

Data sheet

# Flow controller (PN 25) AVQ - return and flow mounting

Description



AVQ is a self-acting flow controller primarily for use in district heating systems. The controller closes when set max. flow is exceeded.

The controller has a control valve with adjustable flow restrictor and an actuator with one control diaphragm.

**Main data:**

- DN 15-50
- $k_{vs}$  1.6-25 m<sup>3</sup>/h
- Flow range 0.03-15 m<sup>3</sup>/h
- PN 25
- Flow restrictor  $\Delta p$ : 0.2 bar
- Temperature:
  - Circulation water / glycolic water up to 30%: 2 ... 150 °C
- Connections:
  - Ext. thread (weld-on, thread and flange tailpieces)
  - Flange

Ordering

Example:  
Flow controller; DN 15;  $k_{vs}$  1.6; PN 25;  
flow restrictor  $\Delta p$  0.2 bar;  
 $T_{max}$  150 °C; ext. thread

- 1x AVQ DN 15 controller  
Code No: **003H6722**

Option:

- 1x Weld-on tailpieces  
Code No: **003H6908**

The controller will be delivered completely assembled, inclusive impulse tube between valve and actuator.

AVQ Controller

Picture	DN (mm)	$k_{vs}$ (m <sup>3</sup> /h)	Connection	Code No.	
	15	1.6	Cylindr. ext. thread acc. to ISO 228/1	<b>003H6722</b>	
		2.5		<b>003H6723</b>	
		4.0		<b>003H6724</b>	
	20	6.3		G 1 A	<b>003H6725</b>
	25	8.0		G 1¼ A	<b>003H6726</b>
	32	12.5		G 1¾ A	<b>003H6727</b>
	40	16		G 2 A	<b>003H6728</b>
	50	20	G 2½ A	<b>003H6729</b>	
	32	12.5	Flanges PN 25, acc. to EN 1092-2	<b>003H6730</b>	
	40	20		<b>003H6731</b>	
	50	25		<b>003H6732</b>	

Ordering (continuous)

Accessories

Picture	Type designation	DN	Connection	Code No.
	Weld-on tailpieces	15	-	003H6908
		20		003H6909
		25		003H6910
		32		003H6911
		40		003H6912
		50		003H6913
	External thread tailpieces	15	Conical ext. thread acc. to EN 10226-1	R 1/2 003H6902
		20		R 3/4 003H6903
		25		R 1 003H6904
		32		R 1 1/4 003H6905
		40		R 1 1/2 065B2004
		50		R 2 065B2005
	Flange tailpieces	15	Flanges PN 25, acc. to EN 1092-2	003H6915
		20		003H6916
		25		003H6917

Service kits

Picture	Type designation	DN	k <sub>vs</sub> (m <sup>3</sup> /h)	Code No.	
	Valve insert	15	1.6	003H6863	
			2.5	003H6864	
			4.0	003H6865	
		20	6.3	003H6866	
			25	8.0	003H6867
			32 / 40 / 50	12.5 / 16 / 20 / 25	003H6868
	Actuator	Fixed setting (bar)		Code No.	
		0.2		003H6841	

Technical data

Valve

Nominal diameter		DN	15		20	25	32	40	50		
k <sub>vs</sub> value		m <sup>3</sup> /h	1.6	2.5	4.0	6.3	8.0	12.5	16/20 <sup>4)</sup>	20/25 <sup>4)</sup>	
Range of max. flow setting	Δp <sub>b</sub> <sup>1)</sup> = 0.2 bar		from	0.03	0.07	0.07	0.16	0.2	0.4	0.8	0.8
			to	0.86	1.4	2.2	3.0	3.5	8.0	10	12
			or to <sup>3)</sup>	0.9	1.6	2.4	3.5	4.5	10	12	15
Cavitation factor z		≥ 0.6				≥ 0.55		≥ 0.5			
Leakage acc. to standard IEC 534		% of k <sub>vs</sub>	≤ 0.02				≤ 0.05				
Nominal pressure		PN	25								
Min. differential pressure		bar	see remark <sup>2)</sup>								
Max. differential pressure			20				16				
Medium		Circulation water / glycolic water up to 30%									
Medium pH		Min. 7, max. 10									
Medium temperature		°C	2 ... 150								
Connections	valve	External thread				External thread and flange					
	tailpieces	Weld-on and external thread									
		Flange				-					
<b>Materials</b>											
Valve body	thread	Red bronze CuSn5ZnPb (Rg5)							Ductile iron		
	flange	-							EN-GJS-400-18-LT (GGG 40.3)		
Valve seat		Stainless steel, mat. No. 1.4571									
Valve cone		Dezincing free brass CuZn36Pb2As									
Sealing		EPDM									
Pressure relieve system		Piston									

