

01 - 01.2

04.03.GB

**Self-acting regulators of differential pressure and
self-acting regulators of differential pressure with flow limitation
BEE line**



Procedure for designing of differential pressure regulator

Given: medium water, 70°C, static pressure at piping spot 800 kPa (8 bar), $\Delta p_{AVAIL} = 110$ kPa (1,1 bar), $\Delta p_{PIPELINE} = 10$ kPa (0,1 bar), $\Delta p_{APPLIANCE} = 20$ kPa (0,2 bar), $\Delta p_{VALVE} = 30$ kPa (0,3 bar), nominal flow rate $Q_{NOM} = 12$ m³.h⁻¹

First, we calculate kv values of differential pressure regulator according to the following equations:

$\Delta p_{RDT} = \Delta p_{AVAIL} - \Delta p_{SET}$, when

$\Delta p_{SET} = \Delta p_{VALVE} + \Delta p_{APPLIANCE} + \Delta p_{PIPELINE}$

$\Delta p_{RDT} = 110 - (30 + 20 + 10) = 50$ kPa (0,5 bar)

$$Kvs = \frac{Q_{NOM}}{\sqrt{\Delta p_{RDT}}} = \frac{12}{\sqrt{0,5}} = 17 \text{ m}^3 \cdot \text{h}^{-1}$$

Precautionary additions for process tolerances (provided that flow rate Q was not oversized):

$$Kvs = (1,1 \text{ to } 1,3) \cdot Kv = (1,1 \text{ to } 1,3) \cdot 17 = 18,7 \text{ to } 22,1 \text{ m}^3 \cdot \text{h}^{-1}$$

Now we choose the nearest higher Kvs value from those available in our catalogue, i.e. $Kvs = 22$ m³.h⁻¹. This value corresponds to nominal size of DN 40.

Then we select a required differential pressure value of the regulator; which is given by adding of pressure drops of the protected pipe section

$\Delta p_{SET} = \Delta p_{VALVE} + \Delta p_{APPLIANCE} + \Delta p_{PIPELINE} = 30 + 20 + 10 = 60$ kPa

Then we choose screwed pressure regulator DN 40, PN 16, with reducing pressure setting range 40 kPa to 100 kPa, and we will get the following specification code:

RD 122 D 2211 25/150-40/T

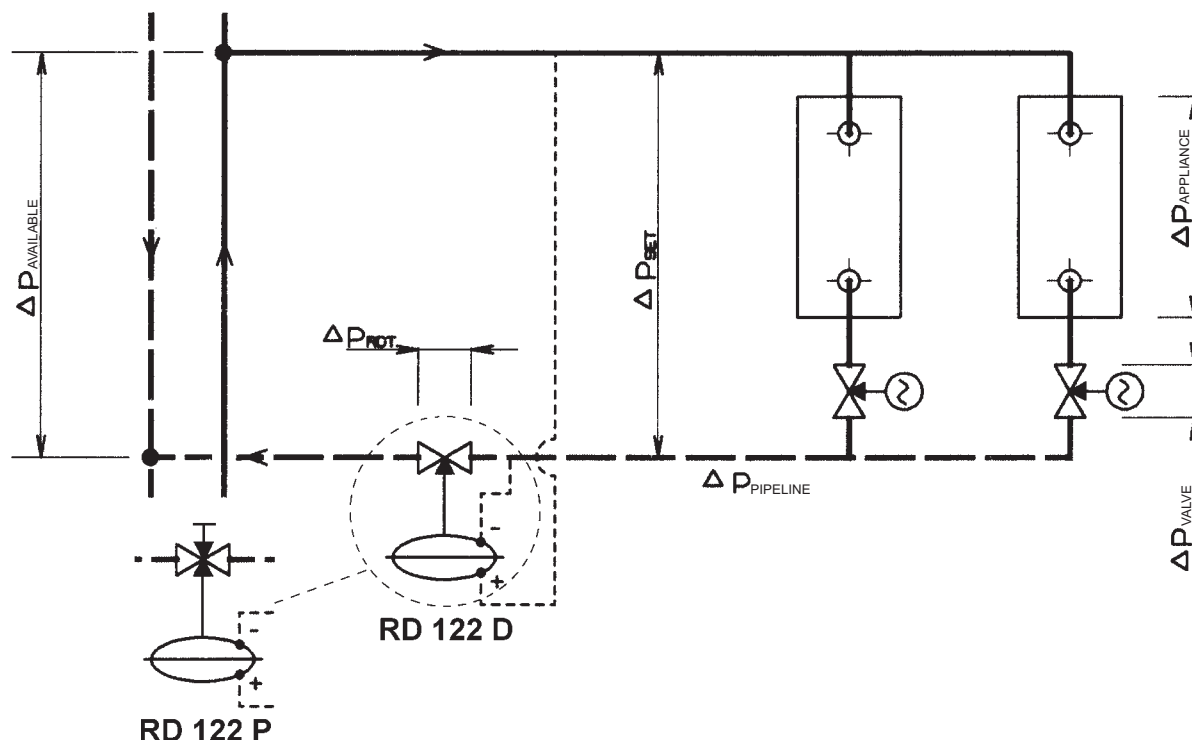
Differential pressure value Δp_{SET} required is set by adjusting screw according to the values on the manometer when piping the valve.

