

Data sheet

Differential pressure controller with flow limitation and with integrated control valve (PN 16)

AHPBM-F – flow mounting, fixed setting

Description



The controller has a control valve with adjustable flow restrictor, connection neck for electrical actuator, and an actuator with one control diaphragm.

Controllers are used together with Danfoss electrical actuators:

- AMV(E) 10
- AMV(E) 13 with spring return function
- AMV(E) 130, AMV(E) 140
- AMV(E) 130H, AMV(E) 140H with manual override knob

AHPBM-F combined with AMV(E) 13 has been approved according to DIN EN 14597.

Main data:

- DN 15-32
- k_{vs} 1.0-6.3 m³/h
- PN 16
- Fixed Δp setting:
 - 0.12 bar for DN 15-20
 - 0.14 bar for DN 25-32
- Temperature:
 - Circulation water / glycolic water up to 30%: 2 ... 120 °C
- Connections:
 - Ext. thread (weld-on, thread and flange tailpieces)

AHPBM-F is a self-acting differential pressure controller with flow limitation primarily for use in direct-connected district heating systems **with mixing loop only**. The controller closes on rising differential pressure or when set max. flow is exceeded.

It can be combined with Danfoss electrical actuators AMV(E) and controlled by ECL electronic controllers.

Ordering

Example:

Differential pressure controller with flow limitation (fixed setting) and integrated control valve, DN 15, k_{vs} 1.6, PN 16, flow restrictor Δp 0.12 bar, t_{max} 120 °C, ext. thread

- 1x AHPBM-F DN 15 controller
Code No.: **003L3582**

Option:

- 1x Impulse tube set AH, 1.5 m
Code No.: **003L8152**
- 1x Fitting for imp. tube
Code No.: **003L5042**
- 1x Weld-on tailpieces
Code No.: **003H6908**

External impulse tube (AH), nipple for impulse tube and electrical actuators AMV(E) must be ordered separately.

AHPBM-F Controller

| Picture | DN (mm) | k_{vs} (m ³ /h) | Connection | Δp setting range (bar) | Code No. | |
|---------|---------|------------------------------|--------------------------------------|--------------------------------|-----------------|-----------------|
| | 15 | 1.0 | Cylin. ext. thread acc. to ISO 228/1 | 0.12 | 003L3580 | |
| | | 1.25 | | | G ¾ A | 003L3581 |
| | | 1.6 | | | G 1 A | 003L3582 |
| | 20 | 2.5 | | G 1 ¼ A | 003L3583 | |
| | 25 | 4.0 | | G 1 ½ A | 003L3584 | |
| | 32 | 6.3 | | G 1 ¾ A | 0.14 | 003L3585 |

Ordering (continuous)
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 1/4 003H6905 |
| | Flange tailpieces | 15 | Flanges PN 25, acc. to EN 1092-2 | 003H6915 |
| | | 20 | | 003H6916 |
| | | 25 | | 003H6917 |
| | Impulse tube set AH | Description: - 1x copper tube Ø 3 x 1 mm - 2x fitting for imp. tube connection to actuator and pipe G 1/16 | 1.5 m | 003L3561 |
| | | | 2.5 m | 003L5043 |
| | | | 5 m | 003L3562 |
| | Impulse tube set AH for pressure reduction | Description: - 1x stainless steel tube Ø 0.8 x 0.2 mm - 2x fitting for imp. tube connection to actuator and pipe G 1/16 | 0.8 m | 003L3560 |
| | Fitting for impulse tube connection to pipe | | G 1/16-R 3/8 | 003L5042 |
| | | | G 1/16-R 1/4 | 003L8151 |
| | 10 EPDM o-rings for impulse tube | | | 003L8175 |

Technical data
Valve

| Nominal diameter | DN | 15 | 20 | 25 | 32 | | |
|--------------------------------------|-------------------|--|------|--------|---------|------|------|
| k_{vs} value | m ³ /h | 1.0 | 1.25 | 1.6 | 2.5 | 4.0 | 6.3 |
| Q_{min} | | 0.035 | 0.11 | 0.2 | 0.25 | 0.43 | 0.65 |
| Q_{nom}^* | | 0.43 | 0.7 | 1.0 | 1.2 | 2.2 | 3.4 |
| Stroke | mm | 5.5 | | 5 | | | |
| Control ratio | | > 1:30 | | > 1:50 | > 1:100 | | |
| Control characteristic | | Linear | | | | | |
| Cavitation factor z ** | | ≥ 0.6 | | | | | |
| Leakage acc. to standard IEC 60534 | | 0.05 | | | | | |
| Nominal pressure | PN | 16 | | | | | |
| Min. differential pressure | bar | See remark *** | | | | | |
| Max. differential pressure | | 4 | | | | | |
| Medium | | Circulation water / glycolic water up to 30% | | | | | |
| Medium pH | | Min. 7, max. 10 | | | | | |
| Medium temperature | °C | 2 ... 120 | | | | | |
| Connections | | External thread | | | | | |
| Materials | | | | | | | |
| Valve body / valve seat / valve cone | | Dezincing free brass CuZn36Pb2As | | | | | |
| Sealing | | EPDM | | | | | |

* At differential pressure across the controller $\Delta p_{AHPBM-F} \geq 0.5$ bar

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

*** Depends on the flow rate and valve k_{vs} ; $\Delta p_{min} = \left(\frac{Q_{nom}}{k_{vs}} \right)^2 + 0.12(0.14)^{1)}$

¹⁾ Depends on DN

Technical data (continuous)

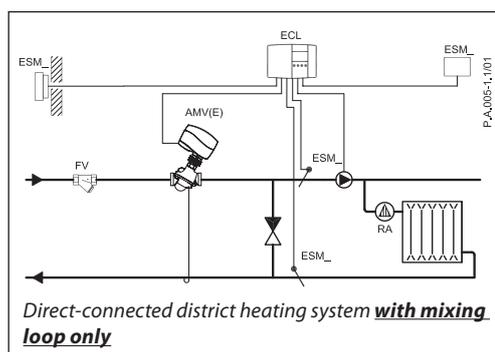
Actuator

| | | | | | |
|---|---|------|----|------|----|
| Type | DN | 15 | 20 | 25 | 32 |
| Actuator size | cm ² | 8.5 | 13 | 20 | 32 |
| Nominal pressure | PN | 16 | | | |
| Flow restrictor differential pressure (AHQM) Fixed differential pressure setting (AHPBM-F) | bar | 0.12 | | 0.14 | |
| Materials | | | | | |
| Housing* | Dezincing free brass CuZn36Pb2As | | | | |
| Diaphragm | EPDM | | | | |
| Impulse tube | Copper tube Ø 3 × 1 mm | | | | |
| | Stainless steel tube Ø 0.8 × 0.2 × 800 mm | | | | |

* Actuator housing is part of valve body

Application principles

AHPBM-F controller must be installed in the flow pipeline only.



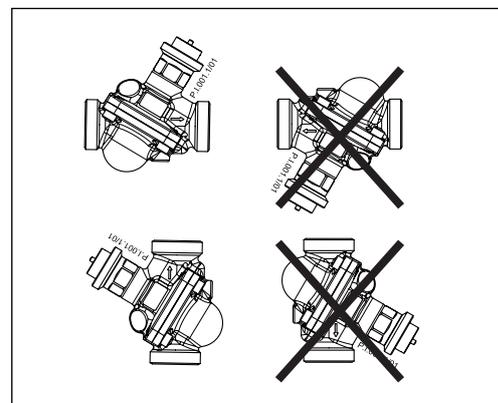
Installation positions

The controllers can be installed in horizontal or vertical pipes with (connection neck for) electrical actuator oriented upwards.

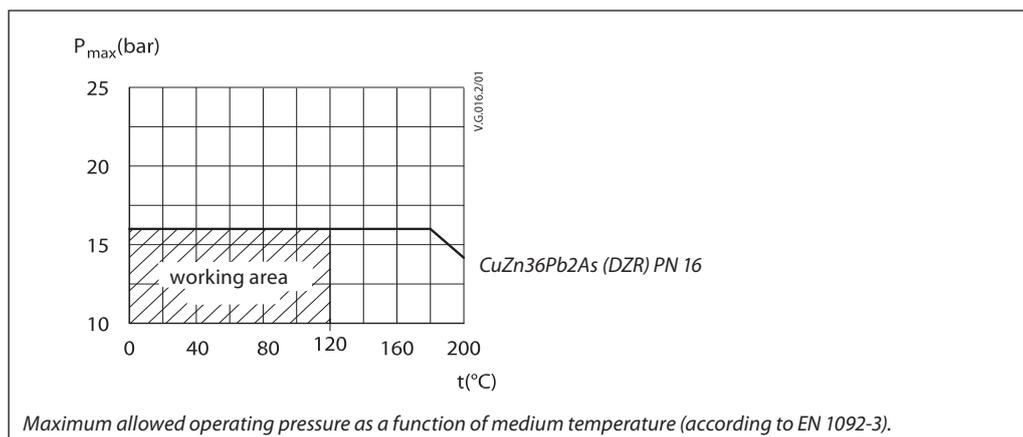
Electrical actuator

Note!

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



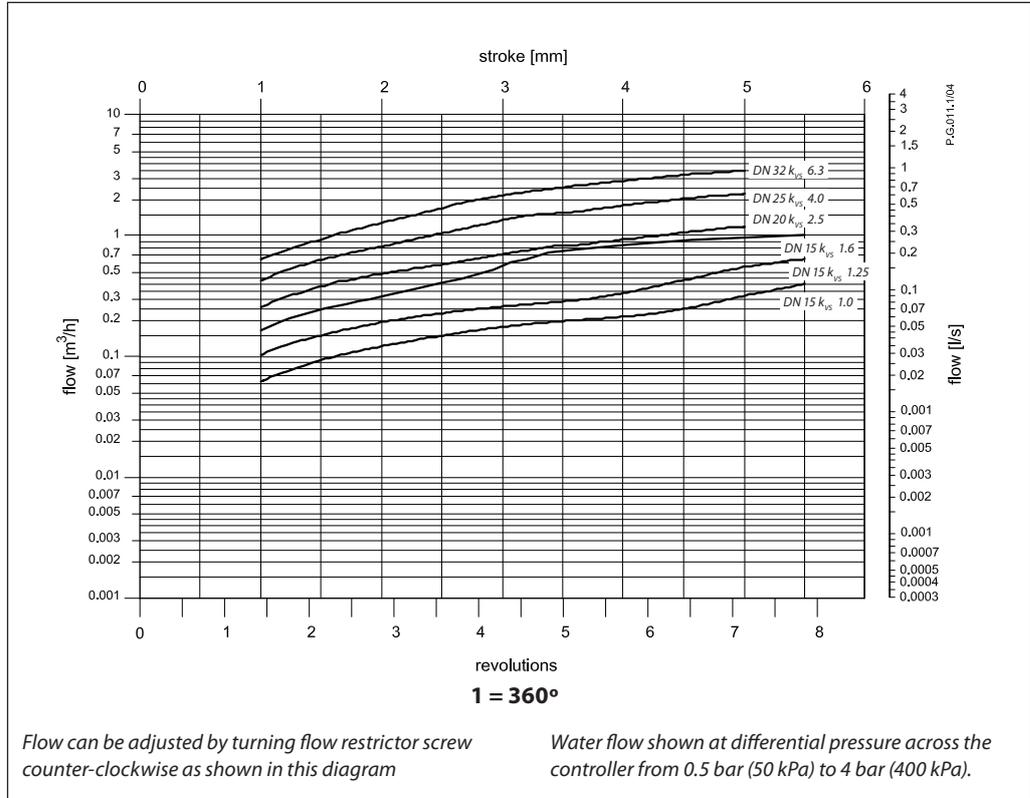
Pressure temperature diagram



Flow diagram

Sizing and setting diagram

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



Sizing

- Directly connected heating system

Example AHPBM-F (flow mounting only)

Motorised control valve (MCV) for mixing circuit in direct-connected heating systems requires differential pressure of 0.12 bar (12 kPa) and flow less than 600 l/h.

Given data:

- $Q_{max} = 0.6 \text{ m}^3/\text{h}$ (600 l/h)
- $\Delta p_{min} = 0.8 \text{ bar}$ (80 kPa)
- * $\Delta p_{circuit} = 0.1 \text{ bar}$ (10 kPa)
- $\Delta p_{MCV} = 0.12 \text{ bar}$ (12 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 AHPBM-F.

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

$$\Delta p_{AHPBM-F,A} = \Delta p_{min}$$

$$\Delta p_{AHPBM-F,A} = 0.8 \text{ bar} \text{ (80 kPa)}$$

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

Select controller from flow diagram, page 5, with the smallest possible k_{vs} value considering available flow ranges.

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

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

$$\Delta p_{AHPBM-F,MIN} = \left(\frac{Q_{max}}{k_{vs}} \right)^2 + \Delta p_{MCV}$$

$$\Delta p_{AHPBM-F,MIN} = \left(\frac{0.6}{1.6} \right)^2 + 0.12$$

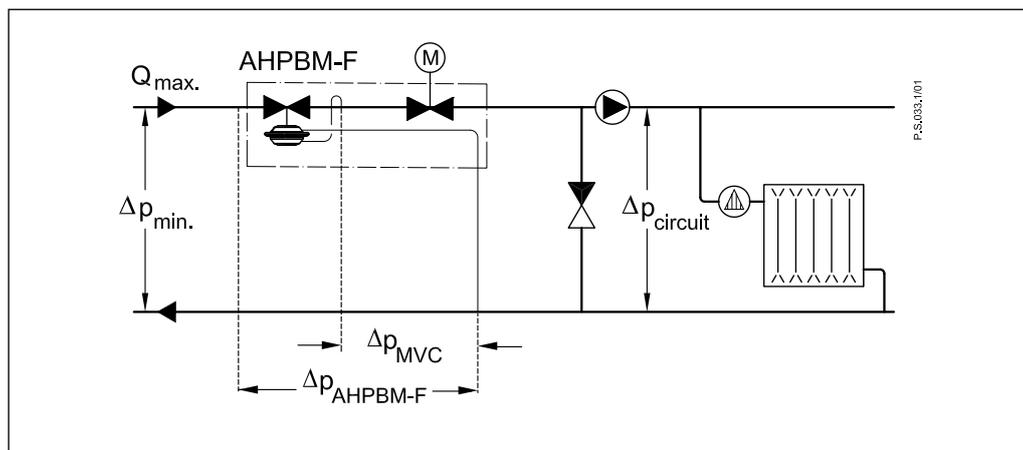
$$\Delta p_{AHPBM-F,MIN} = 0.26 \text{ bar} \text{ (26 kPa)}$$

$$\Delta p_{AHPBM-F,A} > \Delta p_{AHPBM-F,MIN}$$

$$0.8 \text{ bar} > 0.26 \text{ bar}$$

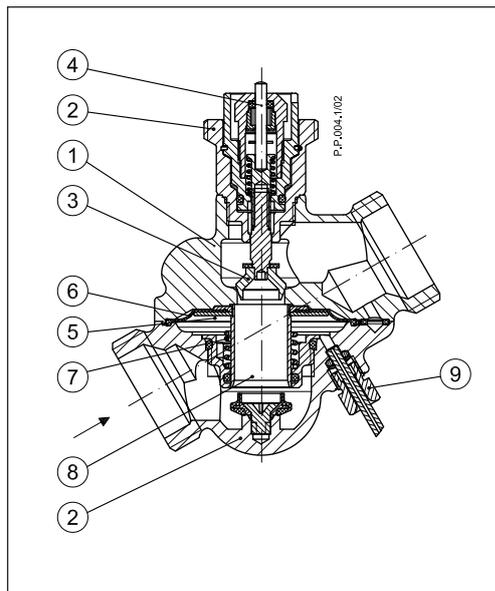
Solution:

The example selects AHPBM-F DN 15, k_{vs} value 1.6, flow setting range 0.06-0.79 m^3/h .



Design

- 1. Valve body
- 2. Control valve insert
- 3. Adjustable flow restrictor
- 4. Control valve stem
- 5. Differential pressure actuator
- 6. Control diaphragm
- 7. Built-in spring for flow rate control
- 8. Pressure relieved valve cone
- 9. Impulse tube



Function

Pressure changes from the flow and return pipeline are being transferred through the impulse tube and control drain 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. Flow volume is controlled and limited by means of the flow restrictor.

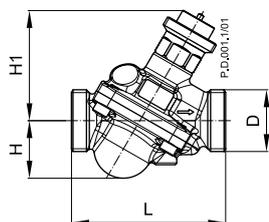
Additionally the electrical actuator will operate from zero to set max. flow according to the load.

Settings

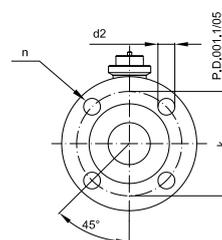
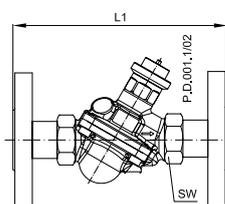
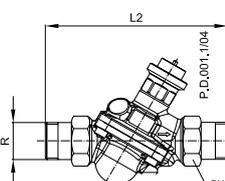
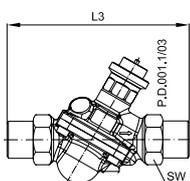
Flow setting

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 | | 15 | 20 | 25 | 32 |
|----------------|----|------|------|-------|-------|
| L | mm | 65 | 82 | 104 | 130 |
| H | | 24 | 31 | 39 | 49 |
| H ₁ | | 57 | 59 | 72 | 84 |
| D (ISO 228/1) | | G ¾A | G 1A | G 1¼A | G 1¾A |
| Valve weight | kg | 0.51 | 0.67 | 1.47 | 2.23 |

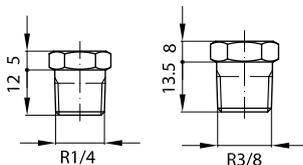


| DN | | 15 | 20 | 25 | 32 |
|-----------------|----|-----------|-----------|------------|------------|
| SW | | 32 (G ¾A) | 41 (G 1A) | 50 (G 1¼A) | 63 (G 1¾A) |
| d | mm | 21 | 26 | 33 | 42 |
| R ¹⁾ | | ½ | ¾ | 1 | 1 ¼ |
| L ²⁾ | | 130 | 150 | 160 | - |
| L ₂ | | 131 | 144 | 160 | 177 |
| L ₃ | | 139 | 154 | 159 | 184 |
| k | | 65 | 75 | 85 | - |
| d ₂ | | 14 | 14 | 14 | - |
| n | 4 | 4 | 4 | - | |

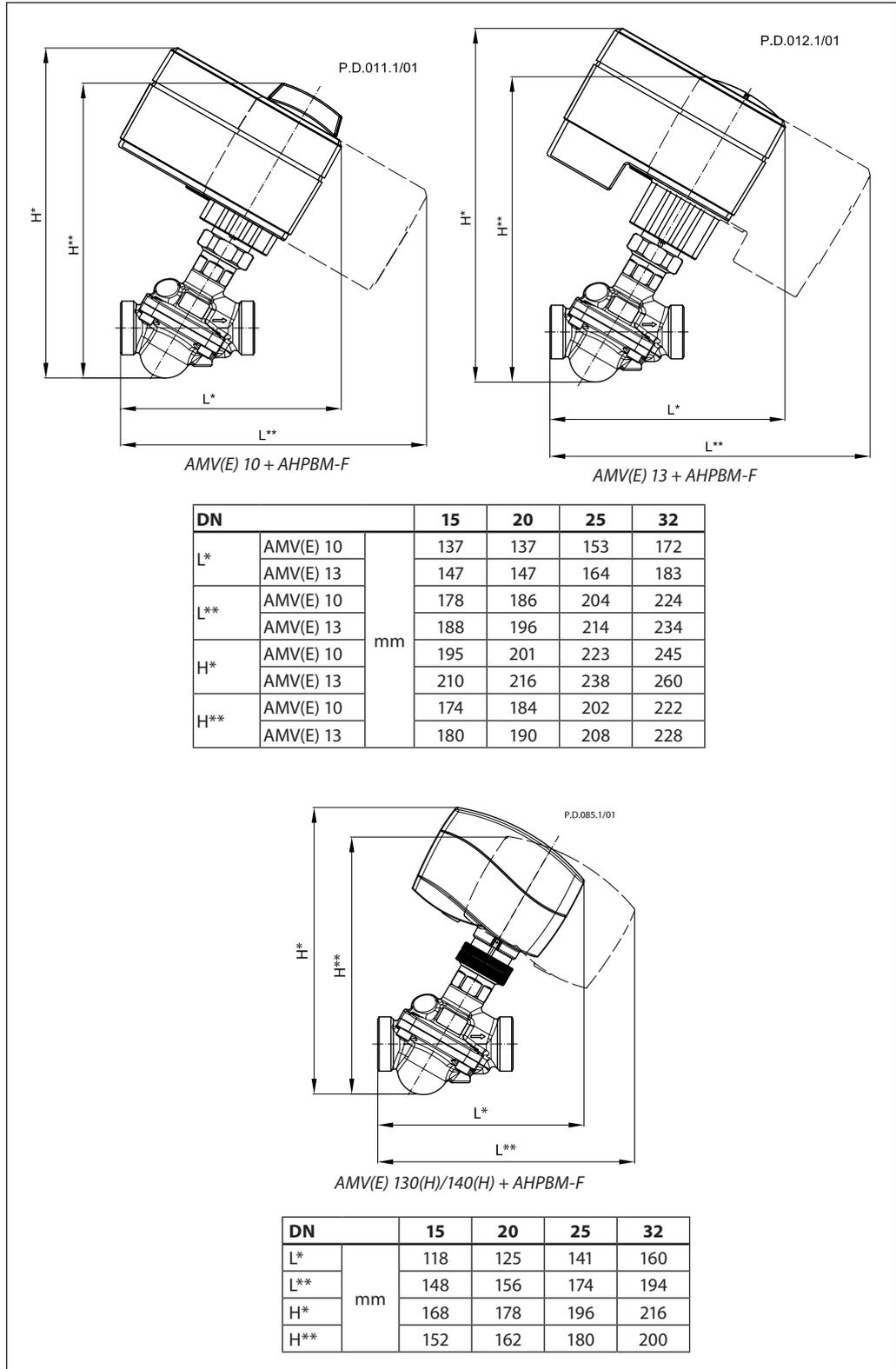
¹⁾ Conical ext. thread acc. to EN 10226-1

²⁾ Flanges PN 25, acc. to EN 1092-2

Fittings



Dimensions (continuous)



Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without consequential changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.