ENGINEERING
TOMORROW

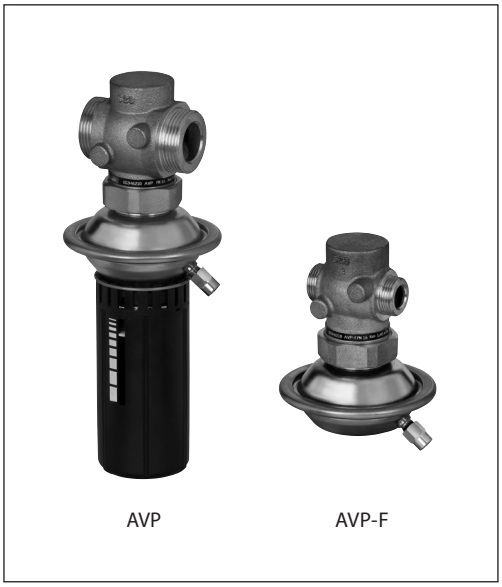
Data sheet

Differential pressure controller (PN 16)

AVP - return and flow mounting, adjustable setting

AVP-F - return mounting, fixed setting

Description



AVP AVP-F

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 m³/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} (m³/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	G ¾ 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**
	20	6.3		G 1 A		**003H6203**		**003H6209**		**003H6215**
	25	8.0		G 1¼ A		**003H6204**		**003H6210**		**003H6216**
	32	10		G 1¾ A		**003H6205**		**003H6211**		**003H6217**

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;

- *1× AVP DN 15 controller*
  *Code No: **003H6206***
- *1× Impulse tube set AV, R ⅛*
  *Code No: **003H6852***

Option:
- *1× 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.

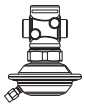
AVP Controller (flow mounting)

Picture	DN (mm)	k_{VS} (m³/h)	Connection		Δp setting range (bar)	Code No.	Δp setting range (bar)	Code No.
	15	0.4	Cylindr. ext. thread acc. to ISO 228/1	G ¾ A	0.05-0.5	-	0.2-1.0	**003H6947** [1]
		1.0				-		**003H6948** [1]
		1.6				**003H6238**		**003H6244**
		2.5				**003H6239**		**003H6245**
		4.0				**003H6240**		**003H6246**
	20	6.3		G 1 A		**003H6241**		**003H6247**
	25	8.0		G 1¼ A		**003H6242**		**003H6248**
	32	10		G 1¾ A		**003H6243**		**003H6249**

[1] *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_{vs} (m^3/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	G ¾ A	0.2	**003H6218**	0.3	**003H6224**	0.5	**003H6230**
		2.5				**003H6219**		**003H6225**		**003H6231**
		4.0				**003H6220**		**003H6226**		**003H6232**
	20	6.3		G 1 A		**003H6221**		**003H6227**		**003H6233**
	25	8.0		G 1¼ A		**003H6222**		**003H6228**		**003H6234**
	32	10		G 1¾ A		**003H6223**		**003H6229**		**003H6235**

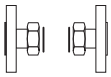
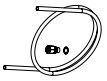
Example 2:
Differential pressure controller; flow mounting; DN 15; k_{VS} 0.4; PN 16; setting range 0.2-1.0 bar; T_{max} 150 °C; ext. thread;

- *1× AVP DN 15 controller*
  *Code No: **003H6947***
- *1× Impulse tube set AV, R ⅛*
  *Code No: **003H6852***

Option:
- *1× 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 ½	**003H6902**
		20		R ¾	**003H6903**
		25		R 1	**003H6904**
		32		R 1¼	**003H6905**
	Flange tailpieces	15	Flanges PN 25, acc. to EN 1092-2		**003H6915**
		20			**003H6916**
		25			**003H6917**
	Impulse tube set AV	Description: - 1× copper tube Ø 6 × 1 × 1500 mm - 1× compression fitting [1] for imp. tube connection to pipe Ø 6 × 1 mm		R ⅛	**003H6852**
				R ⅜	**003H6853**
				R ½	**003H6854**
	[1] 10 compression fittings for imp. tube connection to pipe, Ø 6 × 1 mm R ⅛				**003H6857**
	[1] 10 compression fittings for imp. tube connection to pipe, Ø 6 × 1 mm R ⅜				**003H6858**
	[1] 10 compression fittings for imp. tube connection to pipe, Ø 6 × 1 mm R ½				**003H6859**
	[1] 10 compression fittings for imp. tube connection to actuator, Ø 6 × 1 mm G ⅛				**003H6931**
	Shut off valve Ø 6 mm				**003H0276**

