Data sheet

# Combined automatic balancing valve

## **AB-PM** – valve DN 15-25, PN 16

### Description

AB-PM is a combined automatic balancing valve. It features three function in compact valve body:

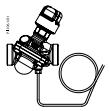
1. Differential pressure controller
2. Control valve with linear characteristic
3. Flow limiter

**Benefits:**

- Reliable heating system resulting in:
  - proper heat distribution even at partial loads
  - noise free operation based on stable low Δp over thermostatic radiator valves even in installation where higher pump head is needed
- Lower heating cost
- Better indoor temperature control
- Faster in simpler installation with less installation space needed

### Ordering

**AB-PM** valve (including 1,5 m impulse tube and imp. tube adapter)

| Picture | DN | Ext. thread (ISO 228/1) | Code No. |
|---|---|---|---|
|  | 15 | G ¾ A | **003Z1402** |
| | 20 | G 1 A | **003Z1403** |
| | 25 | G 1¼ A | **003Z1404** |

#### Accessories

| Type | To pipe | To valve | Code No. |
|---|---|---|---|
| Tailpiece threaded (1 pcs.) | R ½ | DN 15 | **003Z0232** |
| | R ¾ | DN 20 | **003Z0233** |
| | R 1 | DN 25 | **003Z0234** |
| Tailpiece welding (1 pcs.) | | DN 15 | **003Z0226** |
| | | DN 20 | **003Z0227** |
| | | DN 25 | **003Z0228** |
| Tailpiece soldering (1 pcs.) | | DN 15 | **003Z7017** |
| [1] Stroke limiter | | | **003Z1237** |

*[1] Stroke limiter ensures min. 20% opening of AB-PM when TWA-Z is closed.*

#### Actuator

| Type | Power supply | Cable length | Code No. |
|---|---|---|---|
| TWA-Z NO [1] | 24 V AC | 1,2 m | **082F1260** |
| | 230 V AC | | **082F1264** |
| TWA-Z NC [1] | 24 V AC | 1,2 m | **082F1262** |
| | 230 V AC | | **082F1266** |

*[1] up to 60 % of $Q_{max}$ on AB-PM DN 25*

#### Spare parts

| Type | Remark | Code No. |
|---|---|---|
| Impulse tube adapter | $^{3}/_{8}$" - $^{1}/_{16}$" | **003L5042** |
| | ¾" - $^{1}/_{16}$" | **003Z0109** |
| | ¼" - $^{1}/_{16}$" | **003L8151** |
| Impulse tube with O-rings | 1,5 m | **003L8152** |
| | 2,5 m | **003Z0690** |
| Shut-off knob (red) | | **003Z0250** |

## Technical data

| Nominal diameter | | DN 15 | DN 20 | DN 25 |
|---|---|---|---|---|
| Qmax (at $\Delta p_r$ = 10 kPa) | | 300 l/h (at 100% setting) | 600 l/h (at 100% setting) | 1200 l/h (at 100% setting) |
| Upper limit of pressure controller at zero flow | | 22 kPa | | |
| Differential pressure | | 16 – 400 kPa | | |
| Nominal maximal pressure | | 16 bar (PN16) | | |
| Control valves characteristic | | Linear | | |
| Shut-off leakage rate | | Acc. to ISO 5208 class A - no visible leakage | | |
| Medium temperature | | –10 … +120 °C | | |
| CV stroke | | 2,25 mm | | 4,5 mm |
| Connection | Ext. thread ISO 228/1 | G ¾ A | G 1 A | G 1¼ A |
| | Actuator | M 30 × 1,5 | | |
| **Materials in water** | | | | |
| Valve body | | Brass (CuZn40Pb2 - CW 617N) | | |
| Membrane and O-ring | | EPDM | | |
| Spring | | W.Nr. 1.4568, W.Nr. 1.4310 | | |
| Cone (PC) | | W.Nr. 1.4305 | | |
| Seat (PC) | | EPDM | | |
| Cone (CV) | | CuZn40Pb3 - CW 614N | | |
| Seat (CV) | | CuZn40Pb2 - CW 617N | | |
| Flat gasket | | NBR | | |
| Screw | | Stainless Steel (A2) | | |
| Sealing agent | | Dimethacrylate Ester | | |
| **Materials out of the water** | | | | |
| Plastic parts | | POM | | |
| Insert parts and outer screws | | CuZn39Pb3 - CW 614N; W.Nr. 1.4310; W.Nr. 1.4401 | | |