<sup>1)</sup> Δp<sub>b</sub> - differential pressure over flow restrictor

<sup>2)</sup> Depends on the flow rate and valve k<sub>vs</sub>; For Q<sub>set</sub> = Q<sub>max</sub> → Δp<sub>min</sub> ≥ 0.5 bar; For Q<sub>set</sub> < Q<sub>max</sub> → Δp<sub>min</sub> =  $\left(\frac{Q}{k_{vs}}\right)^2 + \Delta p_b$

<sup>3)</sup> Higher max flow are achieved at higher differential pressures over AVQ controller. In general at Δp > 1-1.5 bar

<sup>4)</sup> Flange valve body

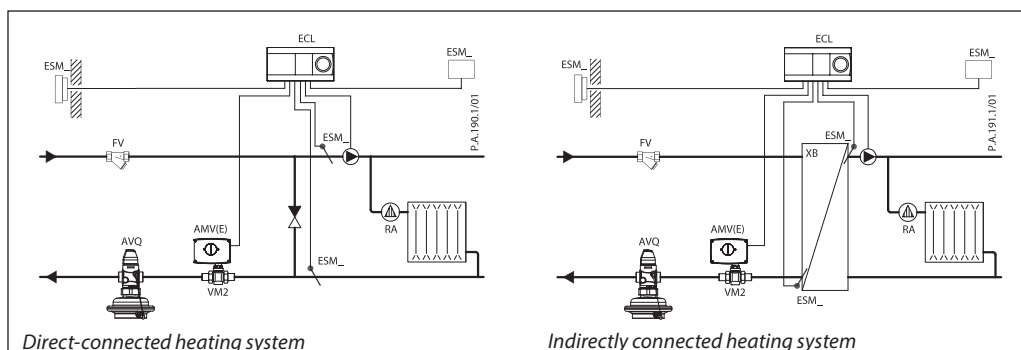
Technical data (continuous)

Actuator

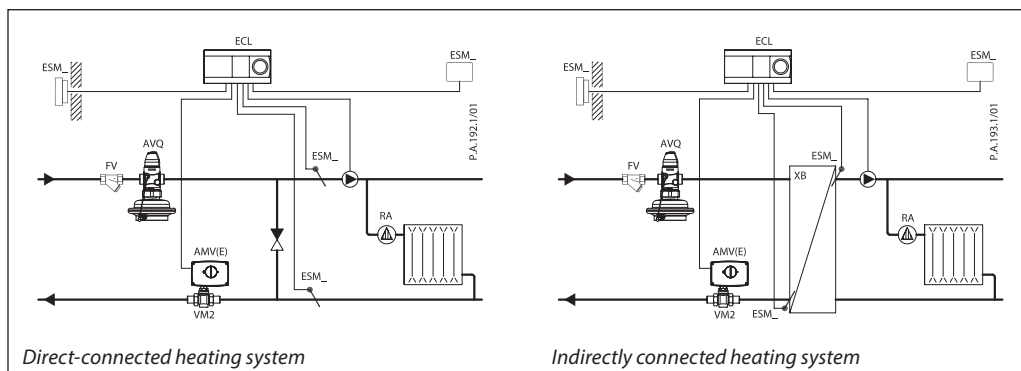
Type		AVQ
Actuator size	cm <sup>2</sup>	54
Nominal pressure	PN	25
Flow restrictor diff. pressure	bar	0.2
<b>Materials</b>		
Actuator housing	Upper casing of diaphragm	Stainless steel, mat. No.1.4301
	Lower casing of diaphragm	Dezincing free brass CuZn36Pb2As
Diaphragm		EPDM
Impulse tube		Copper tube Ø 6 x 1 mm