It is also possible to use execution of the reduction valve with flow limitation that enables to set the valve's Kvs value to the value required. In our case it should be the valve with the following specification code:

RD 122 P 2211 25/150-40/T

The setting of value of $Kvs = 17$ m³.h⁻¹ is carried out by adjusting the hand wheel of the flow limiter according to the diagram on page number 11, i.e. value of 22.

Scheme of typical regulation loop with differential pressure regulator at secondary side



Note: In cases that the differential pressure regulator is forced to work with high differential pressure ($\Delta p_{RDT} > 250$ kPa), the producer recommends to install both differential pressure regulator and control valves at primary line of the control loop. Such an installation ensures better working conditions for the regulator and better function of the whole system.

BEE line

RD 122 D



Self-acting regulator of differential pressure DN 15 - 50, PN 25

Description

Self-acting regulator of differential pressure series RD 122 D is designed to keep a constant differential pressure value of given appliance. Such a function is ensured by a diaphragm exposed to effects of inlet and outlet pressure of the appliance. Deflections of the diaphragm transfer to the valve plug and it closes the valve upon increase of differential pressure value. Owing to a pressure-balanced plug, value of differential pressure is not affected by pressure ratios within the valve. In case when required value of differential pressure is within range of two spring ranges, it is more suitable to choose the range with lower values to ensure sensitivity of the regulator. Connecting impulse pipes for extraction of pressure from the pipeline are within the scope of supply as standard.

Application

These valves are designed for applications in common warm-water and hot-water heating circuits, refrigerating and air-conditioning with max. differential pressure of 1,6 MPa.

Process media

Valves series RD 122 are suitable for process media such as water, air or low-pressure steam to 0,4 MPa. In addition, they are suitable for cooling mixtures and other non-aggressive media and gases with temperature range +2°C to +150°C. Sealing surfaces of the trim are resistant to common sludge or water impurities. Yet it is recommended to pipe a strainer in front of the valve to ensure a reliable function and tightness in case there are abrasive particles present in the process medium.

Installation

Basic operating position of regulator is when the body is above its controlling head that points downwards. The position must be kept especially when reducing steam pressure or when temperature exceeds 80 °C. For gases that have lower temperatures, the valve can be installed in any position.

Technical data

Series	RD 122 D
Execution	Self-acting regulator of differential pressure
Nominal diameter range	DN 15 to 50
Nominal pressure	PN 25
Body material	Spheroidal cast iron EN-JS1030
Plug material	Stainless steel 1.4006 / 17 027.6
Seat material	Stainless steel 1.4021 / 17 027.6
Stem material	Stainless steel 1.4305
Material of diaphragm and sealing	EPDM
Material of diaphragm chamber bonnets	Brass 42 3223
Operating temperature range	+2 to +150°C
Connection	Externally threaded coupling + screw joints Flanges with raised faces Externally threaded coupling + weld unions
Material of weld unions	DN 15 to 32 ... 1.0036 / 11 373.0 DN 40 and 50 ... 1.0308 / 11 353.0
Plug type	Contoured, pressure-balanced, with soft seat sealing
Kvs values	2,5 to 32 m ³ /hour
Leakage rate	Class IV. - S1 according to ČSN-EN 1349 (5/2001) (< 0.0005 % Kvs)
Range of adjustable diff. press. values	DN 15 to 25 10; 15 to 60; 30 to 210; 60 to 400 kPa DN 32 to 50 10; 20; 25 to 70; 40 to 220; 70 to 410 kPa
Δp_{set}	

The tolerance of setting of the end values of the range is 10% from the corresponding value of the range.

Dimensions and weights for RD 122 D../T with thread couplings and RD 122 D../W with weld unions