## Mounting

AB-PM should be mounted in flow in the direction of the arrow on the valve body. The impulse tube should be installed between AB-PM and 1/16" – 3/8" adapter that is supplied together with AB-PM.

Alternatively, impulse tube can be connected to ASV partner valve, such as ASV-BD. With it, additional service functions such as flow verification, shut-off, etc are available.

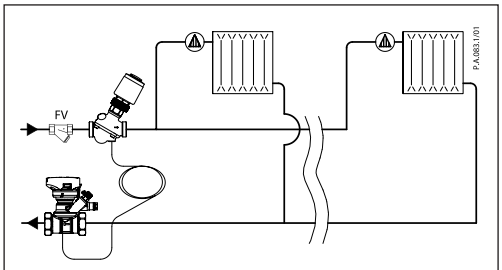



*Fig. 1) The impulse tube must be flushed through before installation.*

## Applications

AB-PM is designed to be used in heating residential application. It can be used both in radiator or floor heating systems. Because it offers 3 functions in one, small valve body, it is ideal for small spaces such as manifold cabinets, etc.

AB-PM is focused to systems with horizontal piping loops and individual flat connections: AB-PM provides proper balance even at partial loads and limitation of maximal flow is simple and fast. In addition, programmable zone control (night setback or holiday mode) is available by using On/Off actuator, connected to a room controller.

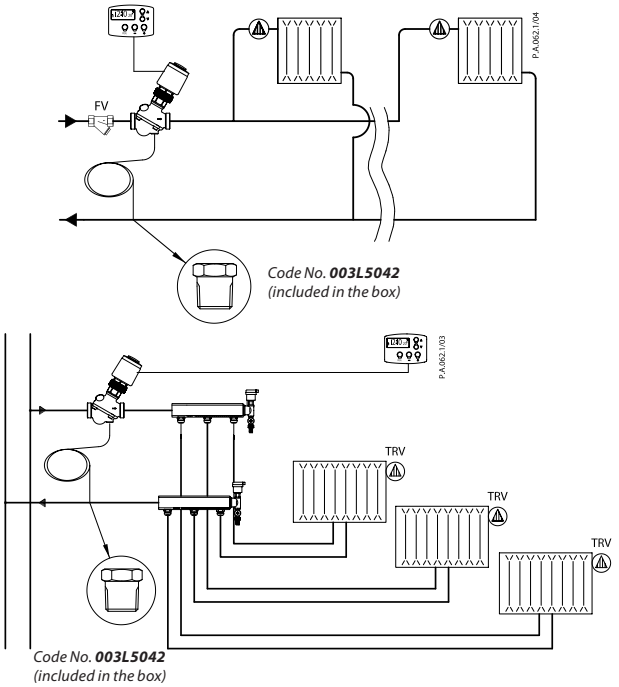



*Fig. 2) AB-PM should be mounted in flow.*

*[1] For each room only one control element (TRV or room controller) is to be used in order to ensure best indoor temperature control performance.*

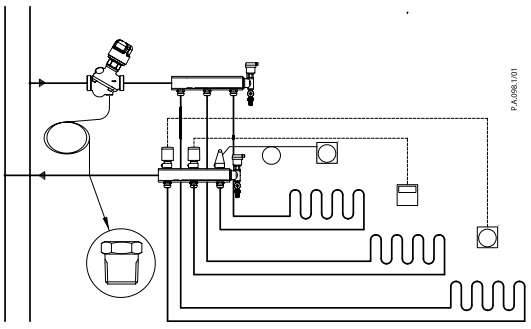


*Fig. 3) AB-PM in manifold for floor heating system*

## Sizing

AB-PM is to be sized based on needed flow (Q) and needed differential pressure drop for the loop ($\Delta p_r$). Max flow data are presented in table 1.