Application principles

- Return mounting



- Flow mounting



Installation positions

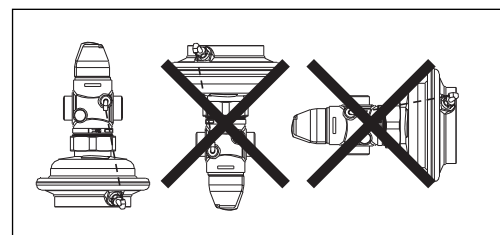
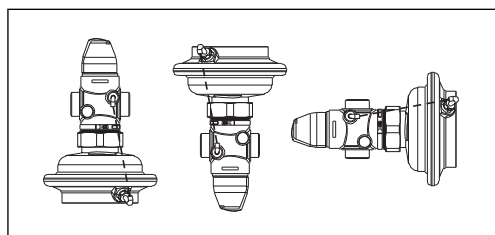
Up to medium temperature of 100°C the controllers can be installed in any position.

For higher temperatures the controllers have to be installed in horizontal pipes only, with a pressure actuator oriented downwards.

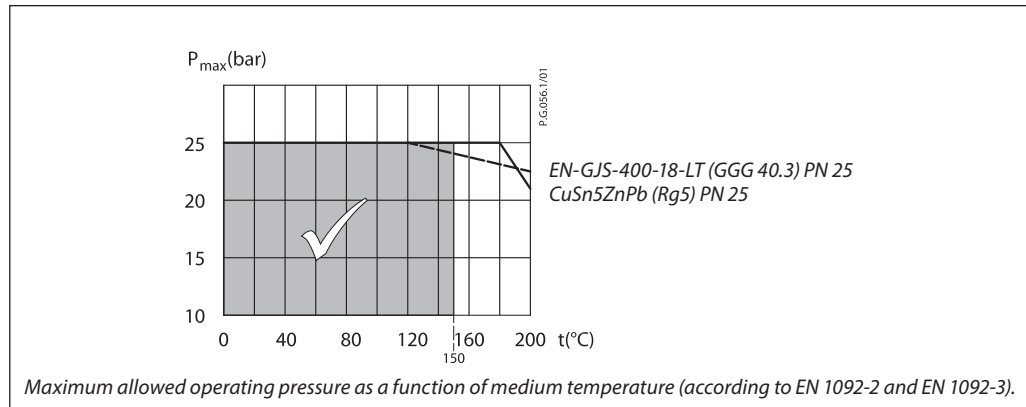
Electrical actuator

**Note!**

Installation positions for electrical actuators AMV(E) have to be observed as well. Please see relevant Data Sheet.