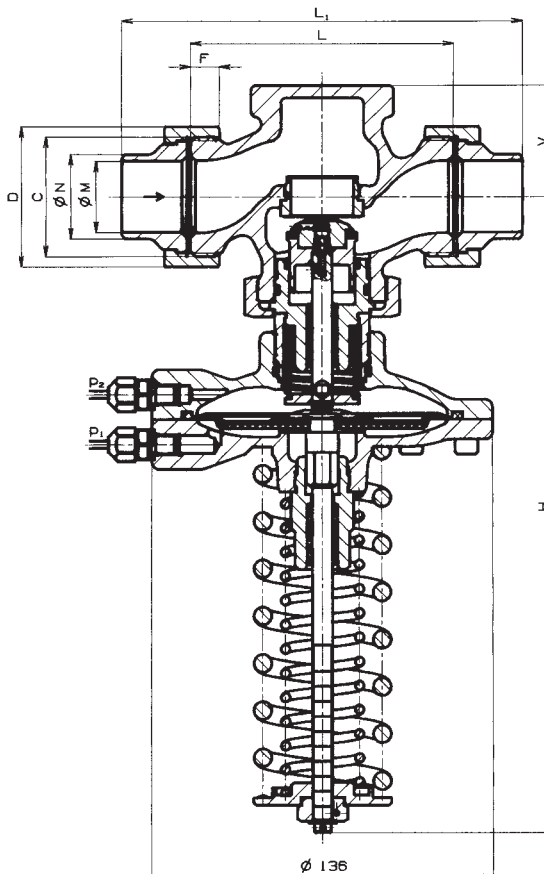
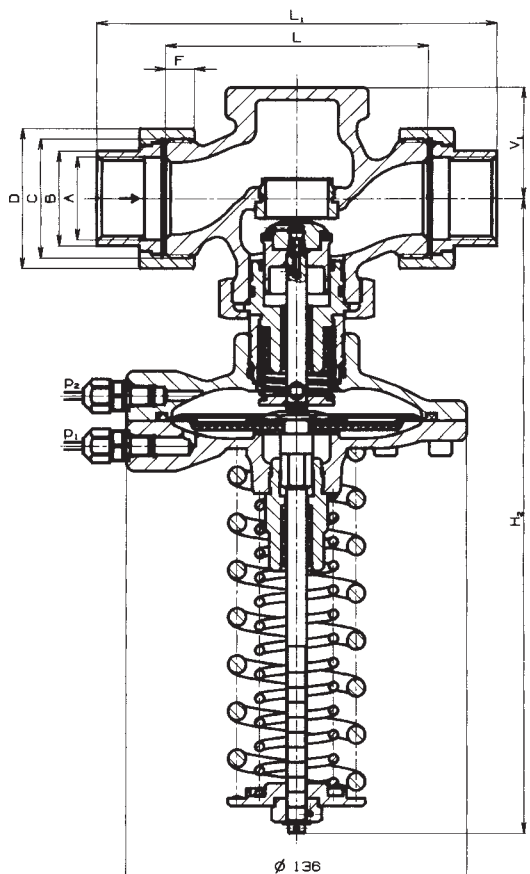
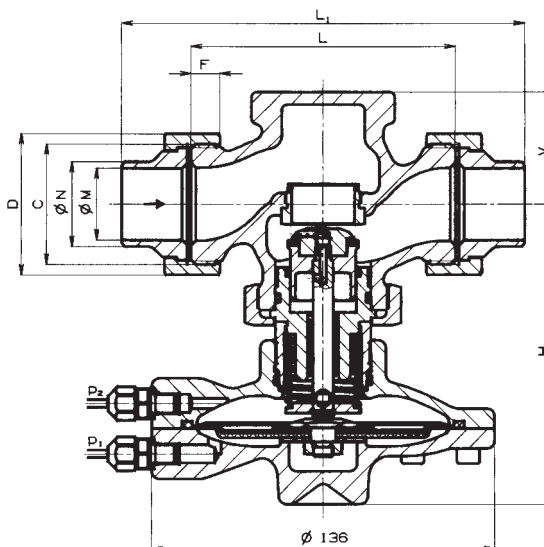
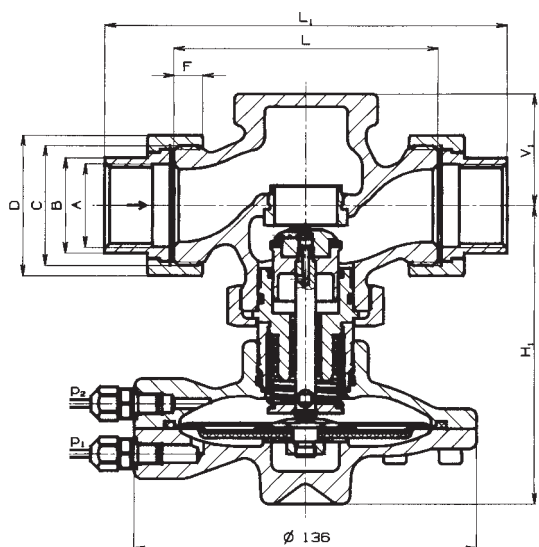
DN	L	L ₁	V ₁	H ₁ ¹⁾	H ₂ ²⁾	A	B	C	D	∅ M	∅ N	F	m ₁ ¹⁾	m ₂ ²⁾
	mm	mm	mm	mm	mm		mm		mm	mm	mm	mm	kg	kg
15	100	146	44.5	119	254	Rp 1/2	25	G 1	41	16.1	21.3	9	3.6	4.1
20	100	149	44.5	119	254	Rp 3/4	32	G 1 1/4	51	21.7	26.9	10	3.9	4.4
25	105	160	44.5	119	254	Rp 1	38	G 1 1/2	56	29.5	33.7	11	4.2	4.7
32	130	193	63	139	274	Rp 1 1/4	47	G 2	71	37.2	42.4	12	5.6	6.1
40	140	207	63	139	274	Rp 1 1/2	53	G 2 1/4	76	43.1	48.3	14	6.5	7.0
50	160	233	63	139	274	Rp 2	66	G 2 3/4	91	54.5	60.3	16	8.6	9.1

