Data sheet

# Pressure independent balancing and control valve AB-QM DN 10-250

*The AB-QM valve equipped with an actuator is a control valve with full authority and an automatic balancing function / flow limitation. Typical applications are: Temperature control with permanent automatic balancing on terminal units (chillers, air-handling units, fan coils, induction units, radiant panels and heat exchangers).*

## Description

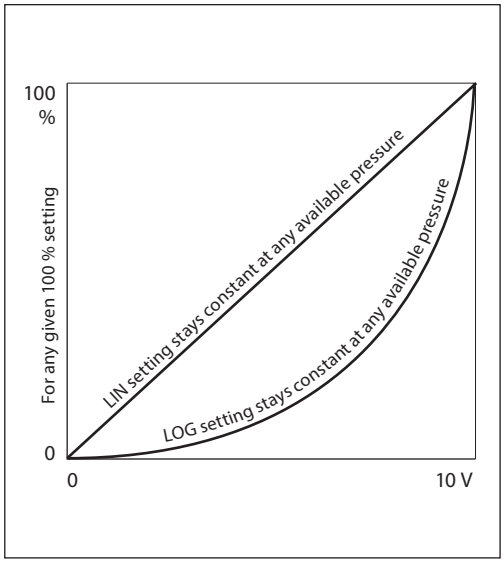
The **precise flow control performance** of the AB-QM with a Danfoss actuator provides increased comfort and **superior Total Cost of Ownership** because of savings made on:

- Efficient energy transfer and minimal pumping costs since there are no overflows at partial loads because of the exact pressure independent flow limitation.
- Smaller pump investments and lower energy consumption as the pump head needed is lower than in the traditional setup. With the built in test plugs it is easy to troubleshoot and find the optimal setpoint for the pump.
- Reduced movements of the actuator since the built-in differential pressure controller ensure the pressure fluctuations do not influence the room temperature.
- Achieving a stable temperature in a room leading to a lower average temperature at the same comfort level.
- Minimal flow complaints, as the valve performs as designed.
- Minimal blockage complaints, as the membrane design makes AB-QM less susceptible to blockage than a cartridge type construction.
- Trouble-free segmentation of the building project. When sections of a project are finished they can normally not be handed over to the customer with a fully functional HVAC installation. However the AB-QM with a Danfoss actuator will automatically control the flow, even when other parts of the installation are still unfinished. The AB-QM doesn't need to be adjusted after finalisation of the project.
- Commissioning costs are close to zero because of the convenient setting procedure that doesn't require flow charts, calculations or measuring equipment. The AB-QM valves can be set to a precise design value even when the system is up and running.
- Lower installation costs as the AB-QM valve covers two functions, Balancing and Control.

## Control performance

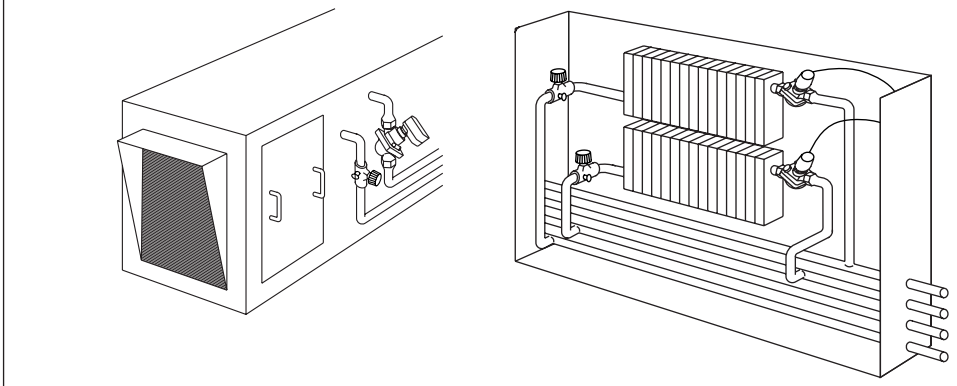
The AB-QM has a linear control characteristic. The AB-QM is pressure independent which means that the control characteristic is independent from the available pressure and is not influenced by a low authority.
The flow limitation on the AB-QM is achieved by limiting the stroke and the Danfoss actuators calibrate to the stroke of the valves. This means that the AB-QM keeps its linear characteristic regardless of the setting or differential pressure.

Because of the predictable characteristic the actuators on the AB-QM can be used to change the response from linear to logarithmic (equal percentage). That makes the AB-QM suitable for all applications, including AHUs, where the equal percentage characteristic is needed to get a stable control loop. The actuators can be switched from linear to logarithmic by changing a dipswitch setting on the actuator.




## Applications

- variable flow systems

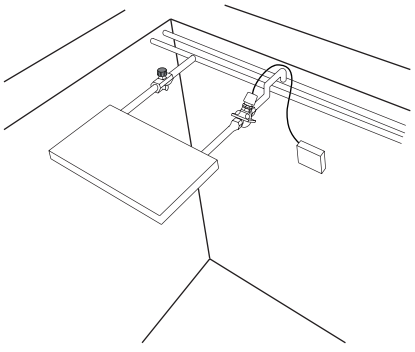


*Air handling unit (AHU) / fan coil unit (FCU)*

An AB-QM with a Danfoss actuator is used as a control valve for terminal units, like an AHU (Air Handling Unit), FCU (Fan Coil Unit) or radiation panel. The AB-QM ensures and controls the required flow on every terminal unit and maintains Hydronic balance in the system.