[1] *Compression fitting consists of a nipple, compression ring and nut.*

Service kits

Picture	Type designation	DN	k_{vs} (m^3/h)	Code No. AVP(-F) return	Code No. 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		

Picture	Type designation	Δp setting range (bar)	Code No. AVP(-F) return	Code No. AVP(-F) flow
	Actuator with adjustable handle (AVP)	0.05-0.5	**003H6821**	**003H6823**
		0.2-1.0	**003H6822**	**003H6824**
		0.8-1.6		
	Actuator without adjustable handle (AVP-F)	0.2	**003H6825**	-
		0.3		
		0.5		

Technical data

Valve

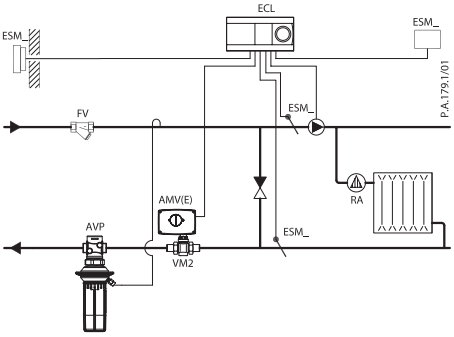
Nominal diameter		**DN**	**15**					**20**	**25**	**32**
k_{VS} value		m^3/h	0.4	1.0	1.6	2.5	4.0	6.3	8.0	10
Cavitation factor z			≥ 0.6						≥ 0.55	
Leakage acc. to standard IEC 534		% of k_{VS}	≤ 0.02							≤ 0.05
Nominal pressure		PN	25							
Max. differential pressure		bar	12							
Medium			Circulation water / glycolic water up to 30%							
Medium pH			Min. 7, Max. 10							
Medium temperature		°C	2…150							
Connections	valve		Extternal thread							
	tailpieces		Weld-on and external thread							
			Flange							-
Materials										
Valve body			Red bronze CuSn5ZnPb (Rg5)							
Valve seat			Stainless steel, mat. No. 1.4571							
Valve cone			Dezincing free brass CuZn36Pb2As							
Sealing			EPDM							
Pressure relieve system			Piston							

Actuator

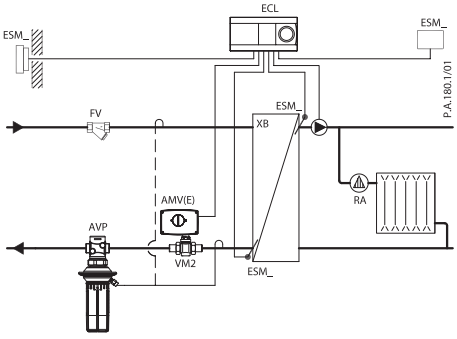
Type		**AVP**			**AVP-F**		
Actuator size	cm^2	39					
Nominal pressure	PN	16					
Diff. pressure setting ranges and spring colours	bar	0.05-0.5	0.2-1.0	0.8-1.6	0.2	0.3	0.5
		grey	black		(fixed setting)		
Materials							
Actuator housing		Zinc plated, DIN 1624, No. 1.0338					
Diaphragm		EPDM					
Impulse tube		Copper tube Ø 6 x 1 mm					