¹⁾ H₁, m₁ ... dimensions and weights for the valves with constant differential pressure value RD 122 D1

²⁾ H₂, m₂ ... dimensions and weights for the valves with adjustable differential pressure value RD 122 D2

Valves RD 122 D../T with thread couplings

Valves RD 122 D../W with weld unions



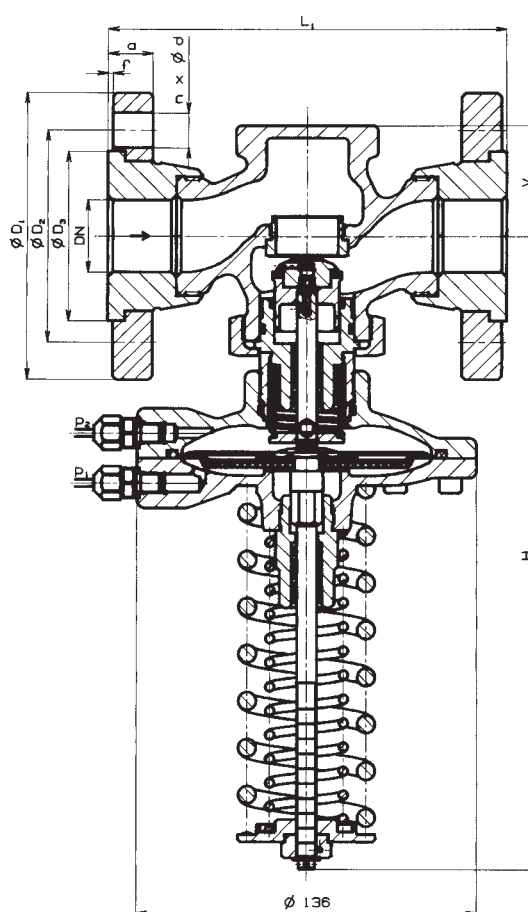
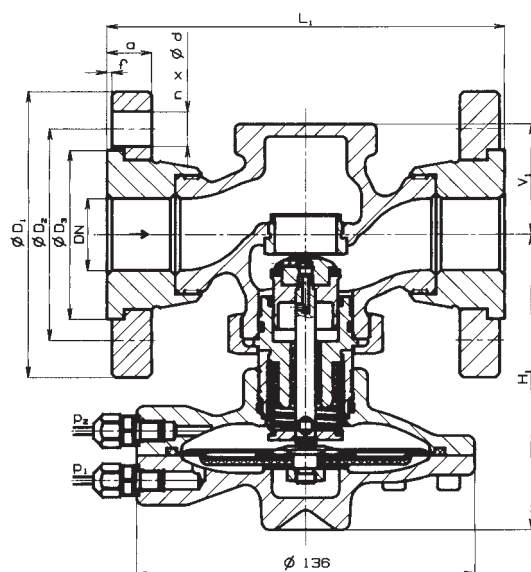
Dimensions and weights for RD 122 D../F with flange connection

DN	L_1	V_1	H_1 ¹⁾	H_2 ²⁾	$\varnothing D_1$	$\varnothing D_2$	$\varnothing D_3$	a	f	n	$\varnothing d$	m_1 ¹⁾	m_2 ²⁾
	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm	kg	kg
15	130	44.5	119	254	95	65	45	16	2	4	14	4.7	5.2
20	150	44.5	119	254	105	75	58	16	2	4	14	5.4	5.9
25	160	44.5	119	254	115	85	68	18	2	4	14	6.3	6.8
32	180	63	139	274	140	100	78	18	2	4	18	8.4	8.9
40	200	63	139	274	150	110	88	19	3	4	18	9.9	10.4
50	230	63	139	274	165	125	102	19	3	4	18	12.8	13.3

¹⁾ H_1, m_1 ... dimensions and weights for the valves with constant differential pressure value RD 122 D1

H_2, m_2 ... dimensions and weights for the valves with adjustable differential pressure value RD 122 D2

Valves RD 122 D../F with raised-faced flanges





Self-acting regulator of differential pressure with flow limitation DN 15 - 50, PN 25

Description

Self-acting regulator of differential pressure with flow limitation RD 122 P is designed especially to ensure maximum flow rate required in an appliance. Such a function is ensured by two plugs one of which is adjustable to the value required by the user, and the other is controlled by differential pressure with the aid of diaphragm head. Deflection of the diaphragm transfer to plug and it closes the valve upon the increase of differential pressure value. Pressure-balanced plugs ensure a reliable function and stability of set value within the whole of both available and differential pressure ranges. Connecting impulse pipes for extraction of pressure from the pipeline are within the scope of supply as standard.