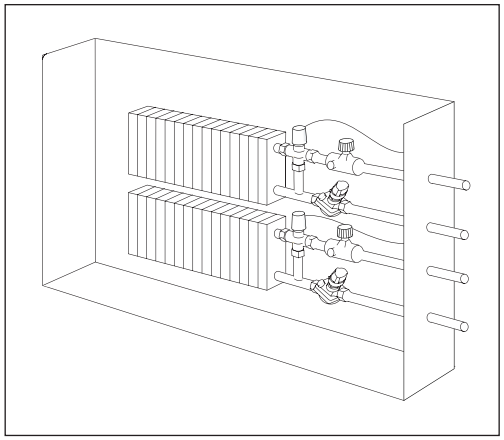
Because of the integrated differential pressure controller the control valve always has 100 % authority and therefore always offers stable control. At partial load there is no overflow, contrary to conventional solutions, because the AB-QM will always limit the flow to exactly what is needed. By installing the AB-QM the whole system is divided in completely independent control loops.

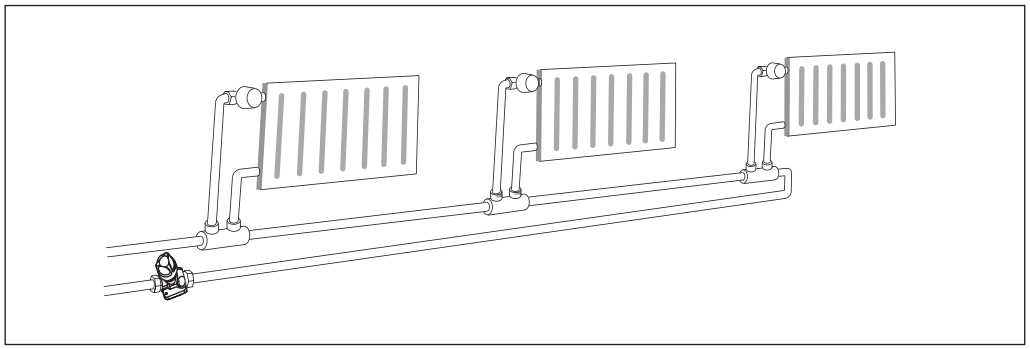
There is a full range of Danfoss actuators available for the AB-QM, suitable for every control strategy. Actuators are available for On/Off, 0-10 Volt, 4-20 mA or floating point.



*Radiant panel*

**Applications**
- constant flow systems





In constant flow systems with FCUs or in a one pipe heating system the AB-QM can be installed as an automatic balancing valve in every riser. The AB-QM limits the flow to the set value, thus automatically achieving hydronic balance in the system.

*There are numerous applications in which AB-QM can be used. Every time you need an automatic flow limiter or a control valve you can take advantage of the cost-saving properties of the AB-QM. This includes systems with (floor) heating/cooling, concrete core activation or radiant panels.*

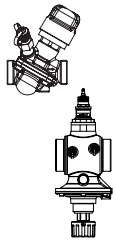
***Note: For more application examples please contact your local Danfoss organization.***

## Easy implementation

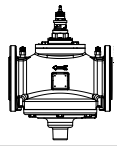
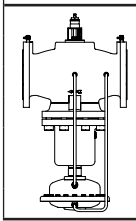
- No Kv or authority calculations needed. Flow is the only parameter to be considered when designing.
- The AB-QM always fits the application because the maximum setting of the AB-QM corresponds with international standards for flow velocity in pipes.
- The AB-QM can be used for all HVAC applications since it can have a linear or logarithmic characteristic when combined with thermal electric or gear actuators.
- Compact design, essential when only limited space is available. e.g. in fan-coil units.
- Easy commissioning. No specialized staff or measuring equipment are needed.
- Easy trouble shooting.
- Fast start-up because AB-QM valves don't need to be flushed or de-aired before use.
- Trouble-free segmentation of the building project. The AB-QM will automatically control the flow, even when parts of the installation are still unfinished. It's not necessary to adjust the AB-QM after finalisation of the building project.