Application principles

- Return mounting



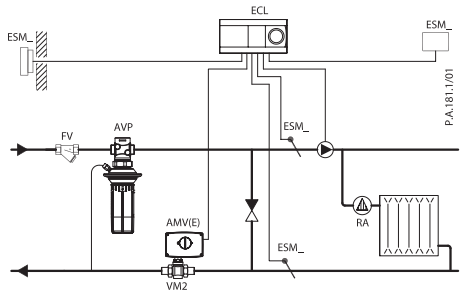
Direct-connected heating system



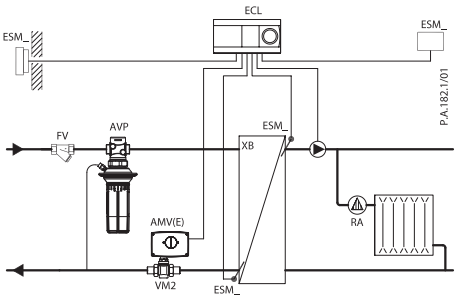
Indirectly connected heating system

Application principles

- Flow mounting



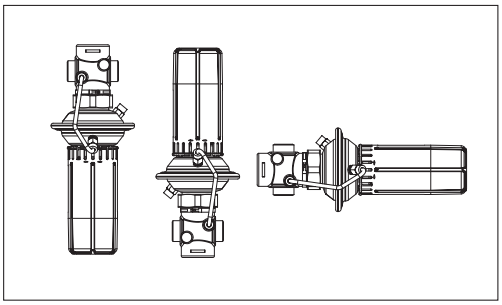
Direct-connected heating system



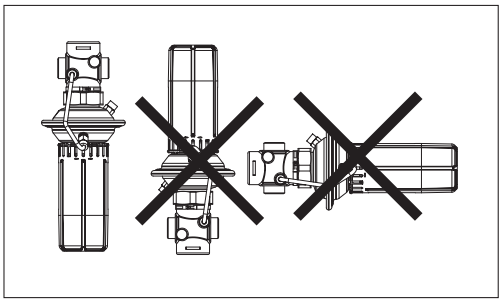
Indirectly connected heating system

Installation positions

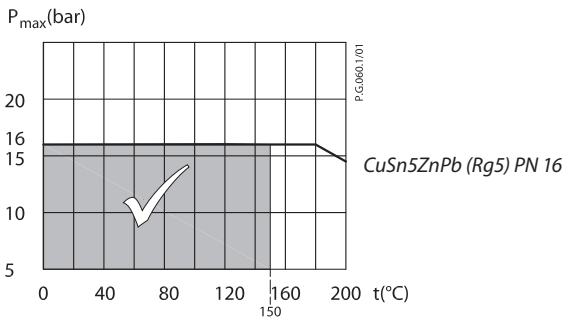
Up to medium temperature of 100 °C the controllers can be installed in any position.



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



Pressure temperature diagram



Maximum allowed operating pressure as a function of medium temperature (according to EN 1092-3).

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 m³/h (1300 l/h)
Δp_{min} = 0.7 bar (70 kPa)
*$\Delta p_{circuit}$ = 0.1 bar (10 kPa)
Δp_{MCV} = 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:
$\Delta p_{set\ value} = \Delta p_{MCV}$
$\Delta p_{set\ value}$ = 0.2 bar (20 kPa)

The total pressure loss across the controller is:
$\Delta p_{AVP} = \Delta p_{min} - \Delta p_{MCV} = 0.7 - 0.2$
Δp_{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:

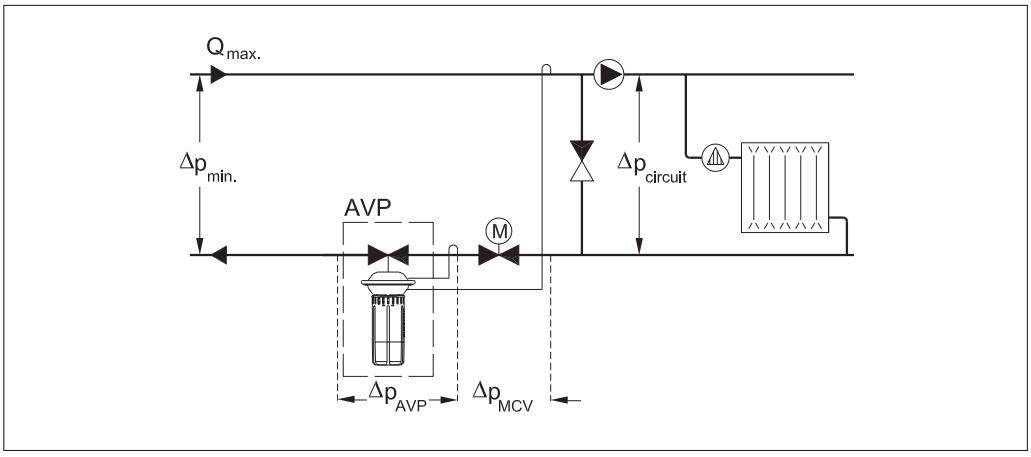
$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AVP}}} = \frac{1.3}{\sqrt{0.5}}$$

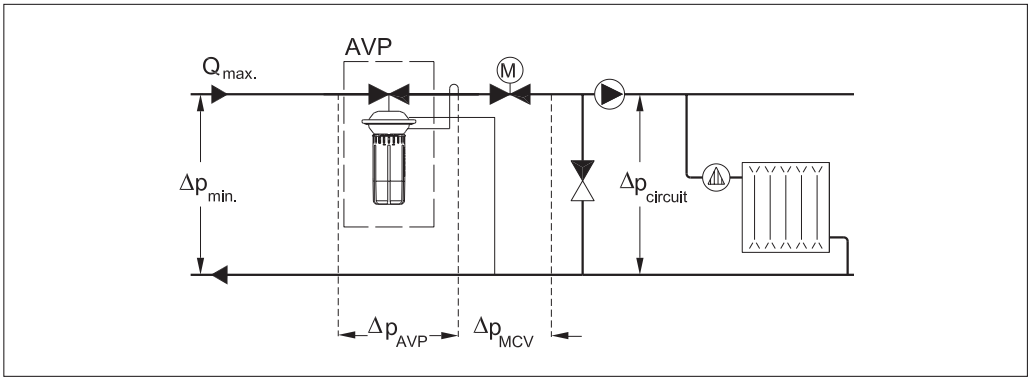
k_v = 1.8 m³/h

or read from the sizing diagram, page 7, by taking a line from Q-scale (1.3 m³/h) through Δp_v-scale (0.5 bar) to intersect k_v-scale at 1.8 m³/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 (Xp) can also be read from the sizing diagram. Take a horizontal line from the k_v-scale (1.8 m³/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 m³/h (800 l/h)
Δp_{min} = 0.8 bar (80 kPa)
$\Delta p_{exchanger}$ = 0.05 bar (5 kPa)
Δp_{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:
$\Delta p_{AVP} = \Delta p_{min} - \Delta p_{exchanger} - \Delta p_{MCV}$
$= 0.8 - 0.05 - 0.3$
Δp_{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:

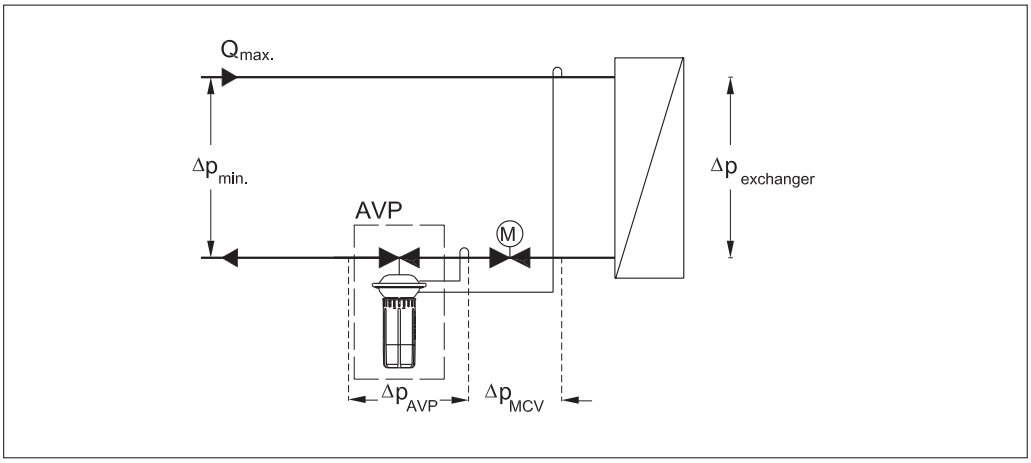
$$k_V = \frac{Q_{max}}{\sqrt{\Delta p_{AVP}}} = \frac{0.8}{\sqrt{0.45}}$$

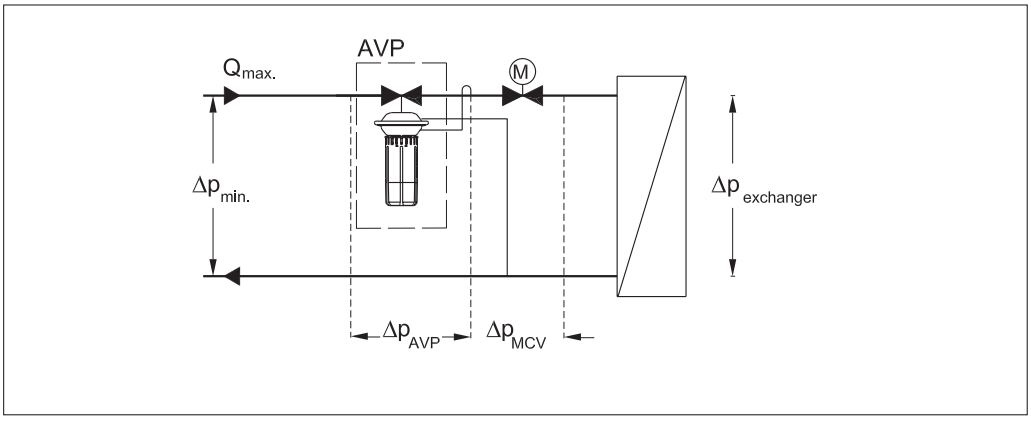
k_v = 1.2 m³/h

or read from the sizing diagram, page 7, by taking a line from Q-scale (0.8 m³/h) through Δp_v-scale (0.45 bar) to intersect k_v-scale at 1.2 m³/h.

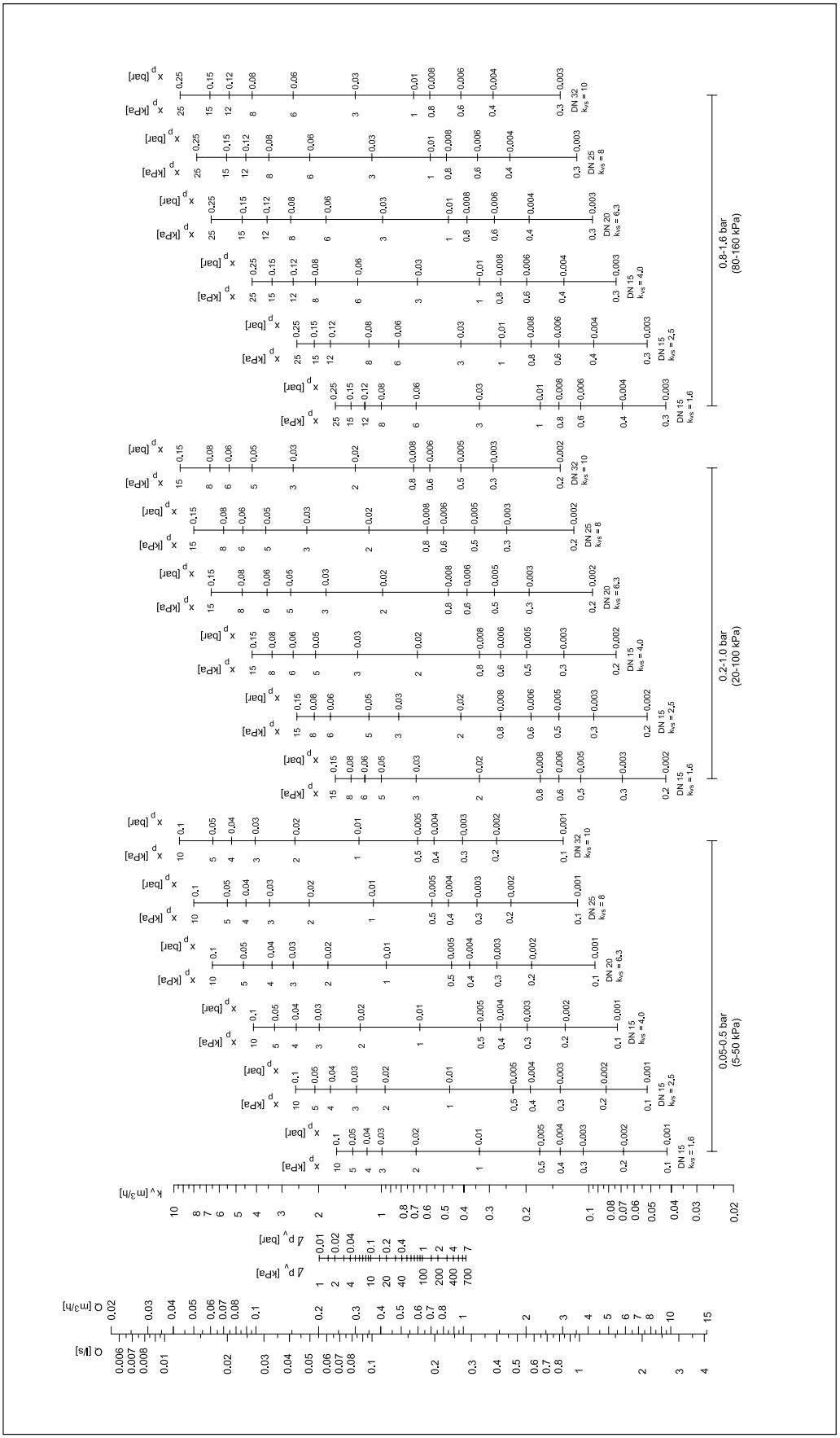
Solution:
The example selects AVP DN 15, k_{VS} value 1.6, with differential pressure setting range 0.05-0.5 bar.

The P-band (X_P) can also be read from the sizing diagram. Take a horizontal line from the k_v-scale (1.2 m³/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).





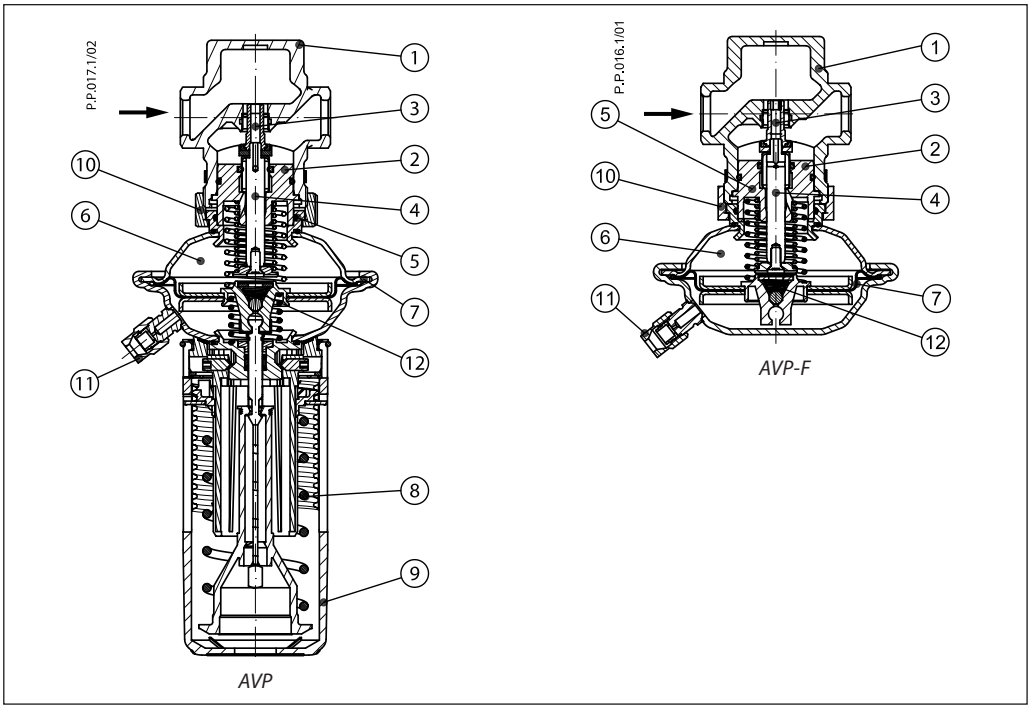
Sizing *(continuous)*



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.

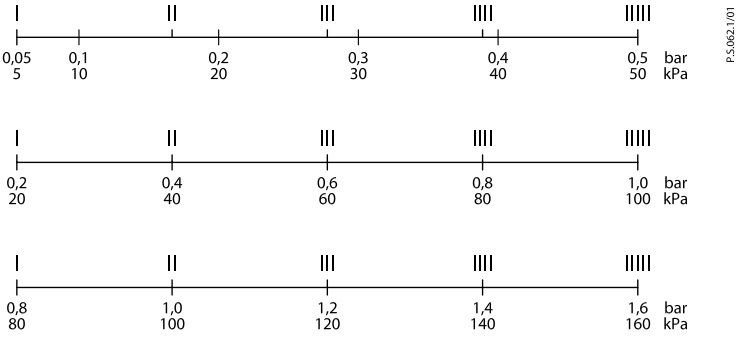
Controller is equipped with excess pressure safety valve, which protects control diaphragm for diff. pressure control from too high differential pressure.

Settings

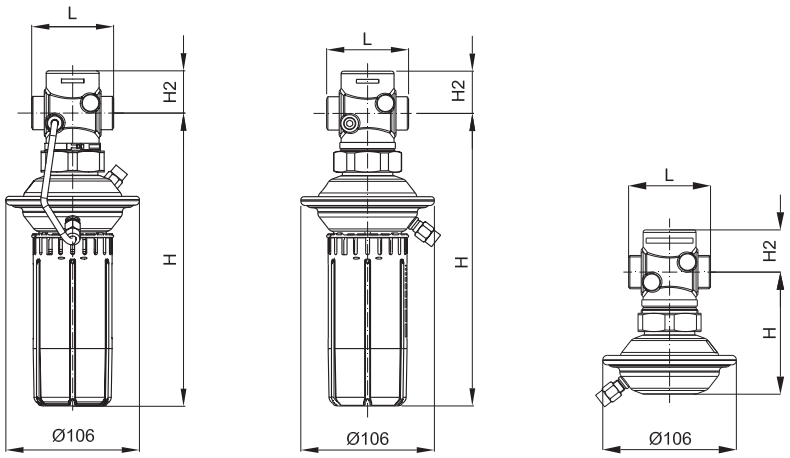
Differential pressure setting
Differential pressure setting (valve for AVP controller only) is being done by the adjustment of the setting spring for diff. pressure control. The adjustment can be done by means of handle for diff. pressure setting and/or pressure indicators.

Adjustment diagram

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



Dimensions

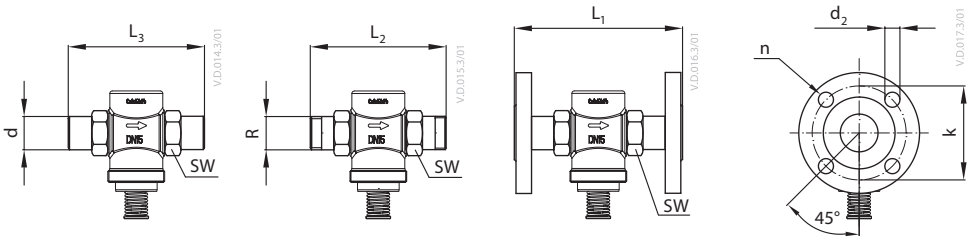


AVP (flow, return)

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)

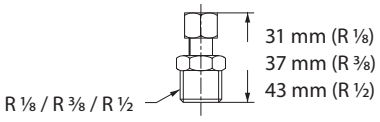
DN	L	H	H2	Weight (kg)
	mm			
15	65	97	34	1.3
20	70	97	34	1.4
25	75	97	38	1.5
32	100	97	38	1.8



DN	R [1]	SW	d	L_1 [2]	L_2	L_3	k	d_2	n
		mm							
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 1 ¾A)	42	-	177	184	-	-	-

[1] Conical ext. thread acc. to EN 10226-1
[2] Flanges PN 25, acc. to EN 1092-2

Compression fittings



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