Application

Application of the differential pressure regulator with flow limitation is suitable everywhere where there is a need to ensure nominal flow rate through an appliance at a maximum level and at the same time limit the output of extraction spot when starting etc.

These valves are designed for application in common warm-water and hot-water heating circuits, refrigerating and air-conditioning with max. differential pressure of 1,6 MPa.

Process media

Valves series RD 122 are suitable for process media such as water, air or low-pressure steam up to 0,4 Mpa of pressure. In addition, they are suitable for cooling mixtures and other non-aggressive media and gases with temperature range +2°C to +150°C. Sealing surfaces of the trim are resistant to common sludge or water impurities. Yet it is recommended to pipe a strainer in front of valve to ensure a reliable function and tightness in case there are abrasive particles present in the process medium.

Installation

Basic operating position of regulator is when the body is above its controlling head that points downwards. The position must be kept especially when reducing steam pressure or temperature exceeds 80°C. For gases that have lower temperatures, the valve can be installed in any position.

Technical data

Series	RD 122 D
Execution	Self-acting regulator of differential pressure with flow limitation
Nominal diameter range	DN 15 to 50
Nominal pressure	PN 25
Body material	Spheroidal cast iron EN-JS1030
Plug material	Stainless steel 1.4006 / 17 027.6
Seat material	Stainless steel 1.4021 / 17 022.6
Stem material	Stainless steel 1.4305
Material of diaphragm and sealing	EPDM
Material of diaphragm chamber bonnets	Brass 42 3223
Operating temperature range	+2 to +150°C
Connection	Externally threaded coupling + screw joints Flanges with raised faces Externally threaded coupling + weld unions
Material of weld unions	DN 15 to 32 ... 1.0036 / 11 373.0 DN 40 and 50 ... 1.0308 / 11 353.0
Plug type	Contoured, pressure-balanced, with soft seat sealing
Kvs values	2,5 to 28,5 m ³ /hour
Leakage rate	Class IV. - S1 according to ČSN-EN 1349 (5/2001) (< 0.0005 % Kvs)
Range of adjustable diff. press. value	DN 15 to 25 10; 15 to 60; 30 to 210; 60 to 400 kPa
Δp_{set}	DN 32 to 50 10; 20; 25 to 70; 40 to 220; 70 to 410 kPa

The tolerance of setting of the end values of the range is 10 % from the corresponding value of the range.

Dimensions and weights for RD 122 P../T with thread couplings and RD 122 P../W with weld unions

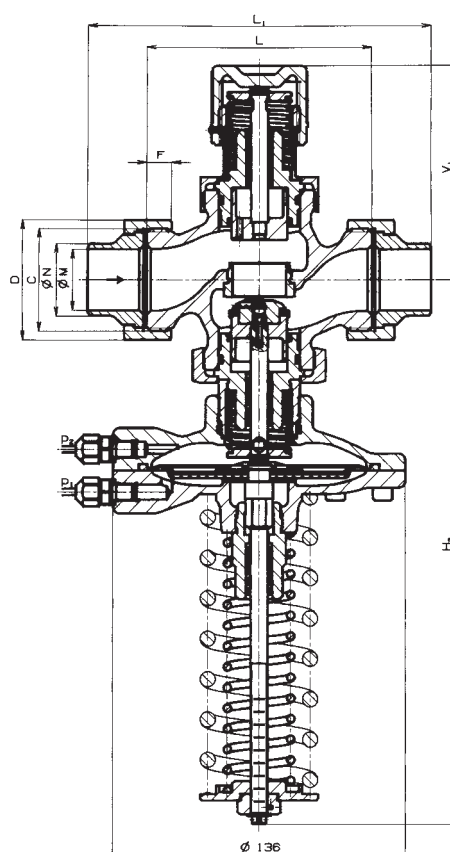
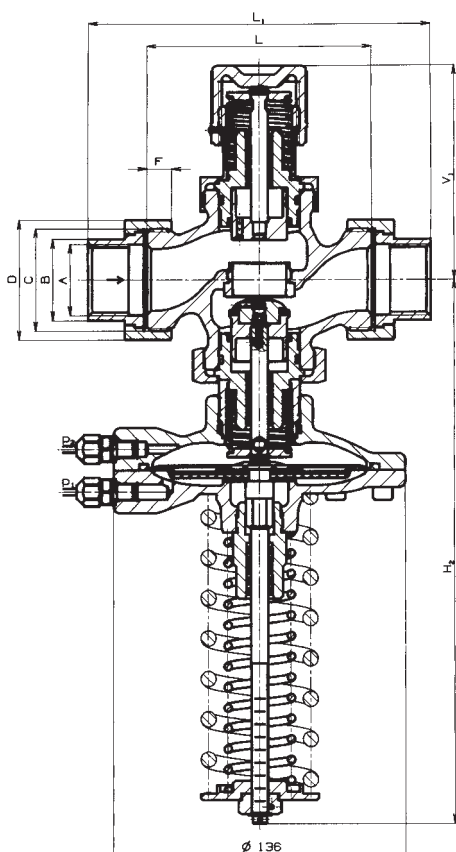
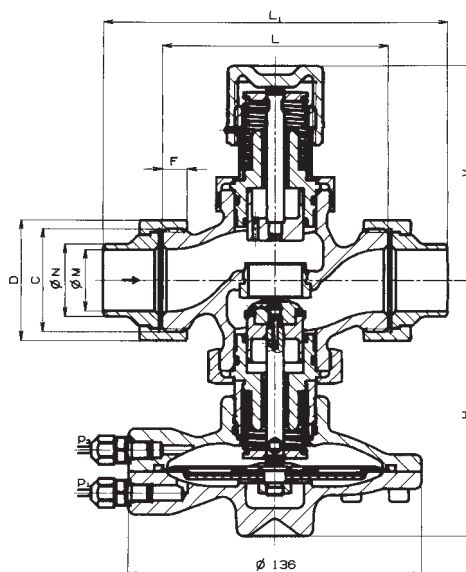
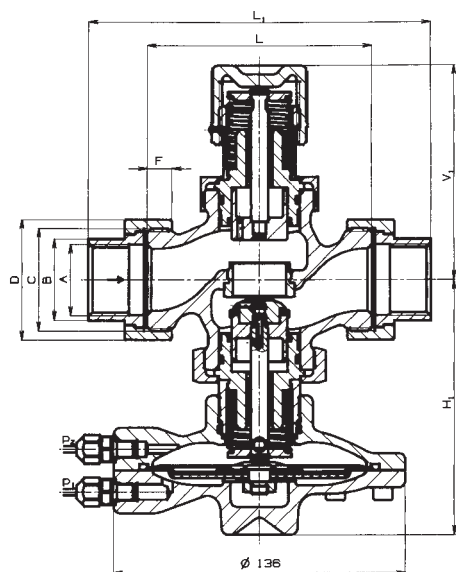
DN	L	L ₁	V ₂	H ¹⁾	H ₂ ²⁾	A	B	C	D	∅ M	∅ N	F	m ₁ ¹⁾	m ₂ ²⁾
	mm	mm	mm	mm	mm		mm		mm	mm	mm	mm	kg	kg
15	100	146	100	119	254	Rp 1/2	25	G 1	41	16.1	21.3	9	4.0	4.5
20	100	149	100	119	254	Rp 3/4	32	G 1 1/4	51	21.7	26.9	10	4.3	4.8
25	105	160	100	119	254	Rp 1	38	G 1 1/2	56	29.5	33.7	11	4.6	5.1
32	130	193	119	139	274	Rp 1 1/4	47	G 2	71	37.2	42.4	12	6.4	6.9
40	140	207	119	139	274	Rp 1 1/2	53	G 2 1/4	76	43.1	48.3	14	7.4	7.9
50	160	233	119	139	274	Rp 2	66	G 2 3/4	91	54.5	60.3	16	9.9	10.4

¹⁾ H₁, m₁ ... dimensions and weights for the valves with constant differential pressure value RD 122 P1

²⁾ H₂, m₂ ... dimensions and weights for the valves with adjustable differential pressure value RD 122 P2

Valves RD 122 P../T with thread couplings

Valves RD 122 P../W with weld unions



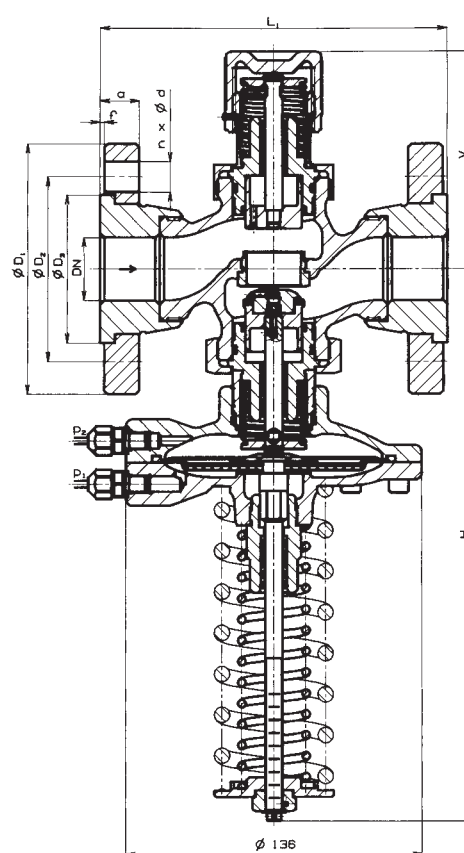
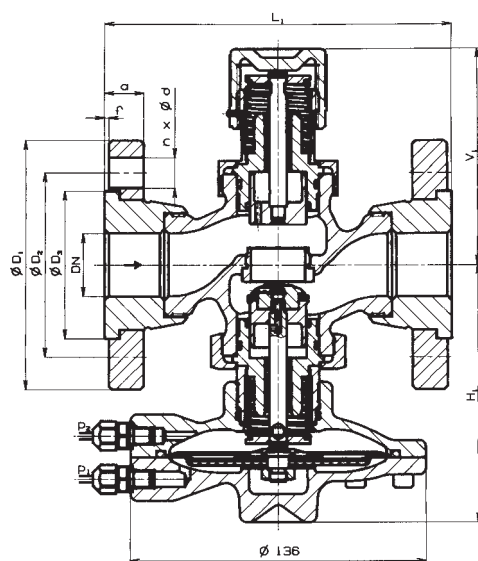
Dimensions and weights for RD 122 P../F with flange connection

