

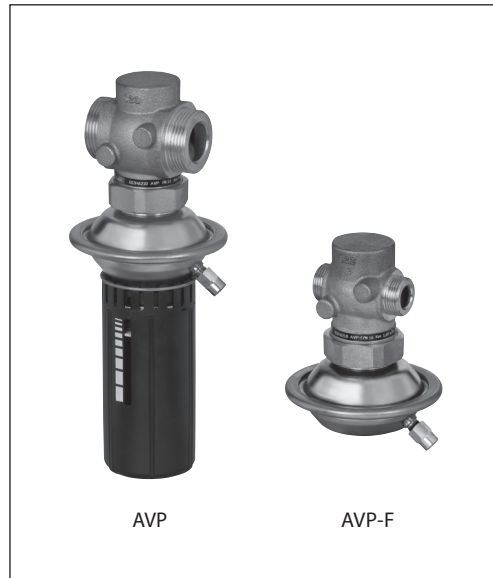


Data sheet

# Differential pressure controller (PN 16)

**AVP** - return and flow mounting, adjustable setting  
**AVP-F** - return mounting, fixed setting

Description



AVP(-F) is a self-acting differential pressure controller primarily for use in district heating systems. The controller closes on rising differential pressure. The controller has a control valve, an actuator with one control diaphragm and handle for differential pressure setting (fixed setting version is without handle).

**Main data:**

- DN 15-32
- $k_{vs}$  0.4-10 m<sup>3</sup>/h
- PN 16
- Setting range (AVP): 0.05-0.5 bar / 0.2-1.0 bar / 0.8-1.6 bar
- Fixed setting (AVP-F): 0.2 bar / 0.3 bar / 0.5 bar
- Temperature:
  - Circulation water / glycolic water up to 30%: 2 ... 150 °C
- Connections:
  - Ext. thread (weld-on, thread and flange tailpieces)

Ordering

AVP Controller (return mounting)

Picture	DN (mm)	$k_{vs}$ (m <sup>3</sup> /h)	Connection		$\Delta p$ setting range (bar)	Code No.	$\Delta p$ setting range (bar)	Code No.	$\Delta p$ setting range (bar)	Code No.
	15	1.6	Cylindr. ext. thread acc. to ISO 228/1	G 3/4 A	0.05-0.5	003H6200	0.2-1.0	003H6206	0.8-1.6	003H6212
		2.5				003H6201		003H6207		003H6213
		4.0				003H6202		003H6208		003H6214
		6.3				003H6203		003H6209		003H6215
	25	8.0	G 1 A	003H6204		003H6210		003H6216		
	32	10	G 1 1/4 A	003H6205		003H6211		003H6217		
			G 1 3/4 A							

Example 1:  
Differential pressure controller; return mounting; DN 15;  $k_{vs}$  1.6; PN 16; setting range 0.2-1.0 bar;  $T_{max}$  150 °C; ext. thread;

- 1x AVP DN 15 controller Code No: .
- 1x Impulse tube set AV, R 1/8 Code No: .

Option:

- 1x Weld-on tailpieces Code No: .

The controller will be delivered completely assembled, inclusive impulse tube between valve and actuator. External impulse tube (AV) must be ordered separately.

AVP Controller (flow mounting)

Picture	DN (mm)	$k_{vs}$ (m <sup>3</sup> /h)	Connection		$\Delta p$ setting range (bar)	Code No.	$\Delta p$ setting range (bar)	Code No.
	15	0.4	Cylindr. ext. thread acc. to ISO 228/1	G 3/4 A	0.05-0.5	-	0.2-1.0	003H6947 <sup>1)</sup>
		1.0				-		003H6948 <sup>1)</sup>
		1.6				003H6238		003H6244
		2.5				003H6239		003H6245
		4.0				003H6240		003H6246
		6.3				003H6241		003H6247
	20	8.0	G 1 A	003H6242		003H6248		
	25	10	G 1 1/4 A	003H6243		003H6249		
	32		G 1 3/4 A					

<sup>1)</sup> This version of controller can be mounted in return or in flow pipe. When ordering 2 impulse tube sets AV (instead of 1) should be ordered (see ordering example 2).

Ordering (continuous)

AVP-F Controller (return mounting)

Picture	DN (mm)	k <sub>vs</sub> (m <sup>3</sup> /h)	Connection	Δp setting range (bar)	Code No.	Δp setting range (bar)	Code No.	Δp setting range (bar)	Code No.	
	15	1.6	Cylindr. ext. thread acc. to ISO 228/1	0.2	003H6218	0.3	003H6224	0.5	003H6230	
		2.5			003H6219				003H6225	003H6231
		4.0			003H6220				003H6226	003H6232
		6.3			003H6221				003H6227	003H6233
		8.0			003H6222				003H6228	003H6234
	20	6.3	G 1 A	0.2	003H6223	0.3	003H6229	0.5	003H6235	
	25	8.0	G 1 ¼ A							
			G 1 ½ A							
			G 1 ¾ A							
			G 2 A							

Example 2:  
Differential pressure controller; flow mounting; DN 15; k<sub>vs</sub> 0.4; PN 16; setting range 0.2-1.0 bar; T<sub>max</sub> 150 °C; ext. thread;

- 1x AVP DN 15 controller  
Code No: **003H6947**
- 1x Impulse tube set AV, R 1/8  
Code No: **003H6852**

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

The controller will be delivered completely assembled, inclusive impulse tube between valve and actuator. External impulse tube (AV) must be ordered separately.

Accessories

Picture	Type designation	DN	Connection	Code No.
	Weld-on tailpieces	15	-	003H6908
		20		003H6909
		25		003H6910
		32		003H6911
	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 ¼ 003H6905
	Flange tailpieces	15	Flanges PN 25, acc. to EN 1092-2	003H6915
		20		003H6916
		25		003H6917
	Impulse tube set AV	Description: - 1x copper tube Ø 6 × 1 × 1500 mm - 1x compression fitting <sup>1)</sup> for imp. tube connection to pipe Ø 6 × 1 mm		R 1/8 003H6852
				R 3/8 003H6853
				R 1/2 003H6854
				<sup>1)</sup> 10 compression fittings for imp. tube connection to pipe, Ø 6 × 1 mm R 1/8 003H6857
				<sup>1)</sup> 10 compression fittings for imp. tube connection to pipe, Ø 6 × 1 mm R 3/8 003H6858
				<sup>1)</sup> 10 compression fittings for imp. tube connection to pipe, Ø 6 × 1 mm R 1/2 003H6859
				<sup>1)</sup> 10 compression fittings for imp. tube connection to actuator, Ø 6 × 1 mm G 1/8 003H6931
	Shut off valve Ø 6 mm			003H0276

<sup>1)</sup> Compression fitting consists of a nipple, compression ring and nut.

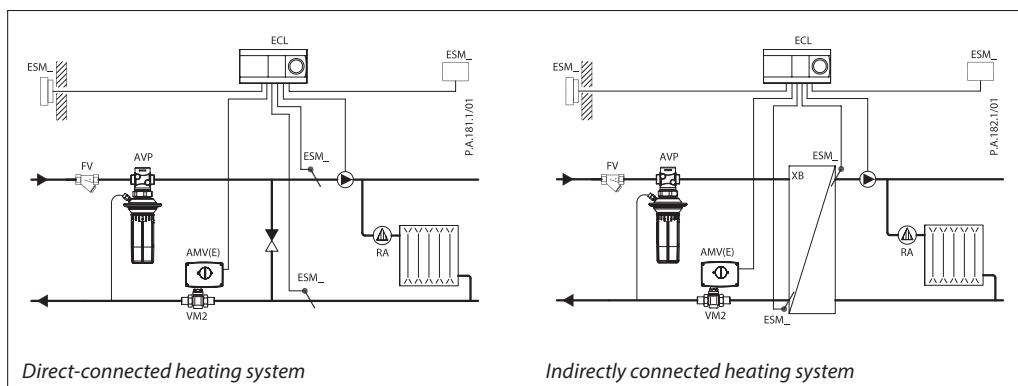
Service kits

Picture	Type designation	DN	k <sub>vs</sub> (m <sup>3</sup> /h)	Code No.		
				AVP(-F) return	AVP(-F) flow	
	Valve insert	15	0.4	-	003H6869	
			1.0	-	003H6870	
			1.6	003H6863	003H6871	
			2.5	003H6864	003H6872	
			4.0	003H6865	003H6873	
		20	6.3	003H6866	003H6874	
		25	8.0	003H6867	003H6875	
32	10					
	Actuator with adjustable handle (AVP)			003H6821	003H6823	
						0.05-0.5
						0.2-1.0
	Actuator without adjustable handle (AVP-F)				003H6822	003H6824
				003H6825	-	
						0.2
						0.3
			0.5			



**Application principles**

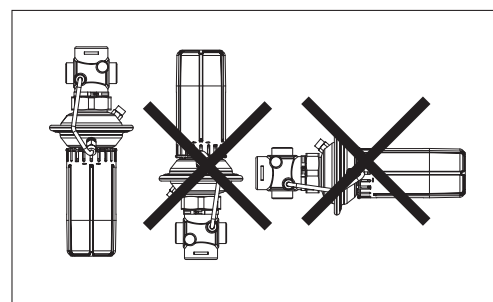
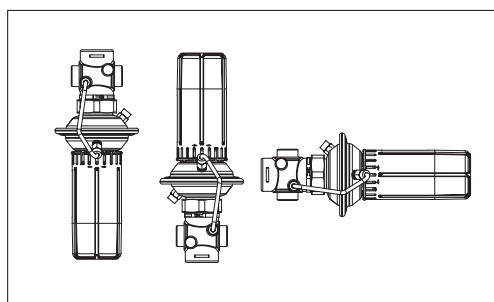
- Flow mounting



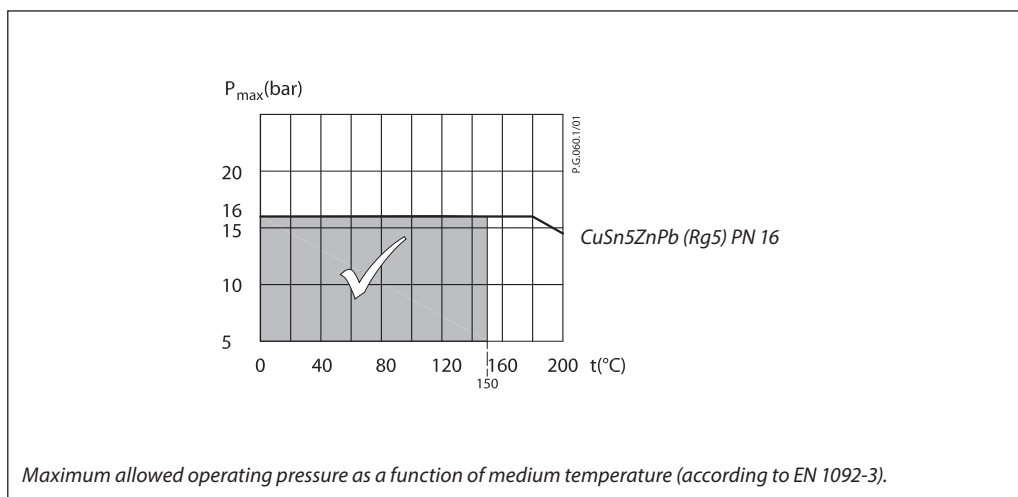
**Installation positions**

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.



**Pressure temperature diagram**



**Sizing**

- Directly connected heating system

**Example 1**

Motorised control valve (MCV) for mixing circuit in direct-connected heating system requires differential pressure of 0.2 bar (20 kPa).

Given data:

- $Q_{max}$  = 1.3 m<sup>3</sup>/h (1300 l/h)
- $\Delta p_{min}$  = 0.7 bar (70 kPa)
- \* $\Delta p_{circuit}$  = 0.1 bar (10 kPa)
- $\Delta p_{MCOV}$  = 0.2 bar (20 kPa) selected

**\*Remark**

$\Delta p_{circuit}$  corresponds to the required pump pressure in the heating circuit and is not to be considered when sizing the AVP

The differential pressure set value is:

$$\Delta p_{set\ value} = \Delta p_{MCOV}$$

$$\Delta p_{set\ value} = 0.2\ bar\ (20\ kPa)$$

The total pressure loss across the controller is:

$$\Delta p_{AVP} = \Delta p_{min} - \Delta p_{MCOV} = 0.7 - 0.2$$

$$\Delta p_{AVP} = 0.5\ bar\ (50\ kPa)$$

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

$k_v$  value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AVP}}} = \frac{1.3}{\sqrt{0.5}}$$

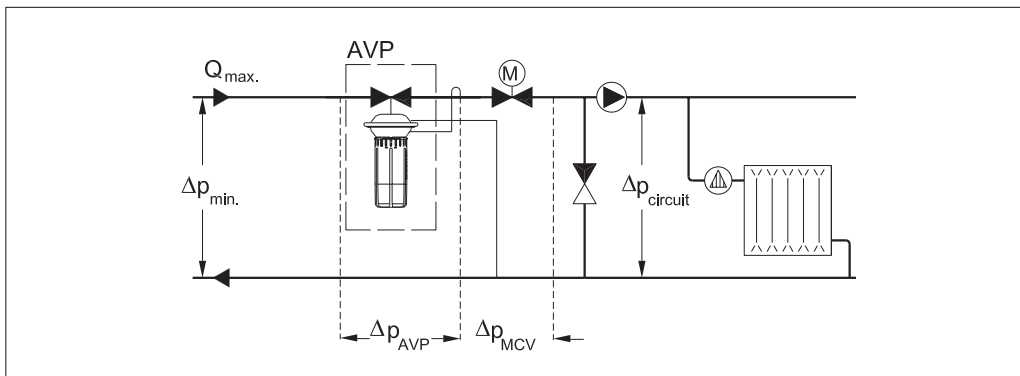
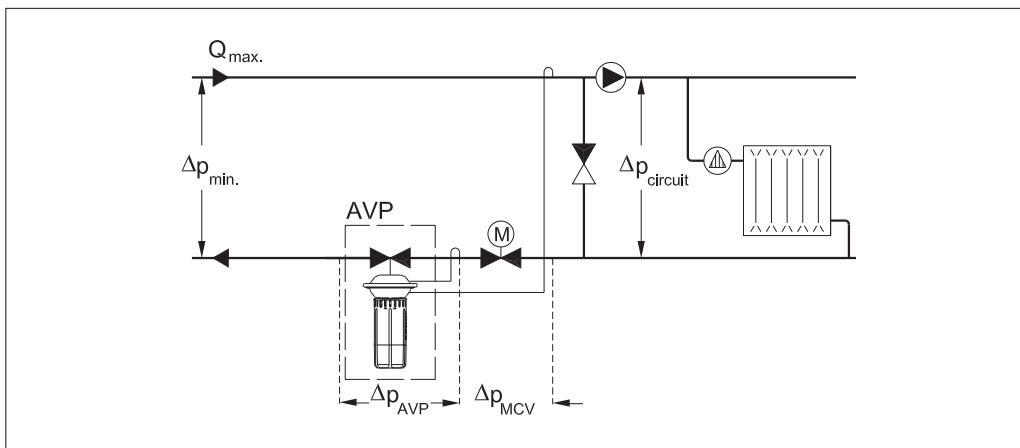
$$k_v = 1.8\ m^3/h$$

or read from the sizing diagram, page 7, by taking a line from Q-scale (1.3 m<sup>3</sup>/h) through  $\Delta p_v$ -scale (0.5 bar) to intersect  $k_v$ -scale at 1.8 m<sup>3</sup>/h.

**Solution:**

The example selects AVP DN 15,  $k_{vS}$  value 2.5, with differential pressure setting range 0.05-0.5 bar.

The P-band ( $X_p$ ) can also be read from the sizing diagram. Take a horizontal line from the  $k_v$ -scale (1.8 m<sup>3</sup>/h) to the right to intersect the  $X_p$ -scale (0.04 bar). At a set value of 0.2 bar and a  $X_p$  of 0.04 bar the AVP controller controls between 0.2 bar with open motorised control valve and 0.2 + 0.04 = 0.24 bar at almost closed motorised control valve (i.e. total pressure loss across the motorised control valve).