For any other Q and $\Delta p_r$ needed, AB-PM size and setting can be indetified based on Fig. 4, 5 and 6. Alternatively table 2, 3 and 4 can be used for AB-PM sizing as well. Q is proportional to the setting on AB-PM while upper limit differential pressure ($\Delta p_r$) is kept the same.

Table 1

| Type | DN 15 at 100% setting | | DN 20 at 100% setting | | DN 25 at 100% setting | |
|---|---|---|---|---|---|---|
| Q max. | 300 l/h | 400 l/h | 600 l/h | 780 l/h | 1200 l/h | 1600 l/h |
| Maximum pressure drop available for system at max flow | 10 kPa | 5 kPa | 10 kPa | 5 kPa | 10 kPa | 5 kPa |
| Upper limit of pressure controller at zero flow | 22 kPa | | 22 kPa | | 22 kPa | |
| Starting $\Delta p_v$ | 16 kPa | | | | | |

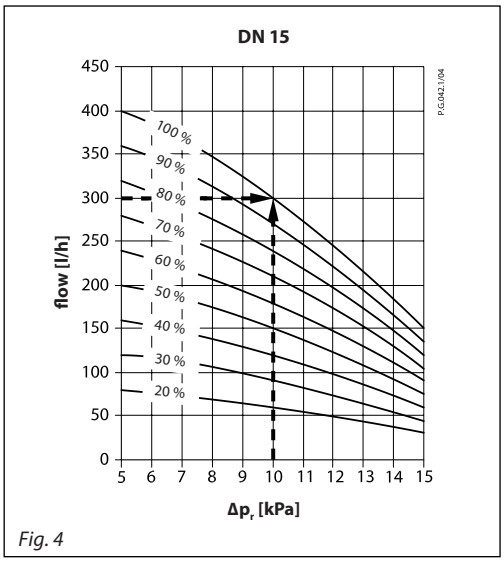



*Fig. 4*

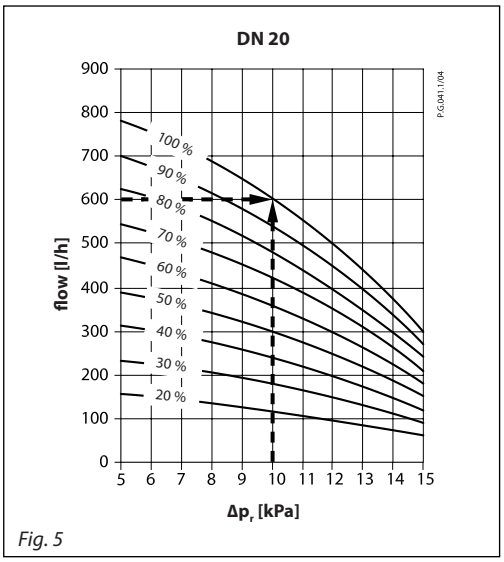



*Fig. 5*

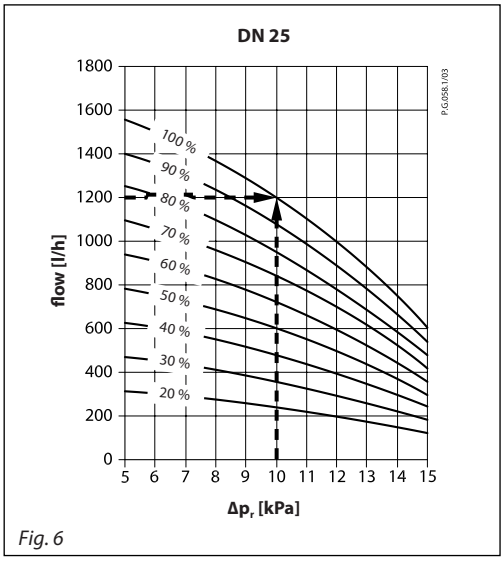
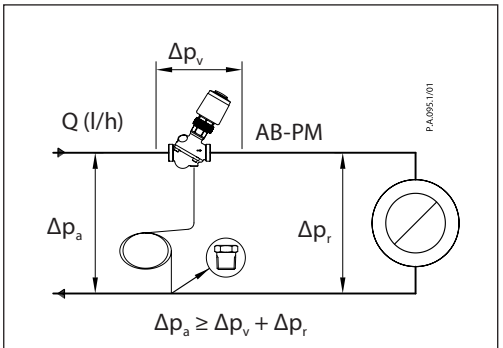



*Fig. 6*




*Legend:*
*Q = needed (design) flow Q for the loop*
*$\Delta p_r$ = needed (design) Δp for the loop*
*$\Delta p_v$ = min needed Δp for AB-PM (starting $\Delta p_v$)*
*$\Delta p_a$ = available Δp*

*Fig. 7*

**Sizing** *(continuous)*

**Example**

*Given:*
Design flow trough radiators loop: 420 l/h
Pressure drop trough the loop at design flow: 10 kPa

*Solution:*
AB-PM DN 20 is selected. Set to 70 % (= 420/600), AB-PM will control differential pressure of 10 kPa when design flow is achieved. It will at any loads including keep it under 22 kPa at zero load, while limiting the flow to radiator system to 420 l/h.

Table 2 **AB-PM DN 15 setting**

| DN 15 | flow [l/h] - average | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **$\Delta p_r$ [kPa]** | **20 %** | **30 %** | **40 %** | **50 %** | **60 %** | **70 %** | **80 %** | **90 %** | **100 %** |
| **5** | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 |