## Ordering

**AB-QM** threaded version (with test plugs and without test plugs)

| Picture | DN | $Q_{nom.}$ (l/h) | Ext. thread (ISO 228/1) | Code No. | AB-QM | Ext. thread (ISO 228/1) | Code No. |
|---|---|---|---|---|---|---|---|
|  | 10 LF | 150 | G ½A | **003Z126100** |  | G ½A | **003Z125100** |
| | 10 | 275 | | **003Z121100** | | | **003Z120100** |
| | 15 LF | 275 | G ¾A | **003Z126200** | | G ¾A | **003Z125200** |
| | 15 | 450 | | **003Z121200** | | | **003Z120200** |
| | 20 | 900 | G 1A | **003Z121300** | | G 1A | **003Z120300** |
| | 25 | 1.700 | G 1 ¼A | **003Z121400** | | G 1 ¼A | **003Z120400** |
| | 32 | 3.200 | G 1 ½A | **003Z121500** | | G 1 ½A | **003Z120500** |
| | 40 | 7.500 | G 2A | **003Z077000** | *AB-QM (DN 10-32) can not be upgraded to AB-QM with test plugs!* | | |
| | 50 | 12.500 | G 2 ½A | **003Z076100** | | | |

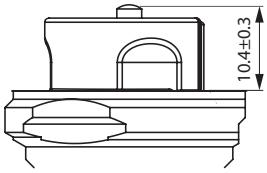
**AB-QM** flanged version

| Picture | DN | $Q_{nom.}$ (l/h) | Flange connection | Code No. |
|---|---|---|---|---|
|  | 50 | 12,500 | PN16 | **003Z077200** |
| | 65 | 20,000 | | **003Z077300** |
| | 80 | 28,000 | | **003Z077400** |
| | 100 | 38,000 | | **003Z077500** |
| | 125 | 90,000 | | **003Z070500** |
|  | 125 HF | 110,000 | | **003Z071500** |
| | 150 | 145,000 | | **003Z070600** |
| | 150 HF | 190,000 | | **003Z071600** |
| | 200 | 190,000 | | **003Z070700** |
| | 200 HF | 250,000 | | **003Z071700** |
| | 250 | 280,000 | | **003Z070800** |
| | 250 HF | 370,000 | | **003Z071800** |

**Ordering** *(continued)*

## Accessories & spare parts

| Type | Comments | | Code No. |
|---|---|---|---|
| | To pipe | To valve | |
| Union connection (1 pcs.)  | R 3/8 | DN 10 | **003Z023100** |
| | R 1/2 | DN 15 | **003Z023200** |
| | R 3/4 | DN 20 | **003Z023300** |
| | R 1 | DN 25 | **003Z023400** |
| | R 1 1/4 | DN 32 | **003Z023500** |
| | R 1 1/2 | DN 40 | **003Z027900** |
| | R 2 | DN 50 | **003Z027800** |
| Shut-off & protection piece (max. closing pressure 16 bar) | | DN 10-32 | **003Z123000** |
| Shut-off - plastic (max. closing pressure 1 bar) | | | **003Z024000** |
| Handle AB-QM (necessary accessory if installing valve without actuator) | | DN 40-100 | **003Z069500** |
| | | DN 125-250 | **003Z069600** |
| Insulation Cap | | DN10 | **003Z473000** |
| | | DN15 | **003Z473100** |
| | | DN20 | **003Z473200** |
| | | DN25 | **003Z473300** |
| | | DN32 | **003Z473400** |
| | | DN40 | **003Z473500** |
| | | DN50 | **003Z473600** |
| Locking Ring (5 pcs.) | | DN 10-32 | **003Z123600** |
| Adapter for AB-QM DN 10, G ½ internal thread for AB-QM, G 3/8 internal thread (1 pcs.) | | | **003Z395400** |
| Adapter for AB-QM DN 15, G ¾ internal thread for AB-QM, G ¾A external thread (1 pcs.) | | | **003Z395500** |
| Adapter for AB-QM DN 20, G 1 internal thread for AB-QM, G 1A external thread (1 pcs.) | | | **003Z395600** |
| Adapter for AB-QM DN 25, G 5/4 internal thread for AB-QM, G 5/4A external thread (1 pcs.) | | | **003Z395700** |
| Adapter AMV(E) 15/16/25/35 (AB-QM DN 40-100, 2nd. generation) | | | **003Z069400** |
| Stem heater for AB-QM DN 40-100 / AME 15 QM | | | **065B217100** |
| Stem heater for AB-QM DN 40-100 / AME 435 QM | | | **065Z031500** |
| Stem heater for AB-QM DN 125, 150 / AME 55 QM | | | **065Z7022 00** |
| Stem heater for AB-QM DN 200, 250 / AME 85 QM | | | **065Z702100** |




*Closing point (measure) for DN 10-32*

## Combinations AB-QM with electrical actuators (AB-QM DN 10-100) [1]

| Valve type | Stroke (mm) | TWA-Z [3] | AMI 140 | ABNM | AMV 110/120 NL AME 110/120 NL | AME 435 QM |
|---|---|---|---|---|---|---|
| | | Recommended ordering code numbers (for details refer to data sheets for these actuators) | | | | |
| | | **082F138000** NC, 230 V<br>**082F138200** NC, 24 V | **082H804800** AMI 140 24 V, 12 s/mm, 2-point control | **082F116000** Thermal act. LOG 24 V (0-10 V) | **082H805600** AMV 110 NL 24 V, 24 s/mm, 3-point control<br>**082H805700** AME 110 NL 24 V, 24 s/mm, 0-10 V | **082H017100** AME 435 QM 24 V |
| DN 10-20 | 2.25 | ✓ | ