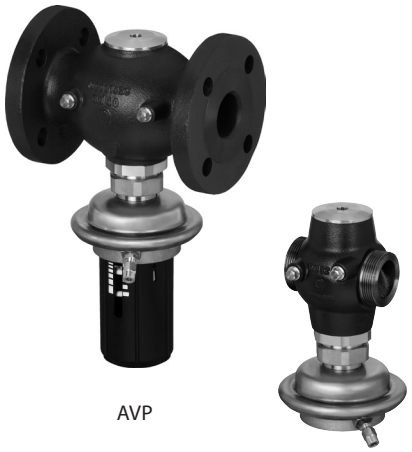
Data sheet

# Differential pressure controller (PN 25)

## AVP - return and flow mounting, adjustable setting

## AVP-F - return and flow 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 15-50
- $k_{vs}$ 0.4 - 25 $m^3/h$
- PN 25
- Setting range (AVP): 0.2 - 1.0 bar / 0.3 - 2.0 bar
- Fixed setting (AVP-F): 0.2 bar / 0.5 bar
- Temperature:
  - Circulation water / glycolic water up to 30%: 2 … 150 °C
- Connections:
  - Ext. thread (weld-on, thread and flange tailpieces)
  - Flange

### Ordering

*Example 1 - **AVP** controller with predefined impulse tube:*

*Differential pressure controller; return mounting; DN 15; $k_{vs}$ 1.6; PN 25; setting range 0.2 - 1.0 bar; $t_{max}$ 150 °C; ext. thread*

- *1x AVP DN 15 controller*
  *Code No: **003H6283***

*Option:*
- *1x Impulse tube set AV, R ⅛*
  *Code No: **003H6852***
- *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.*

**AVP** Controller (return 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 | 0.2 - 1.0 | **003H6281** | 0.3 - 2.0 | **003H6291** |
| | | 1.0 | | | | **003H6282** | | **003H6292** |
| | | 1.6 | | | | **003H6283** | | **003H6293** |
| | | 2.5 | | | | **003H6284** | | **003H6294** |
| | | 4.0 | | | | **003H6285** | | **003H6295** |
| | 20 | 6.3 | | G 1 A | | **003H6286** | | **003H6296** |
| | 25 | 8.0 | | G 1¼ A | | **003H6287** | | **003H6297** |
|  | 15 | 4.0 | Flanges PN 25, acc. to EN 1092-2 | | | **003H6345** | | **003H6351** |
| | 20 | 6.3 | | | | **003H6346** | | **003H6352** |
| | 25 | 8.0 | | | | **003H6347** | | **003H6353** |
| | 32 | 12.5 | | | | **003H6348** | | **003H6354** |
| | 40 | 20 | | | | **003H6349** | | **003H6355** |
| | 50 | 25 | | | | **003H6350** | | **003H6356** |

***Note:** other controllers available on request.*

## Ordering *(continuous)*

*Example 2 - **AVP** controller without predefined impulse tube:*

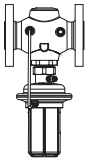
*Differential pressure controller; flow mounting; DN 15; $k_{vs}$ 4.0; PN 25; setting range 0.2 - 1.0 bar; $t_{max}$ 150°C; flange*

- *1x AVP DN 15 controller Code No: **003H6369***

*Option:*
- *2x Impulse tube set AV, R ⅛ Code No: **003H6852***
- *1x Weld-on tailpieces Code No: **003H6908***

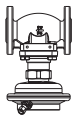
*The controller will be delivered completely assembled, without impulse tube between valve and actuator. External impulse tubes (AV) must be ordered separately.*

**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 | 0.2 - 1.0 | **003H6313** | 0.3 - 2.0 | **003H6323** |
| | | 1.0 | | | | **003H6314** | | **003H6324** |
| | | 1.6 | | | | **003H6315** | | **003H6325** |
| | | 2.5 | | | | **003H6316** | | **003H6326** |
| | | 4.0 | | | | **003H6317** | | **003H6327** |
| | 20 | 6.3 | | G 1 A | | **003H6318** | | **003H6328** |
| | 25 | 8.0 | | G 1¼ A | | **003H6319** | | **003H6329** |
|  | 15 | 4.0 | Flanges PN 25, acc. to EN 1092-2 | | | **003H6369** [1] | | **003H6375** [1] |
| | 20 | 6.3 | | | | **003H6370** [1] | | **003H6376** [1] |
| | 25 | 8.0 | | | | **003H6371** [1] | | **003H6377** [1] |
| | 32 | 12.5 | | | | **003H6372** | | **003H6378** |
| | 40 | 20 | | | | **003H6373** | | **003H6379** |
| | 50 | 25 | | | | **003H6374** | | **003H6380** |

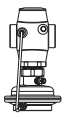
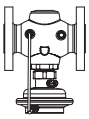
***Note:** other controllers available on request.*
*[1] Controller is without predefined impulse tube (see ordering example 2)*

**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. |
|---|---|---|---|---|---|---|---|---|
|  | 15 | 4.0 | Cylindr. ext. thread acc. to ISO 228/1 | G ¾ A | 0.2 | **003H6301** | 0.5 | **003H6307** |
| | 20 | 6.3 | | G 1 A | | **003H6302** | | **003H6308** |
| | 25 | 8.0 | | G 1¼ A | | **003H6303** | | **003H6309** |
| | | | | | | | | |
|  | 15 | 4.0 | Flanges PN 25, acc. to EN 1092-2 | | | **003H6357** | | **003H6363** |
| | 20 | 6.3 | | | | **003H6358** | | **003H6364** |
| | 25 | 8.0 | | | | **003H6359** | | **003H6365** |
| | 32 | 12.5 | | | | **003H6360** | | **003H6366** |
| | 40 | 20 | | | | **003H6361** | | **003H6367** |
| | 50 | 25 | | | | **003H6362** | | **003H6368** |

***Note:** other controllers available on request.*

**AVP-F** Controller (flow mounting)

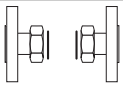
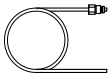
| Picture | DN (mm) | $k_{vs}$ ($m^3$/h) | Connection | | Δp setting range (bar) | Code No. | Δp setting range (bar) | Code No. |
|---|---|---|---|---|---|---|---|---|
|  | 15 | 4.0 | Cylindr. ext. thread acc. to ISO 228/1 | G ¾ A | 0.2 | **003H6333** | 0.5 | **003H6339** |
| | 20 | 6.3 | | G 1 A | | **003H6334** | | **003H6340** |
| | 25 | 8.0 | | G 1¼ A | | **003H6335** | | **003H6341** |
| | | | | | | | | |
|  | 15 | 4.0 | Flanges PN 25, acc. to EN 1092-2 | | | **003H6381** [1] | | **003H6387** [1] |
| | 20 | 6.3 | | | | **003H6382** [1] | | **003H6388** [1] |
| | 25 | 8.0 | | | | **003H6383** [1] | | **003H6389** [1] |
| | 32 | 12.5 | | | | **003H6384** | | **003H6390** |
| | 40 | 20 | | | | **003H6385** | | **003H6391** |
| | 50 | 25 | | | | **003H6386** | | **003H6392** |

***Note:** other controllers available on request.*

*[1] Controller is without predefined impulse tube (see ordering example 2)*

## Ordering *(continuous)*

### Accessories

| Picture | Type designation | DN | Connection | | Code No. |
|---|---|---|---|---|---|
|  | Weld-on tailpieces | 15 | - | | **003H6908** |
| | | 20 | | | **003H6909** |
| | | 25 | | | **003H6910** |
|  | External thread tailpieces | 15 | Conical ext. thread acc. to EN 10226-1 | R ½ | **003H6902** |
| | | 20 | | R ¾ | **003H6903** |
| | | 25 | | R 1 | **003H6904** |
|  | Flange tailpieces | 15 | Flanges PN 25, acc. to EN 1092-2 | | **003H6915** |
| | | 20 | | | **003H6916** |
| | | 25 | | | **003H6917** |
|  | Impulse tube set AV | Description:<br>- 1× copper tube Ø6 × 1 × 1500 mm<br>- 1× compression fitting *) for imp. tube connection to pipe Ø6 × 1 mm | | R ⅛ | **003H6852** |
| | | | | R ⅜ | **003H6853** |
| | | | | R ½ | **003H6854** |
|  | * 10 compression fittings for imp. tube connection to pipe, Ø6 × 1 mm R ⅛ | | | | **003H6857** |
| | * 10 compression fittings for imp. tube connection to pipe, Ø6 × 1 mm R ⅜ | | | | **003H6858** |
| | * 10 compression fittings for imp. tube connection to pipe, Ø6 × 1 mm R ½ | | | | **003H6859** |
| | * 10 compression fittings for imp. tube connection to actuator, Ø6 × 1 mm G ⅛ | | | | **003H6931** |
| | Shut off valve Ø6 mm | | | | **003H0276** |

*) *Compression fitting consists of a nipple, compression ring and nut.*

### Service kits

| Picture | Type designation | DN (mm) | $k_{vs}$ ($m^3/h$) | Code No. AVP(-F) return | Code No. AVP(-F) flow |
|---|---|---|---|---|---|
|  | Valve insert | 15 | 1.6 | **003H6863** | **003H6871** |
| | | | 2.5 | **003H6864** | **003H6872** |
| | | | 4.0 | **003H6865** | **003H6873** |
| | | 20 | 6.3 | **003H6866** | **003H6874** |
| | | 25 | 8 | **003H6867** | **003H6875** |
| | | 32 / 40 / 50 | 12.5 / 20 / 25 | **003H6868** | **003H6876** |

| Picture | Type designation | Δp setting range (bar) | AVP(-F) return | AVP(-F) flow |
|---|---|---|---|---|
|  | Actuator with adjustable handle (AVP) | 0.2 - 1.0 | **003H6829** | **003H6834** |
| | | 0.3 - 2.0 | **003H6830** | **003H6835** |
| | Actuator without adjustable handle (AVP-F) | 0.2 | **003H6841** | **003H6839** |
| | | 0.5 | | **003H6840** |

## Technical data

### Valve

| **Nominal diameter** | **DN** | **15** | | | | | **20** | **25** | **32** | **40** | **50** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $k_{vs}$ value | $m^3/h$ | 0.4 | 1.0 | 1.6 | 2.5 | 4.0 | 6.3 | 8.0 | 12.5 | 20 | 25 |
| Cavitation factor z *1)* | | ≥ 0.6 | | | | | | | | | |
| Nominal pressure | PN | 25 | | | | | | | | | |
| Max. differential pressure | bar | 20 | | | | | | | 16 | | |
| Medium | | Circulation water / glycolic water up to 30% | | | | | | | | | |
| Medium pH | | Min. 7, max. 10 | | | | | | | | | |
| Medium temperature | °C | 2 … 150 | | | | | | | | | |
| Connections | valve | Ext. thread and flange | | | | | | | Flange | | |
| | tailpieces | Weld-on, external thread and flange | | | | | | | - | | |
| **Materials** | | | | | | | | | | | |
| Valve body | thread | Red bronze CuSn5ZnPb (Rg5) | | | | | | | - | | |
| | flange | Ductile iron EN-GJS-400-18-LT (GGG 40.3) | | | | | | | | | |
| Valve seat | | Stainless steel, mat. No. 1.4571 | | | | | | | | | |
| Valve cone | | Dezincing free brass CuZn36Pb2As | | | | | | | | | |
| Sealing | | EPDM | | | | | | | | | |

*1) $k_v/k_{vs} \leq 0.5$ at DN 25 and higher*

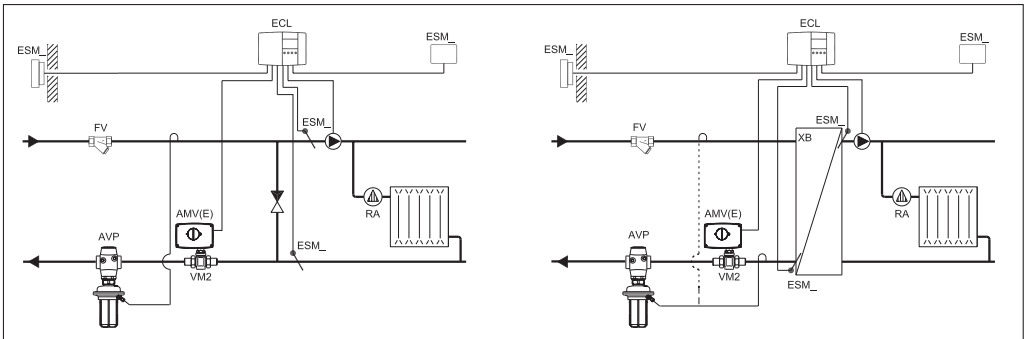
## Technical data *(continuous)*

### Actuator

| Type | | | AVP | | AVP-F | |
|---|---|---|---|---|---|---|
| Actuator size | | $cm^2$ | 54 | | | |
| Nominal pressure | | PN | 25 | | | |
| Diff. pressure setting ranges and spring colours | | bar | 0.2 - 1.0 | 0.3 - 2.0 | 0.2 | 0.5 |
| | | | yellow | red | (fixed setting) | |
| **Materials** | | | | | | |
| 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 Ø6 × 1 mm | | | |

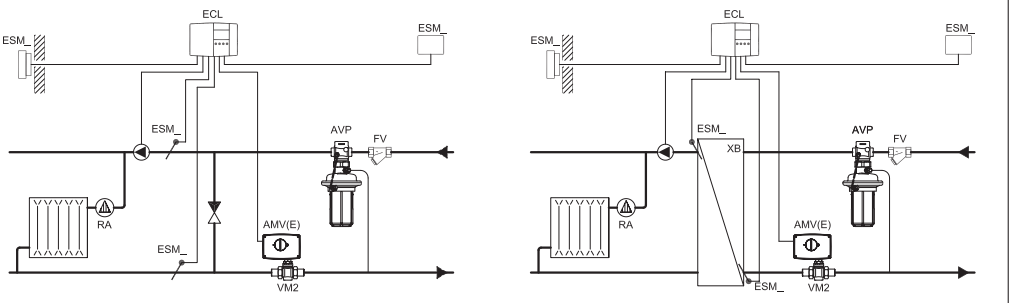
## Application principles

*- Return mounting*




*Direct-connected heating system* *Indirectly connected heating system*

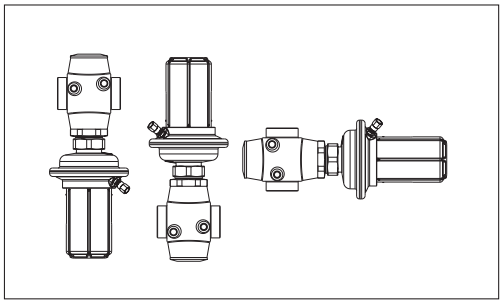
*- Flow mounting*



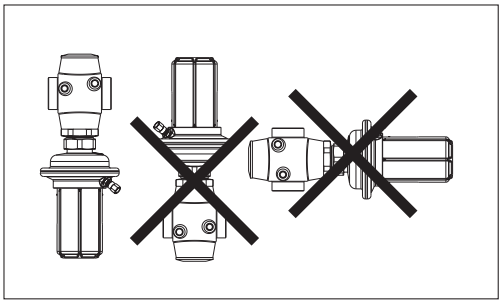

*Direct-connected heating system* *Indirectly connected heating system*

## Installation positions

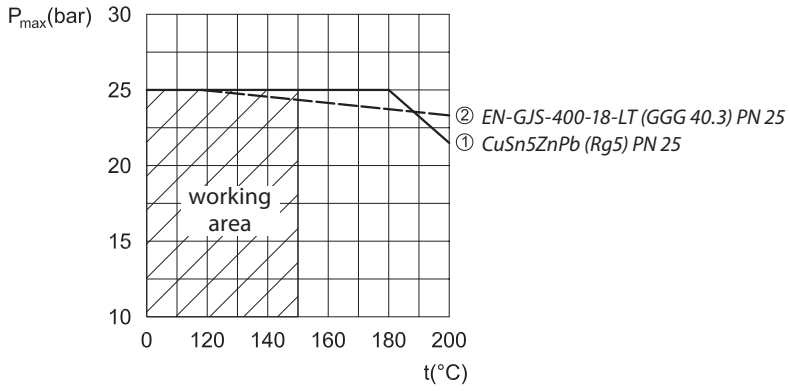
Up to medium temperature of 100 °C the controllers can be installed in any position.



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 1092-2 and 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 0.3 bar (30 kPa).

*Given data:*
$Q_{max}$ = 1.2 m³/h (1200 l/h)
$\Delta p_{min}$ = 0.7 bar (70 kPa)
*$\Delta p_{circuit}$ = 0.1 bar (10 kPa)
$\Delta p_{MCV}$ = 0.3 bar (30 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:
$\Delta p_{set\ value} = \Delta p_{MCV}$
$\Delta p_{set\ value}$ = 0.3 bar (30 kPa)

The total pressure loss across the controller is:
$\Delta p_{AVP} = \Delta p_{min} - \Delta p_{MCV} = 0.7 - 0.3$
$\Delta p_{AVP}$ = 0.4 bar (40 kPa)

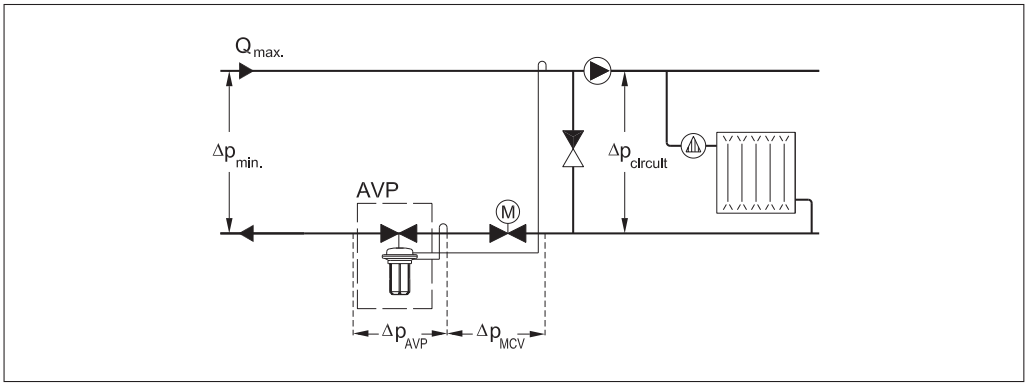
Possible pipe pressure losses in tubes, shut-off fittings, heatmeters, etc. are not included.

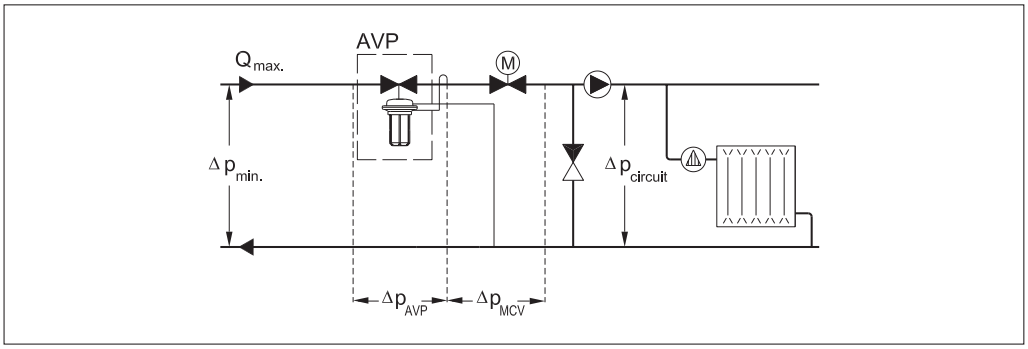
$k_v$ value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AVP}}} = \frac{1.2}{\sqrt{0.4}}$$

$k_v$ = 1.9 m³/h

*Solution:*
The example selects AVP DN 15, $k_{vs}$ value 2.5, with differential pressure setting range 0.2 - 1.0 bar.



**Sizing** *(continuous)*

- *Indirectly connected heating system*

**Example 2**
Motorised control valve (MCV) for indirectly connected heating system requires differential pressure of 0.5 (50 kPa) bar.

*Given data:*
$Q_{max}$ = 1.25 m³/h (1250 l/h)
$\Delta p_{min}$ = 1.0 bar (100 kPa)
$\Delta p_{exchanger}$ = 0.05 bar (5 kPa)
$\Delta p_{MCV}$ = 0.4 bar (40 kPa) selected

The differential pressure set value is:
$\Delta p_{set\ value} = \Delta p_{exchanger} + \Delta p_{MCV} = 0.05 + 0.4$
$\Delta p_{set\ value}$ = 0.45 bar (45 kPa)

The total pressure loss across the controller is:
$\Delta p_{AVP} = \Delta p_{min} - \Delta p_{exchanger} - \Delta p_{MCV} = 1.0 - 0.05 - 0.4$
$\Delta p_{AVP}$ = 0.55 bar (55 kPa)

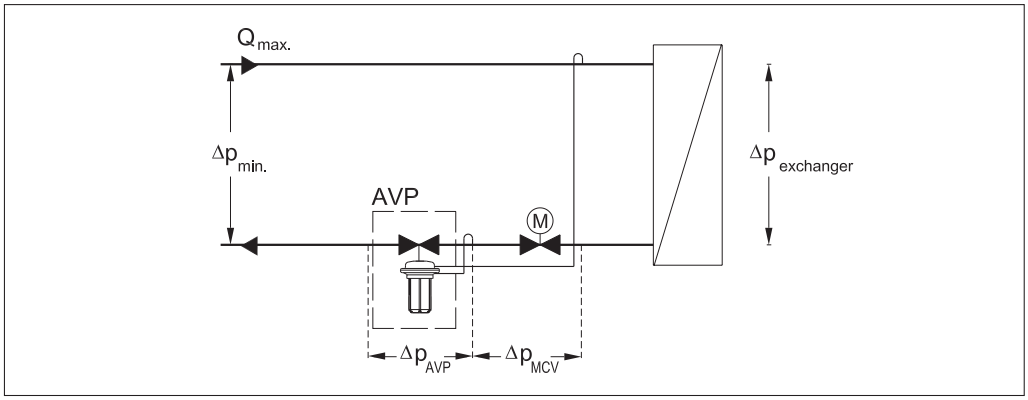
Possible pipe pressure losses in tubes, shut-off fittings, heatmeters, etc. are not included.

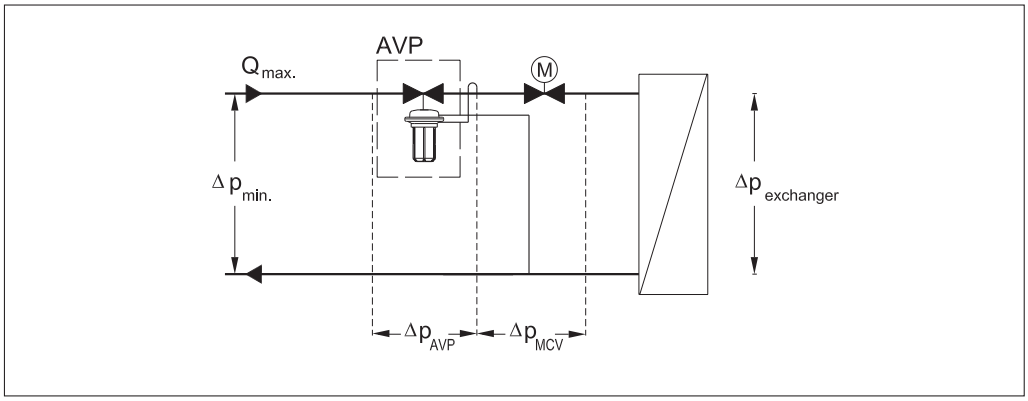
$k_v$ value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AVP}}} = \frac{1.25}{\sqrt{0.55}}$$

$k_v$ = 1.7 m³/h

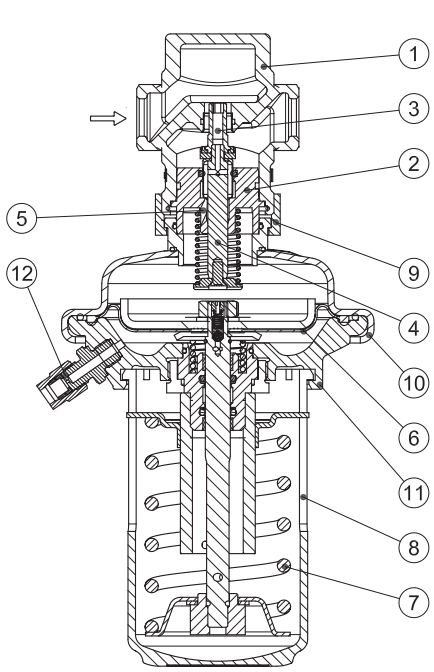
*Solution:*
The example selects AVP DN 15, $k_{vs}$ value 2.5, with differential pressure setting range 0.2 - 1.0 bar.



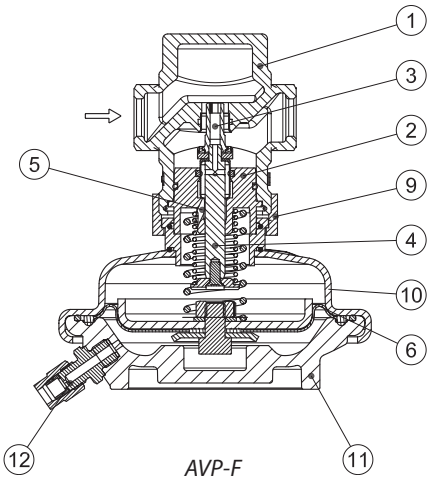



## Design

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




*AVP*




*AVP-F*

## Function

Pressure changes from the flow and return pipeline are being transferred through the impulse tubes and/or control drain in the actuator stem to the actuator chambers and act on control diaphragm. Control valve closes on rising differential pressure and opens on falling differential pressure to maintain constant differential pressure.

Controller with adjustable setting is equipped with excess pressure safety valve, which protects actuator from too high differential pressure.

## Settings

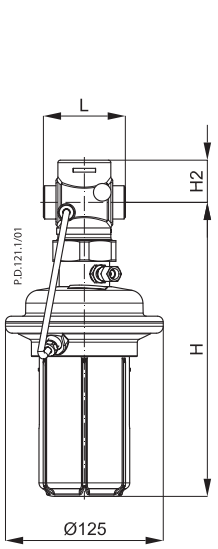
*Differential pressure setting*
Differential pressure setting is being done by the adjustment of the setting spring for diff. pressure control. The adjustment can be performed on the basis of diff. pressure adjustment diagram (see relevant instructions) and/or pressure indicators.

## Adjustment

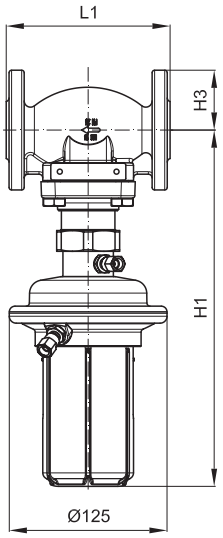
*Relation between scale figures and differential pressure. Values given are approximate.*

| | I | II | III | IIII | IIIII | |
|---|---|---|---|---|---|---|
| | 0,2 | 0,4 | 0,6 | 0,8 | 1,0 | bar |
| | 20 | 40 | 60 | 80 | 100 | kPa |
| | I | II | III | IIII | IIIII | |
| | 0,3 | 0,73 | 1,16 | 1,58 | 2,0 | bar |
| | 30 | 73 | 116 | 158 | 200 | kPa |

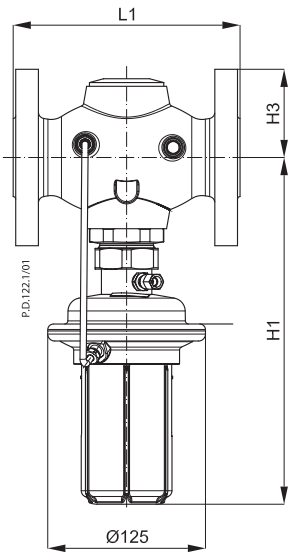
## Dimensions




*DN 15-25*




*DN 15-25*



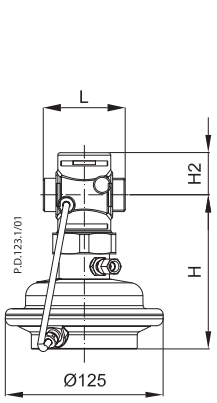

*DN 32-50*

**AVP**

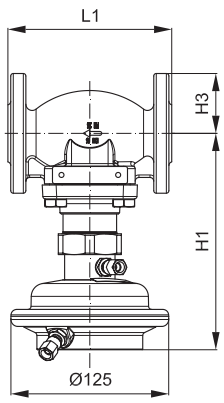
| DN | | 15 | | 20 | | 25 | | 32 | | 40 | | 50 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | flow | return | flow | return | flow | return | flow | return | flow | return | flow | return |
| L | mm | 65 | | 70 | | 75 | | - | | - | | - | |
| L1 | | 130 | | 150 | | 160 | | 180 | | 200 | | 230 | |
| H | | 233 | 220 | 233 | 220 | 233 | 220 | - | - | - | - | - | - |
| H1 | | 223 | 269 | 223 | 269 | 223 | 269 | 275 | 261 | 275 | 261 | 275 | 261 |
| H2 | | 34 | | 34 | | 37 | | - | | - | | - | |
| H3 | | 47 | | 52 | | 57 | | 70 | | 75 | | 82 | |
| Weight (thread) | kg | 3.5 | | 3.5 | | 3.7 | | - | | - | | - | |
| Weight (flange) | | 6.1 | | 6.8 | | 7.4 | | 10.2 | | 11.7 | | 13.9 | |

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

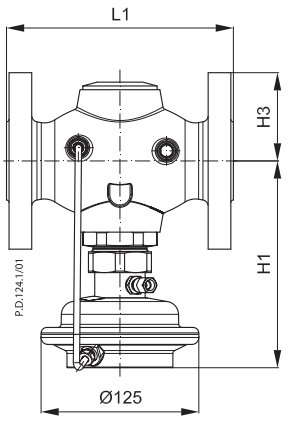
**Dimensions** *(continuous)*




*DN 15-25*




*DN 15-25*

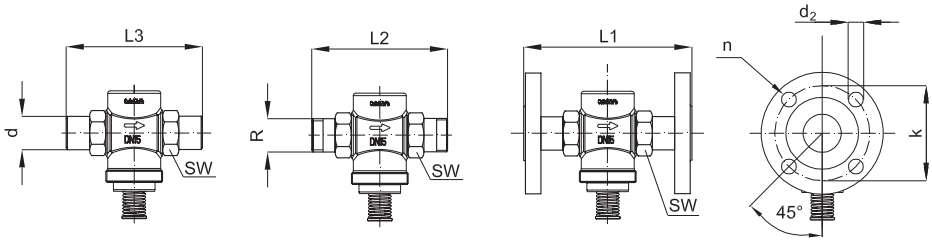



*DN 32-50*

**AVP-F**

| DN | | 15 | | 20 | | 25 | | 32 | | 40 | | 50 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | flow | return | flow | return | flow | return | flow | return | flow | return | flow | return |
| L | mm | 65 | | 70 | | 75 | | - | | - | | - | |
| L1 | | 130 | | 150 | | 160 | | 180 | | 200 | | 230 | |
| H | | 122 | 108 | 122 | 108 | 122 | 108 | - | - | - | - | - | - |
| H1 | | 172 | 158 | 172 | 158 | 172 | 158 | 164 | 150 | 164 | 150 | 164 | 150 |
| H2 | | 34 | | 34 | | 37 | | - | | - | | - | |
| H3 | | 47 | | 52 | | 57 | | 70 | | 75 | | 82 | |
| Weight (thread) | kg | 2.5 | | 2.5 | | 2.7 | | - | | - | | - | |
| Weight (flange) | | 5.1 | | 5.8 | | 6.4 | | 9.2 | | 10.8 | | 12.9 | |

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




| DN | | 15 | 20 | 25 | 32 | 40 | 50 |
|---|---|---|---|---|---|---|---|
| SW | mm | 32 (G ¾A) | 41 (G 1A) | 50 (G 1¼A) | | | |
| d | | 21 | 26 | 33 | | | |
| R [1] | | ½ | ¾ | 1 | | | |
| L1[2] | | 130 | 150 | 160 | | | |
| L2 | | 131 | 144 | 160 | | | |
| L3 | | 139 | 154 | 159 | | | |
| k | | 65 | 75 | 85 | 100 | 110 | 125 |
| $d_2$ | | 14 | 14 | 14 | 18 | 18 | 18 |
| n | | 4 | 4 | 4 | 4 | 4 | 4 |

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

Compression fittings