**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.

Given data:

- $Q_{max}$  = 0.8 m<sup>3</sup>/h (800 l/h)
- $\Delta p_{min}$  = 0.8 bar (80 kPa)
- $\Delta p_{exchanger}$  = 0.05 bar (5 kPa)
- $\Delta p_{MCV}$  = 0.3 bar (30 kPa) selected

The differential pressure set value is:

$$\Delta p_{set\ value} = \Delta p_{exchanger} + \Delta p_{MCV} = 0.05 + 0.3$$

$$\Delta p_{set\ value} = 0.35\ bar\ (35\ kPa)$$

The total pressure loss across the controller is:

$$\Delta p_{AVP} = \Delta p_{min} - \Delta p_{exchanger} - \Delta p_{MCV}$$

$$= 0.8 - 0.05 - 0.3$$

$$\Delta p_{AVP} = 0.45\ bar\ (45\ kPa)$$

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

$k_v$  value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AVP}}} = \frac{0.8}{\sqrt{0.45}}$$

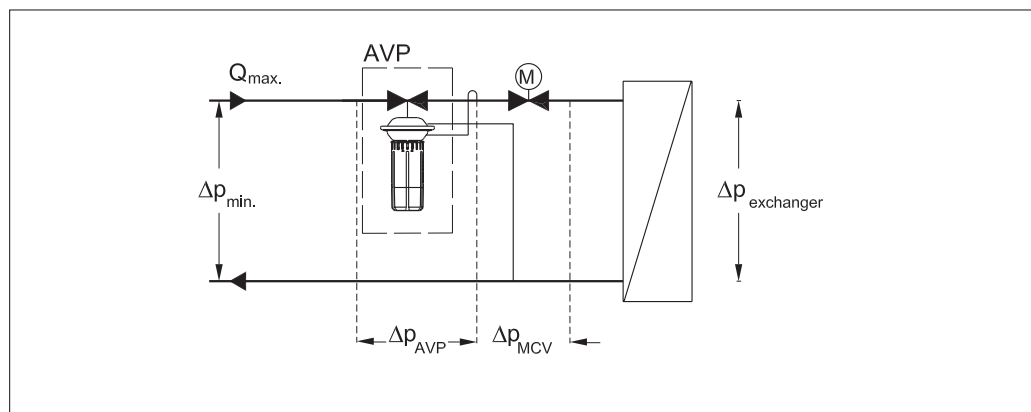
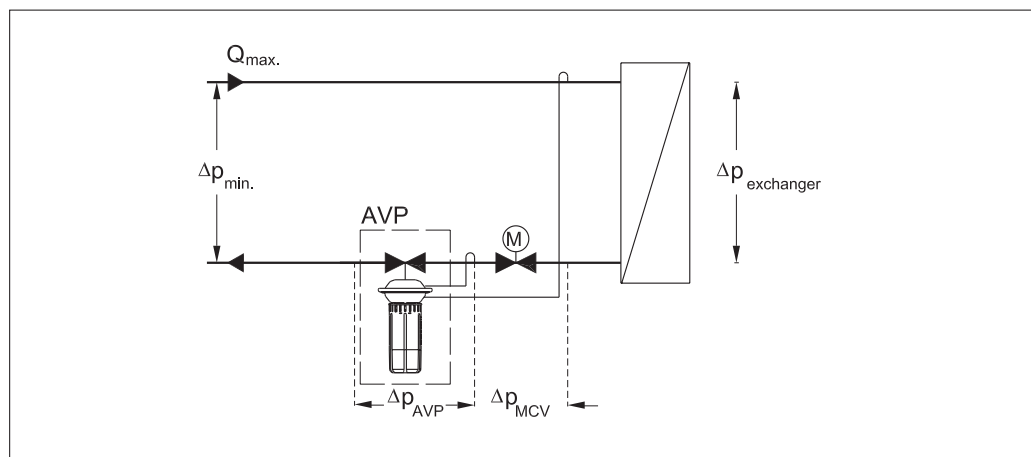
$$k_v = 1.2\ m^3/h$$

or read from the sizing diagram, page 7, by taking a line from  $Q$ -scale (0.8 m<sup>3</sup>/h) through  $\Delta p_v$ -scale (0.45 bar) to intersect  $k_v$ -scale at 1.2 m<sup>3</sup>/h.

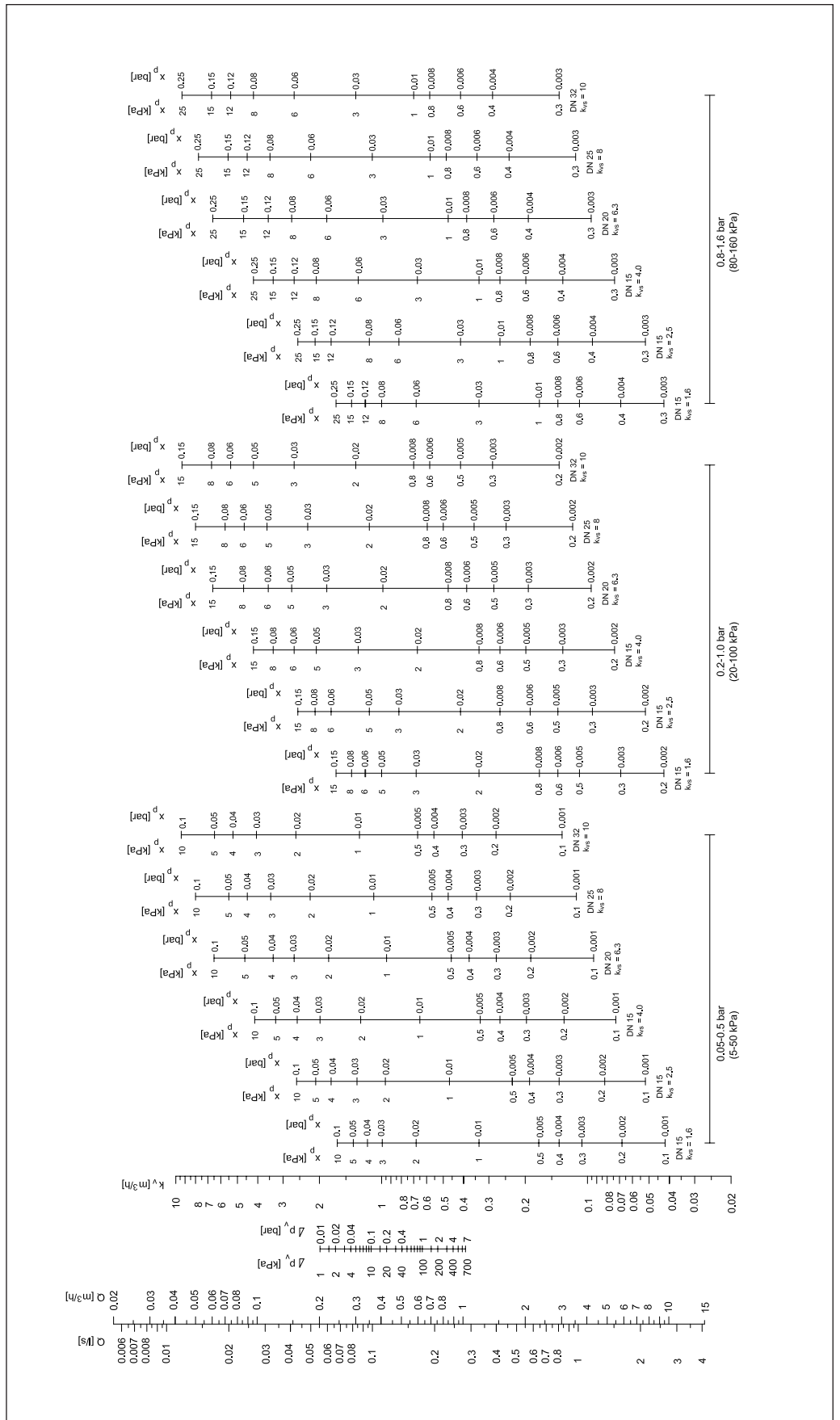
Solution:

The example selects AVP DN 15,  $k_{v5}$  value 1.6, with differential pressure setting range 0.05-0.5 bar.

The P-band ( $X_p$ ) can also be read from the sizing diagram. Take a horizontal line from the  $k_v$ -scale (1.2 m<sup>3</sup>/h) to the right to intersect the  $X_p$ -scale (0.04 bar). At a set value of 0.35 bar and a  $X_p$  of 0.04 bar the AVP controller controls between 0.35 bar with open motorised control valve and 0.35 + 0.04 = 0.39 bar at almost closed motorised control valve (i.e. total pressure loss across the motorised control valve).



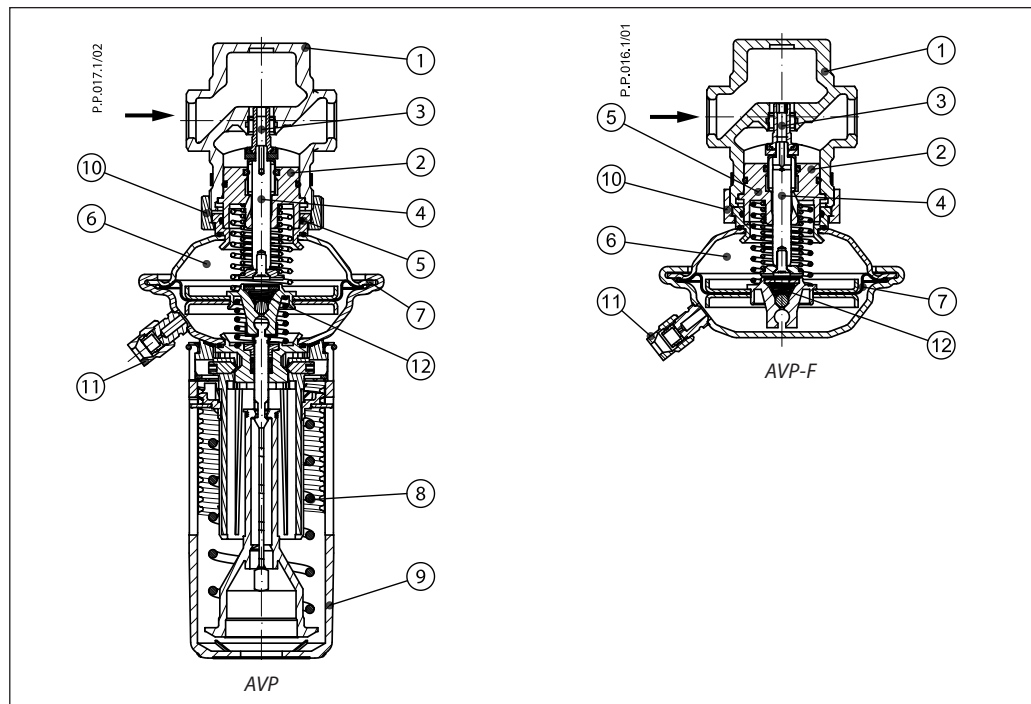
Sizing (continuous)



Select suitable controller size. Xp should not exceed 50% of the controller differential pressure setting.

**Design**

1. Valve body
2. Valve insert
3. Pressure relieved valve cone
4. Valve stem
5. Control drain
6. Actuator
7. Control diaphragm for diff. pressure control
8. Setting spring for diff. pressure control
9. Handle for diff. pressure setting, prepared for sealing
10. Union nut
11. Compression fitting for impulse tube
12. Excess pressure safety valve



**Function**

Pressure changes from flow and return pipes 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 diff. pressure control. The diff. pressure is controlled by means of setting spring for diff. pressure control. Control valve closes on rising differential pressure and opens on falling differential pressure to maintain constant differential pressure.

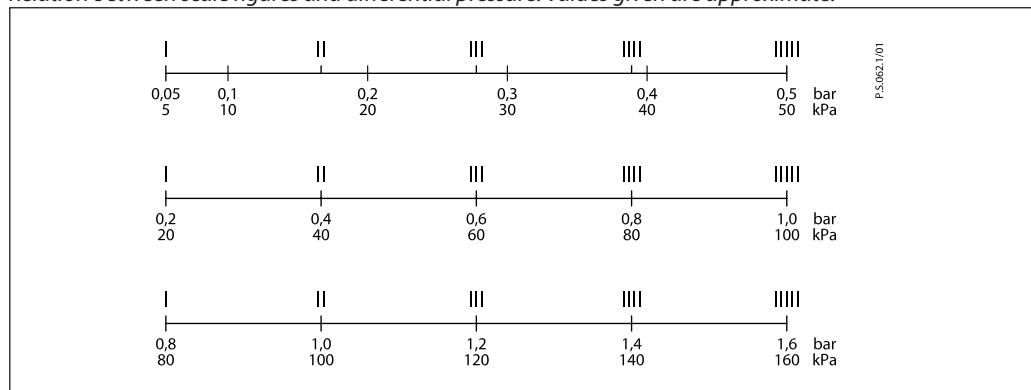
Controller is equipped with excess pressure safety valve, which protects control diaphragm for diff. pressure control from too high differential pressure.

**Settings**

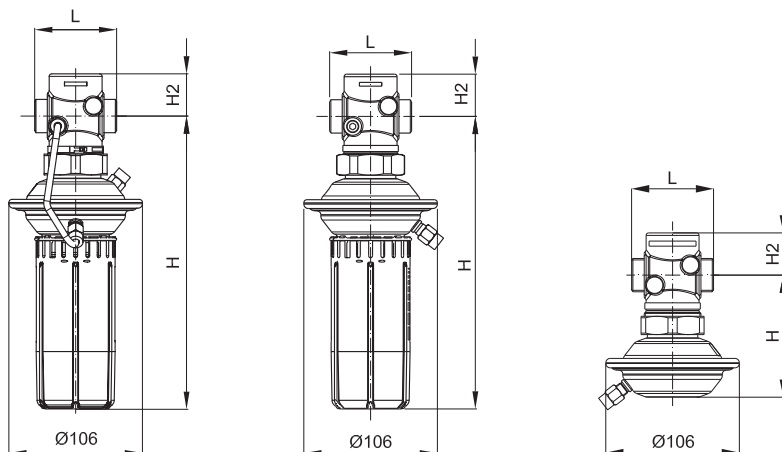
*Differential pressure setting*  
 Differential pressure setting (valid for AVP controller only) is being done by the adjustment of the setting spring for diff. pressure control. The adjustment can be done by means of handle for diff. pressure setting and/or pressure indicators.

**Adjustment diagram**

*Relation between scale figures and differential pressure. Values given are approximate.*



Dimensions

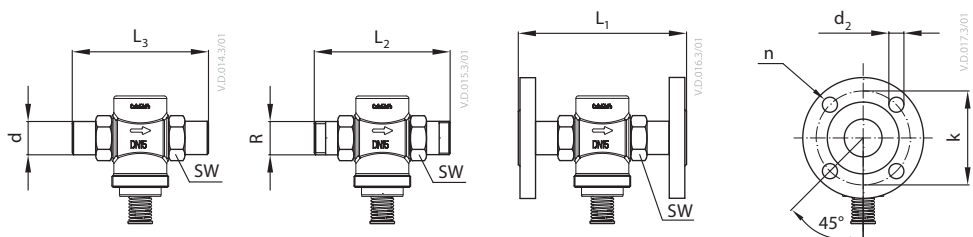


AVP (flow, return)

DN	L	H	H2	Weight (kg)
	mm			
15	65	232	34	1.7
20	70	232	34	1.8
25	75	232	38	1.9
32	100	232	38	2.2

AVP-F (return)

DN	L	H	H2	Weight (kg)
	mm			
15	65	97	34	1.3
20	70	97	34	1.4
25	75	97	38	1.5
32	100	97	38	1.8



DN	R <sup>1)</sup>	SW	d	L <sup>2)</sup>						n
				L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	k	d <sub>2</sub>		
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	-	-	-	

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

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

Compression fittings