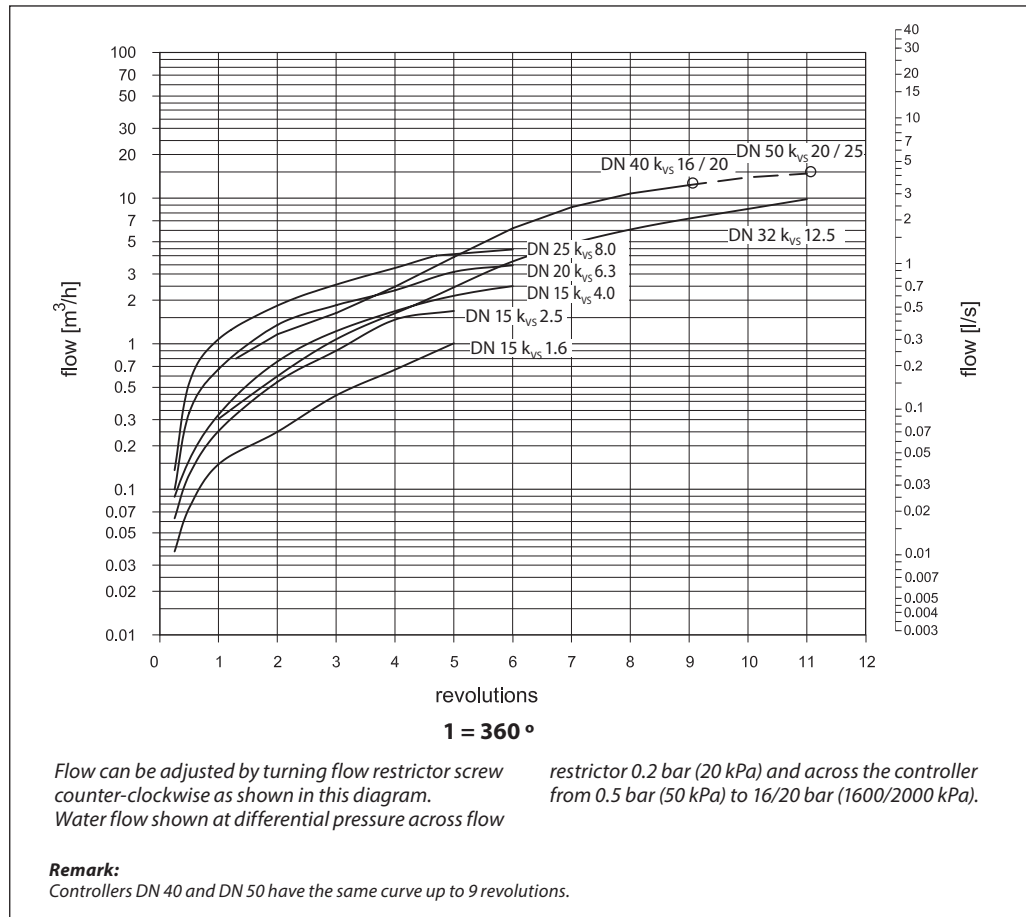
Pressure temperature diagram



Flow diagram

Sizing and setting diagram

Relation between actual flow and number of revolutions on flow restrictor. Values given are approximate.



**Note:**

For max flow setting on the controller diagrams from Instructions should be used.

**Sizing**

- Directly connected heating system

**Example 1**

Motorised control valve (MCV) for mixing circuit in direct-connected heating system requires differential pressure of 0.3 bar (30 kPa) and flow less than 600 l/h.

Select controller from flow diagram, page 4, with the smallest possible  $k_{VS}$  value considering available flow ranges.

Given data:

- $Q_{max} = 0.6 \text{ m}^3/\text{h}$  (600 l/h)
- $\Delta p_{min} = 0.9 \text{ bar}$  (90 kPa)
- $\Delta p_{circuit}^1 = 0.1 \text{ bar}$  (10 kPa)
- $\Delta p_{MCV} = 0.3 \text{ bar}$  (30 kPa) selected
- $\Delta p_b^2 = 0.2 \text{ bar}$  (20 kPa)

$$k_{VS} = 1.6 \text{ m}^3/\text{h}$$

The min. required differential pressure across the selected controller is calculated from the formula:

$$\Delta p_{AVQ,MIN} = \left( \frac{Q_{max}}{k_{VS}} \right)^2 + \Delta p_b = \left( \frac{0,6}{1,6} \right)^2 + 0,2$$

Remark:

<sup>1)</sup>  $\Delta p_{circuit}$  corresponds to the required pump pressure in the heating circuit and is not to be considered when sizing the AVQ.

<sup>2)</sup>  $\Delta p_b$  is differential pressure over flow restrictor.

$$\Delta p_{AVQ,MIN} = 0.34 \text{ bar} \text{ (34 kPa)}$$

$$\Delta p_{AVQ,A} > \Delta p_{AVQ,MIN}$$

The total (available) pressure loss across the controller is:

$$0.6 \text{ bar} > 0.34 \text{ bar}$$

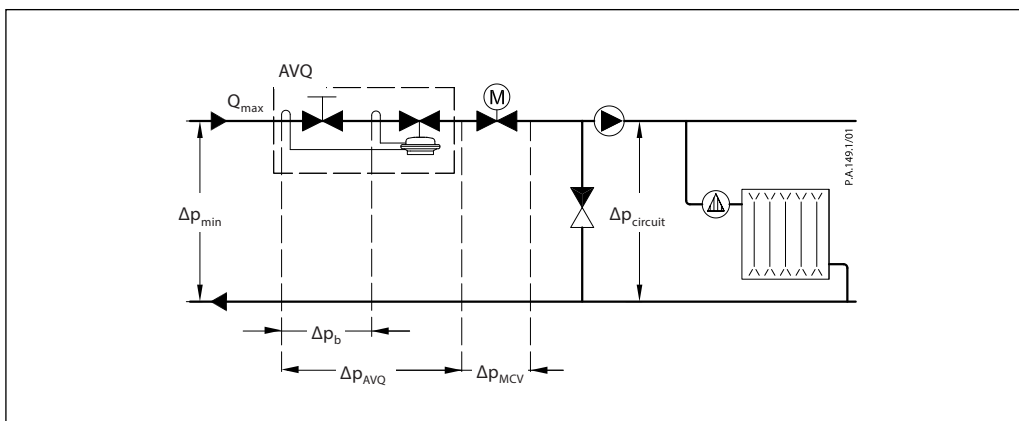
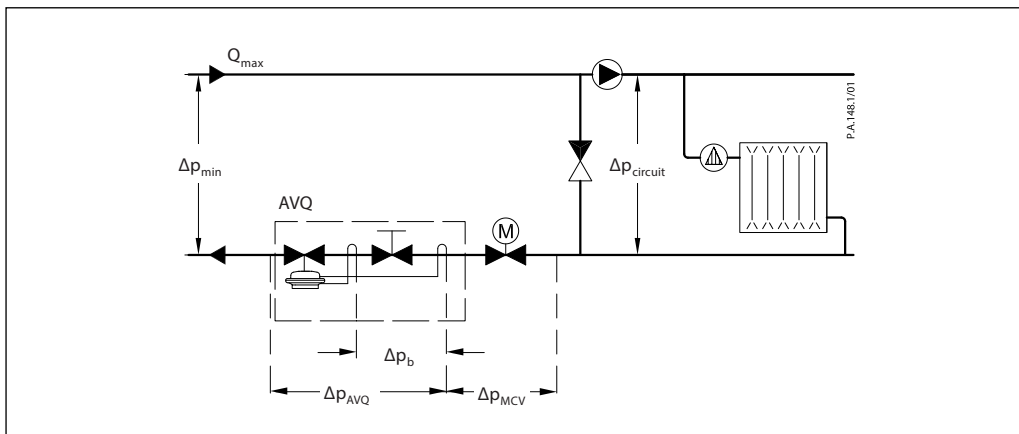
$$\Delta p_{AVQ,A} = \Delta p_{min} - \Delta p_{MCV} = 0.9 - 0.3$$

$$\Delta p_{AVQ,A} = 0.6 \text{ bar} \text{ (60 kPa)}$$

Solution:

The example selects AVQ DN 15;  $k_{VS}$  value 1.6; flow setting range 0.03-0.9  $\text{m}^3/\text{h}$ .

Possible pipe pressure losses in tubes, shut-off fittings, heatmeters, etc. are not included.



**Sizing** (continuous)

- Indirectly connected heating system

**Example 2**

Motorised control valve (MCV) for indirectly connected heating system requires differential pressure of 0.3 (30 kPa) bar and flow less than 1900 l/h.

Given data:

- $Q_{max}$  = 1.9 m<sup>3</sup>/h (1900 l/h)
- $\Delta p_{min}$  = 1.1 bar (110 kPa)
- $\Delta p_{exchanger}$  = 0.1 bar (10 kPa)
- $\Delta p_{MCV}$  = 0.3 bar (30 kPa) selected
- $\Delta p_b^{1)}$  = 0.2 bar (20 kPa)

Remark:

<sup>1)</sup>  $\Delta p_b$  is differential pressure over flow restrictor

The total (available) pressure loss across the controller is:

$$\Delta p_{AVQ,A} = \Delta p_{min} - \Delta p_{exchanger} - \Delta p_{MCV}$$

$$= 1.1 - 0.1 - 0.3$$

$$\Delta p_{AVQ,A} = 0.7 \text{ bar (70 kPa)}$$

Possible pipe pressure losses in tubes, shut-off fittings, heatmeters, etc. are not included.

Select controller from flow diagram, page 4, with the smallest possible  $k_{VS}$  value considering available flow ranges.

$$k_{VS} = 4.0 \text{ m}^3/\text{h}$$

The min. required differential pressure across the selected controller is calculated from the formula:

$$\Delta p_{AVQ,MIN} = \left( \frac{Q_{max}}{k_{VS}} \right)^2 + \Delta p_b = \left( \frac{1.9}{4.0} \right)^2 + 0.2$$