DN	L_1	V_2	H_1 ¹⁾	H_2 ²⁾	$\varnothing D_1$	$\varnothing D_2$	$\varnothing D_3$	a	f	n	$\varnothing d$	m_1 ¹⁾	m_2 ²⁾
	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm	kg	kg
15	130	100	119	254	95	65	45	16	2	4	14	5.1	5.6
20	150	100	119	254	105	75	58	16	2	4	14	5.8	6.3
25	160	100	119	254	115	85	68	18	2	4	14	6.7	7.2
32	180	119	139	274	140	100	78	18	2	4	18	9.2	9.7
40	200	119	139	274	150	110	88	19	3	4	18	10.8	11.3
50	230	119	139	274	165	125	102	19	3	4	18	14.1	14.6

¹⁾ H_1, m_1 ... dimensions and weights of the valves with constant differential pressure value RD 122 P1

H_2, m_2 ... dimensions and weights of the valves with adjustable differential pressure values RD 122 P2

Valves RD 122 P../F with raised-faced flanges



Specification code for ordering of RD 122 D and RD 122 P

		XX	XXX	X	XXXX	XX	/	XXX	-	XX	/	X
1. Valve	Self-acting pressure regulator	RD										
2. Series	Pressure-balanced		122									
3. Function	Differential pressure regulator			D								
	Differential pressure regulator with flow limitation			P								
4. Execution	With constant differential pressure value					1						
	With adjustable differential pressure value					2						
5. Range of pressure setting	DN 15 to 25					11						
	10 kPa											
	15 to 60 kPa (red spring)					22						
	30 to 210 kPa (yellow spring)					23						
	60 to 400 kPa (black spring)					24						
	DN 32 to 50					10						
	10 kPa ¹⁾											
	20 kPa					11						
	25 to 70 kPa (red spring)					22						
	40 to 220 kPa (yellow spring)					23						
	70 to 410 kPa (black spring)					24						
6. Impulse pipeline	Standard 1,6 m					1						
	Extended 2,5 m					2						
7. Kvs	No. of the column of the Kvs values						X					
8. Pressure nominal	PN 25							25				
9. Max. operating temp. °C	150°C								150			
10. Nominal size	DN 15 to 50									XX		
11. Connection	Threaded couplings											T
	Flange PN 25 with raised-faced flanges											F
	Weld unions											W

Note: flange dimensions for PN 25, PN 16 and PN 10 in range of DN 15 - 50 remain the same.

Ordering example: RD 122 D 2411 25/150-25/T

Kvs values table

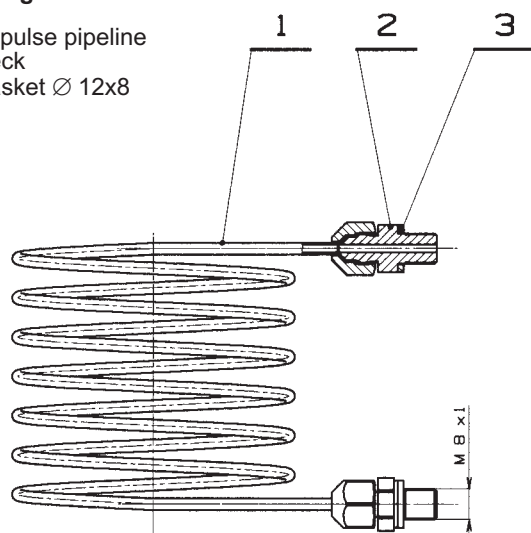
DN	Kvs [m ³ /hod]	
	1	2
15	5	2.5
20	8	---
25	10	---
32	15	---
40	21	---
50	32 (28,5)*	---

* The values in the parentheses apply to the version with flow limitation.

Accessories

Impulse pipeline for supply of pressure impulse into regulator

- 1 impulse pipeline
- 2 neck
- 3 gasket \varnothing 12x8



Welding coupling for connecting of impulse pipe

It is in the scope of supply as standard.