| **6** | 77 | 115 | 155 | 195 | 230 | 270 | 310 | 350 | 385 |
| **7** | 75 | 110 | 150 | 185 | 220 | 260 | 295 | 335 | 370 |
| **8** | 70 | 105 | 140 | 175 | 210 | 245 | 280 | 315 | 350 |
| **9** | 65 | 100 | 130 | 160 | 195 | 230 | 260 | 295 | 325 |
| **10** | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
| *$Q_{max}$ at ΔT 20 °C* | | | | | | | | | *7,0 kW* |
| **11** | 55 | 85 | 110 | 140 | 165 | 195 | 220 | 250 | 275 |
| **12** | 40 | 75 | 100 | 125 | 150 | 170 | 195 | 220 | 245 |
| **13** | 45 | 65 | 85 | 110 | 130 | 150 | 170 | 195 | 215 |
| **14** | 40 | 55 | 75 | 95 | 110 | 130 | 150 | 165 | 185 |
| **15** | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 |
| *$Q_{max}$ at ΔT 20 °C* | | | | | | | | | *3,5 kW* |

Table 3 **AB-PM DN 20 setting**

| DN 20 | flow [l/h] - average | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **$\Delta p_r$ [kPa]** | **20 %** | **30 %** | **40 %** | **50 %** | **60 %** | **70 %** | **80 %** | **90 %** | **100 %** |
| **5** | 155 | 235 | 310 | 390 | 470 | 545 | 625 | 700 | 780 |
| **6** | 150 | 225 | 300 | 375 | 450 | 525 | 600 | 675 | 750 |
| **7** | 140 | 215 | 285 | 355 | 425 | 495 | 570 | 640 | 710 |
| **8** | 135 | 205 | 270 | 340 | 410 | 475 | 545 | 610 | 680 |
| **9** | 130 | 190 | 255 | 320 | 385 | 450 | 510 | 575 | 640 |
| **10** | 120 | 180 | 240 | 300 | 360 | 420 | 480 | 540 | 600 |
| *$Q_{max}$ at ΔT 20 °C* | | | | | | | | | *13,9 kW* |
| **11** | 110 | 165 | 220 | 275 | 330 | 385 | 440 | 495 | 550 |
| **12** | 100 | 145 | 195 | 245 | 295 | 345 | 390 | 440 | 490 |
| **13** | 85 | 130 | 170 | 215 | 260 | 300 | 345 | 385 | 430 |
| **14** | 75 | 110 | 150 | 185 | 220 | 260 | 295 | 335 | 370 |
| **15** | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
| *$Q_{max}$ at ΔT 20 °C* | | | | | | | | | *7,0 kW* |

Table 4 **AB-PM DN 25 setting**

| DN 25 | flow [l/h] - average | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **$\Delta p_r$ [kPa]** | **20 %** | **30 %** | **40 %** | **50 %** | **60 %** | **70 %** | **80 %** | **90 %** | **100 %** |
| **5** | 310 | 470 | 625 | 780 | 935 | 1090 | 1250 | 1405 | 1560 |
| **6** | 300 | 450 | 600 | 750 | 900 | 1050 | 1200 | 1350 | 1500 |
| **7** | 285 | 425 | 570 | 710 | 850 | 995 | 1135 | 1280 | 1420 |
| **8** | 270 | 410 | 545 | 680 | 815 | 950 | 1090 | 1225 | 1360 |
| **9** | 255 | 385 | 510 | 640 | 770 | 895 | 1025 | 1150 | 1280 |
| **10** | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |
| *$Q_{max}$ at ΔT 20 °C* | | | | | | | | | *27,9 kW* |
| **11** | 220 | 330 | 440 | 550 | 660 | 770 | 880 | 990 | 1100 |
| **12** | 195 | 295 | 390 | 490 | 590 | 685 | 785 | 880 | 980 |
| **13** | 170 | 260 | 345 | 430 | 515 | 600 | 690 | 775 | 860 |
| **14** | 150 | 220 | 295 | 370 | 445 | 520 | 590 | 665 | 740 |
| **15** | 120 | 180 | 240 | 300 | 360 | 420 | 480 | 540 | 600 |
| *$Q_{max}$ at ΔT 20 °C* | | | | | | | | | *13,9 kW* |

## Design

1. Spindle
2. Stuffing box
3. Pointer
4. Control valve's cone
5. Membrane
6. Main spring
7. Hollow cone (pressure controller)
8. Vulcanized seat (pressure controller)
9. Impulse tube

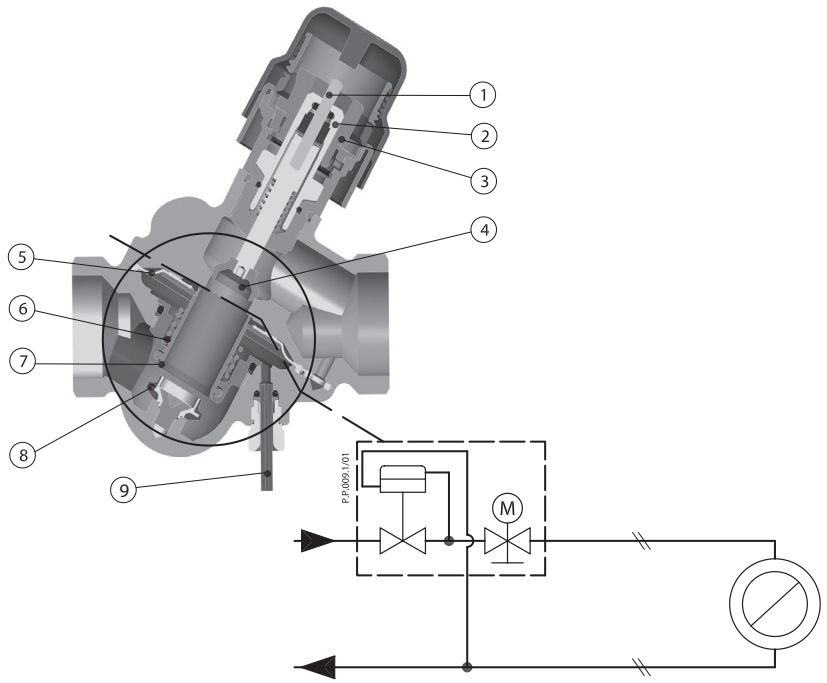


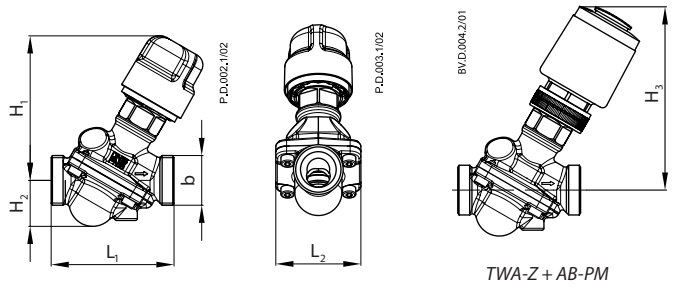

*Fig. 8) AB-PM, DN 15-25*

AB-PM is a combined automatic balancing valve. It is working as Δp controller, flow limiter and zone controller. Higher pressure acts on the upper side of the control diaphragm (5) while via an impulse tube (9) lower pressure in the return pipe acts on the lower side of the diaphragm. When available pressure increases at partial loads, the membrane closes and thus keeps stable Δp inside the controlled loop. Δp controller keeps constant differential pressure on the controlled loop including the control part of AB-PM (similar as if ASV-I would be integrated into ASV-P).

The control part of AB-PM is working as a flow limiter. This enables to set both the design flow as well as needed Δp. The flow rate is defined by presetting AB-PM, based on pressure demand of the loop.

With actuator mounted on the valve, AB-PM can be used as zone valve. When connected to the room controller with time programs, functions such as night setback, holiday mode, etc become available.

## Dimensions




*TWA-Z + AB-PM*

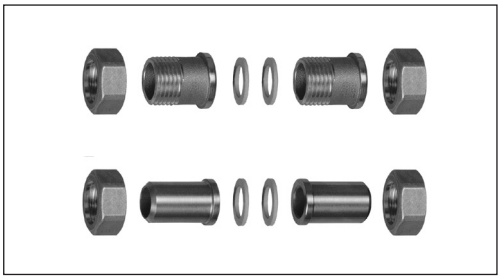
| Type | $L_1$ | $L_2$ | $H_1$ | $H_2$ | $H_3$ | b | Valve weight |
|---|---|---|---|---|---|---|---|
| | mm | | | | | ISO 228/1 | (kg) |
| AB-PM DN 15 | 65 | 45 | 75 | 25 | 102 | G ¾ | 0,530 |
| AB-PM DN 20 | 82 | 56 | 77 | 33 | 105 | G 1 | 0,751 |
| AB-PM DN 25 | 104 | 71 | 88 | 42 | 117 | G 1 ¼ | 1,338 |

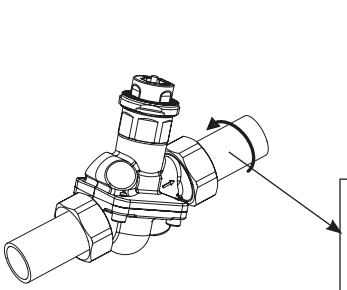
*Fig. 9*

## Fittings

For valves with external thread Danfoss offers threaded or welded tailpieces as accessory.

Materials:
Nut.....brass
Tailpiece welding.....steel
Tailpiece threaded.....brass






| DN | | | | |
|---|---|---|---|---|
| | **To pipe** | L (mm) | **Weld.con.** | **Sold.con.** |
| | | | L (mm) | |
| 15 | R ½ | 27,5 | 37 | 22 |
| 20 | R ¾ | 30,5 | 42 | |
| 25 | R 1 | 35 | 42 | |