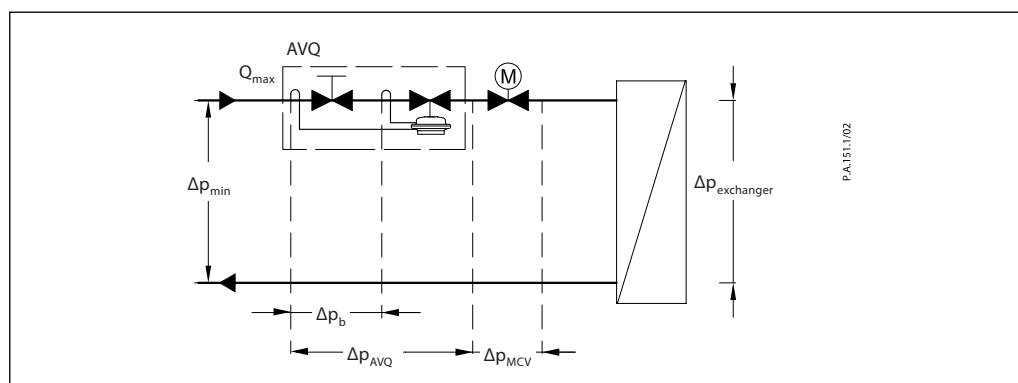
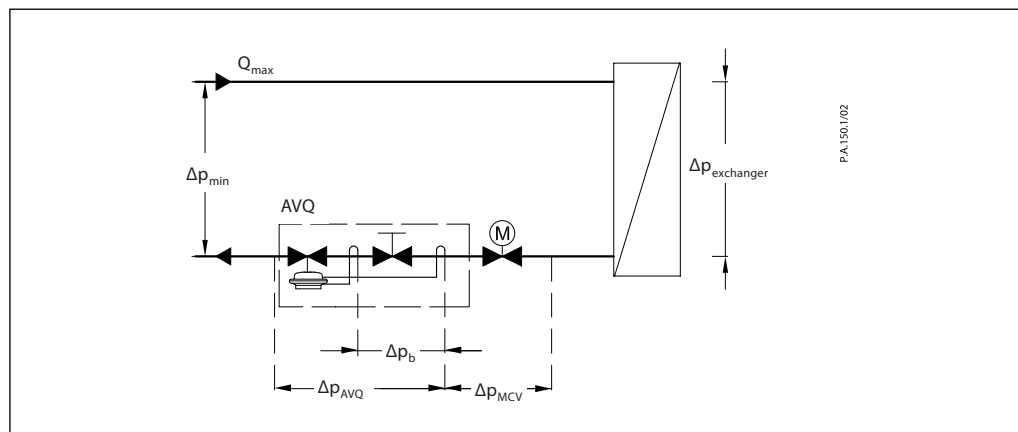
$$\Delta p_{AVQ,MIN} = 0.43 \text{ bar (43 kPa)}$$

$$\Delta p_{AVQ,A} > \Delta p_{AVQ,MIN}$$

$$0.7 \text{ bar} > 0.43 \text{ bar}$$

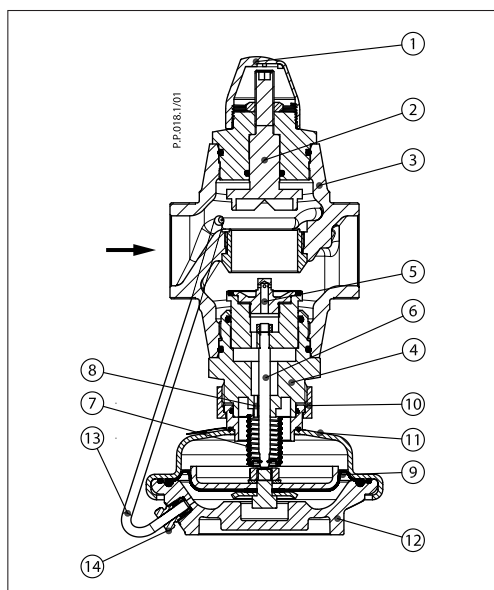
**Solution:**

The example selects AVQ; DN 15;  $k_{VS}$  value 4.0; flow setting range 0.07-2.4 m<sup>3</sup>/h.



**Design**

- 1. Cover
- 2. Adjustable flow restrictor
- 3. Valve body
- 4. Valve insert
- 5. Pressure relieved valve cone
- 6. Valve stem
- 7. Built-in spring for flow rate control
- 8. Control drain
- 9. Control diaphragm
- 10. Union nut
- 11. Upper casing of diaphragm
- 12. Lower casing of diaphragm
- 13. Impulse tube
- 14. Compression fitting for impulse tube



**Function**

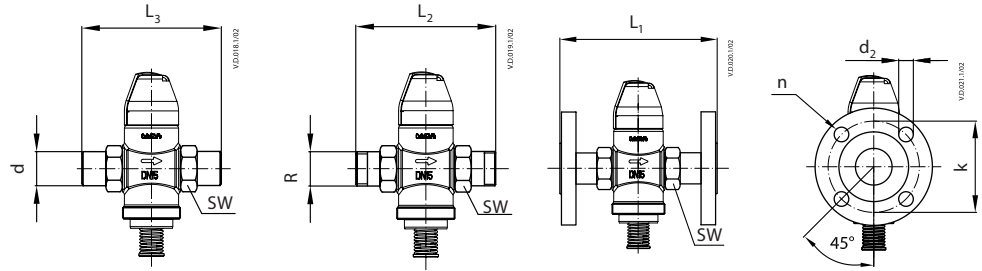
Flow volume causes pressure drop across the adjustable flow restrictor. Resulting pressures are being transferred through the impulse tubes and/or control drain in the actuator stem to the actuator chambers and act on control diaphragm for flow control. The flow restrictor diff. pressure is controlled and limited by means of built-in spring for flow control. Control valve closes on rising differential pressure and opens on falling differential pressure to control max flow.

**Settings**

*Flow setting*

Flow setting is being done by the adjustment of the flow restrictor position. The adjustment can be performed on the basis of flow adjustment diagram (see relevant instructions) and/or by the means of heat meter.

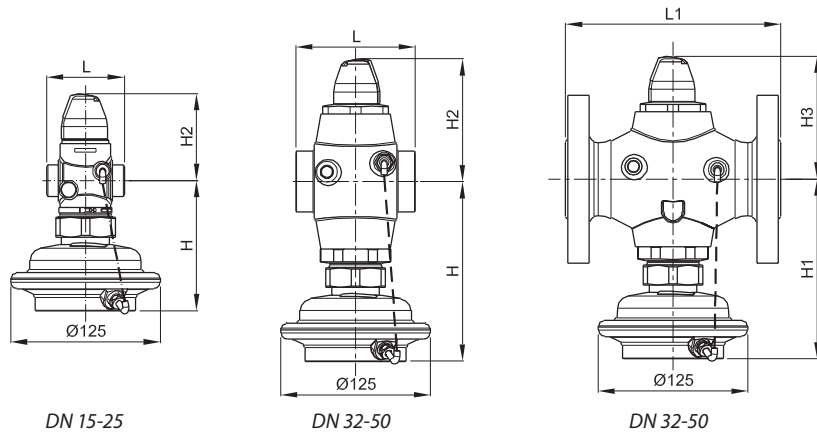
Dimensions



DN	R <sup>1)</sup>	SW	d	L <sub>1</sub> <sup>2)</sup>	L <sub>2</sub>	L <sub>3</sub>	k	d <sub>2</sub>	n
15	½	32 (G ¾A)	21	130	120	139	65	14	4
20	¾	41 (G 1A)	26	150	131	154	75	14	4
25	1	50 (G 1¼A)	33	160	145	159	85	14	4
32	1¼	63 (G 1¾A)	42	-	177	184	100	18	4
40	1½	70 (G 2A)	47	-	200	204	110	18	4
50	2	82 (G 2½A)	60	-	244	234	125	18	4

<sup>1)</sup> Conical ext. thread acc. to EN 10226-1

<sup>2)</sup> Flanges PN 25, acc. to EN 1092-2



DN 15-25

DN 32-50

DN 32-50

DN		15	20	25	32	40	50
L	mm	65	70	75	100	110	130
L <sub>1</sub>		-	-	-	180	200	230
H		109	109	109	150	150	150
H <sub>1</sub>		-	-	-	150	150	150
H <sub>2</sub>		73	73	76	103	103	103
H <sub>3</sub>		-	-	-	103	103	103
Weight (thread)		kg	2.7	2.7	2.9	5.3	5.5
Weight (flange)	-		-	-	9.8	11.4	13.5

**Note:** other flange dimensions-see table for tailpieces.