Made of: 1.0036 / 11 373.0
Ordering code: VM 43 0046

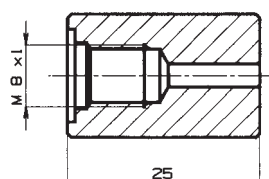
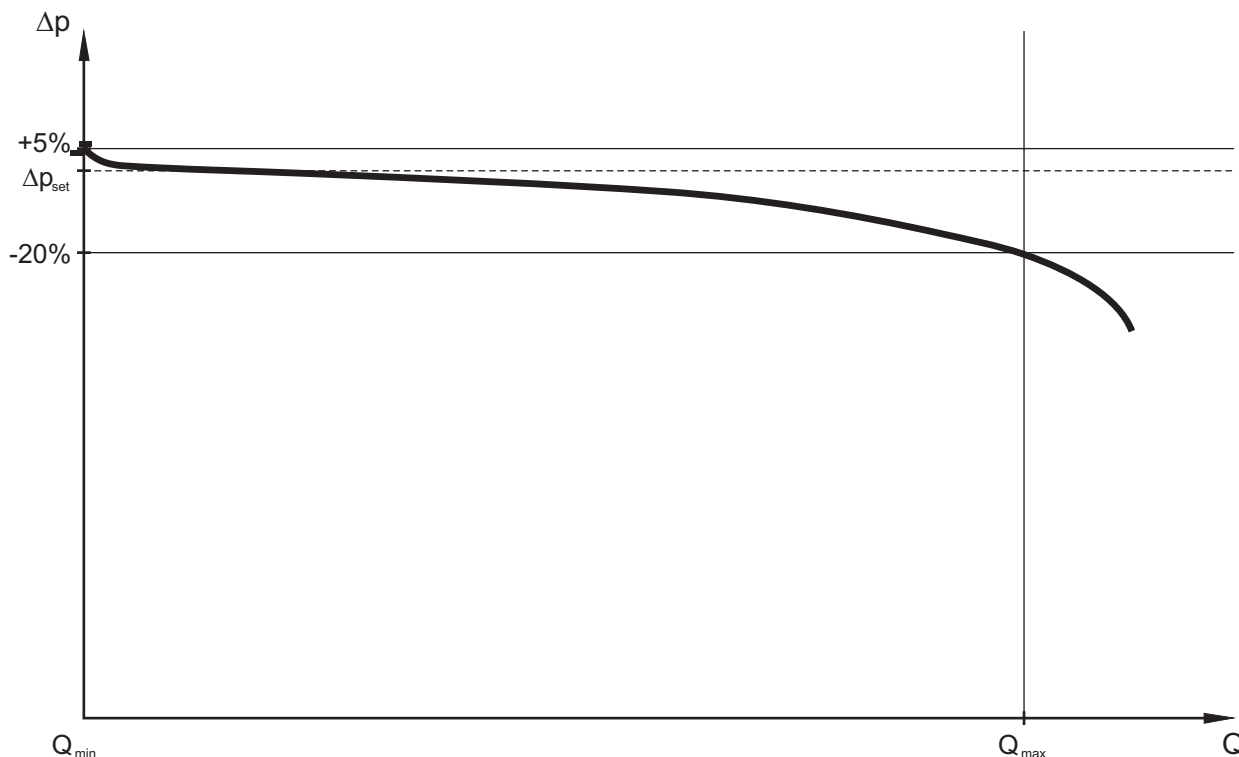


Diagram of behaviour of Δp of the protected line with flow rate Q in the circuit



The table specifying flow rate values Q_{max} [m³/h] for different Δp_{set} values

The values have been measured at total pressure drop $\Delta p_{AVAIL} = 2 \times \Delta p_{SET}$.

DN	Kvs	Δp_{SET} [kPa]								coefficient k
		10	25	40	60	80	100	180	400	
15	2.5	0.85	1.60	2.05	2.25	2.40	2.70	3.80	4.70	1
15	5	1.35	2.20	3.00	3.80	4.00	4.70	6.50	7.60	1.12
20	8	1.85	3.25	4.45	5.50	6.20	7.00	9.50	12.00	1.15
25	10	2.65	4.60	6.40	7.80	8.80	9.80	13.00	16.00	1.1

DN	Kvs	Δp_{SET} [kPa]								coefficient k
		10	20	30	45	65	100	180	400	
32	15	5.50	6.70	8.70	10.50	12.70	14.90	20.50	25.00	1
40	21	6.30	10.80	11.90	13.30	16.00	20.00	26.40	33.00	1.05
50	32	7.00	12.10	14.40	17.50	21.00	26.50	34.00	42.00	1.25

For in-between values of Δp_{SET} , it is possible to calculate an approximate value of Q_{MAX} according to the following formula:

$$Q_{max} = \frac{Kvs}{k} \cdot \sqrt{\frac{\Delta p_{SET}}{100}}$$

where: Δp_{SET} stands for set differential pressure value [kPa]
 k is correction coefficient [-]

For minimum flow rate Q_{min} the following applies: $Q_{min} = 0$.

RD 122 P - behaviour of Kvs value with flow limiter setting

