-25 Differential Pressure Regulator														
Set points	**Type 2425 Actuator**													
0.05 to 0.25 bar	Height H [4) 5) 6)]	625						700		755	990	1120	1260	
	Actuator	ØD = 285 mm · A = 320 cm² [1)]						ØD = 285 mm · A = 640 cm²			ØD = 390 mm · A = 640 cm²			
	Weight [3)] in kg	21	21.5	22.5	29	29.5	32	46	51	65	135	185	425	485
0.1 to 0.6 bar	Height H [4) 5) 6)]	625						685		740	990	1120	1260	
	Actuator	ØD = 225 mm · A = 160 cm² [2)]						ØD = 285 mm · A = 320 cm² [1)]			ØD = 390 mm · A = 640 cm²			
	Weight [3)] in kg	16	16.5	17.5	24	24.5	27	46	51	65	135	185	425	485
0.2 to 1 bar	Height H [4) 5) 6)]	625						700		755	990	1120	1260	
	Actuator	ØD = 225 mm · A = 160 cm² [2)]									ØD = 390 mm · A = 640 cm²			
	Weight [3)] in kg	16	16.5	17.5	24	24.5	27	42	47	61	135	185	425	485
0.5 to 1.5 bar	Height H [4) 5) 6)]	625						700		755	940	1070	1210	
	Actuator	ØD = 225 mm · A = 160 cm² [2)]									ØD = 285 mm · A = 320 cm²			
	Weight [3)] in kg	16	16.5	17.5	24	24.5	27	42	47	61	125	175	415	475
1 to 2.5 bar	Height H [4) 5) 6)]	625						700		755	940	1070	1210	
	Actuator	ØD = 225 mm · A = 160 cm²												
	Weight [3)] in kg	16	16.5	17.5	24	24.5	27	42	47	61	125	175	415	475
2 to 5 bar	Height H [4) 5) 6)]	605						680		735	940	1070	1210	
	Actuator	ØD = 170 mm · A = 80 cm²									ØD = 225 mm · A = 160 cm²			
	Weight [3)] in kg	16	16.5	17.5	24	24.5	27	42	47	61	102	170	410	470
4.5 to 10 bar	Height H [4) 5) 6)]	685						760		815	On request			
	Actuator	ØD = 170 mm · A = 80 cm²												
	Weight [3)] in kg	16	16.5	17.5	24	24.5	27	42	47	61				
Type 42-20 Differential Pressure Regulator														
Set points	**Type 2420 Actuator**													
0.2 bar 0.3 bar 0.4 bar 0.5 bar	Height H [4) 5) 6)]	390						465		520	–			
	Actuator	ØD = 225 mm · A = 160 cm² [2)]						ØD = 285 mm · A = 320 cm²						
	Weight [3)] in kg	11.5	12	13	19.5	20	22.5	38	43	57				

1) Optionally with 640 cm² actuator
2) Optionally with 320 cm² actuator
3) The weight applies to the version with the material specifications EN-GJL-250. Add +10 % for all other materials.
4) Actuators with metal cover H +135 mm
5) The height H increases to 200 mm at the maximum, depending on the extension piece used.
6) Minimum clearance required to remove the actuator: +100 mm

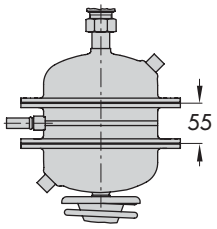
Dimensional drawing of Type 42-25 and Type 42-20 balanced by a diaphragm · Dimensions and weights (see Table 5)



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

Type 42-20 only

Dimensional drawing of actuator with two diaphragms



Type 42-25 with two diaphragms (special version).

Add approx. 55 mm to the overall height H.

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

Dimensions in mm · Weights in kg

Valve size DN		**65**	**80**	**100**	**125**	**150**	**200**	**250**
Length L		290	310	350	400	480	600	730
Height H2		98		118	145	175	260	
Type 42-20 Differential Pressure Regulator								
Set points	**Type 2420 Actuator**							
0.2 bar 0.3 bar 0.4 bar 0.5 bar	Height H1	355		375	–			
	Actuator	ØD = 285 mm · A = 320 cm²			–			
	Weight, approx. kg	38	43	51	–			
Type 42-25 Differential Pressure Regulator								
Set points	**Type 2425 Actuator**							
0.05 to 0.25 bar	Height H [3] [4]	590		610	815	840	910	
	Actuator	ØD = 390 mm · A = 640 cm²						
	Weight [kg]	42	47	55	75	95	250	270
0.1 to 0.6 bar	Height H [3] [4]	590		610	815	840	910	
	Actuator	ØD = 285 mm · A = 320 cm² [1]			ØD = 390 mm · A = 640 cm²			
	Weight [kg]	42	47	55	75	95	250	270
0.2 to 1 bar	Height H [3] [4]	590		610	765	790	860	
	Actuator	ØD = 225 mm · A = 160 cm² [2]			ØD = 285 mm · A = 320 cm² [1]			
	Weight [kg]	42	47	55	75	95	250	270
0.5 to 1.5 bar	Height H [3] [4]	590		610	765	790	860	
	Actuator	ØD = 225 mm · A = 160 cm² [2]			ØD = 285 mm · A = 320 cm² [1]			
	Weight [kg]	42	47	55	75	95	250	270
1 to 2.5 bar	Height H [3] [4]	590		610	765	790	860	
	Actuator	ØD = 225 mm · A = 160 cm² [2]						
	Weight [kg]	42	47	55	75	95	250	270
Set point range 2 to 5 bar	Height H [3] [4]	590		610	765	790	860	
	Actuator	ØD = 225 mm · A = 160 cm²						
	Weight [kg]	42	47	55	75	95	250	270

[1] Optionally with 640 cm² actuator
[2] Optionally with 320 cm² actuator
[3] Actuators with metal cover H +135 mm
[4] Minimum clearance required to remove the actuator: +100 mm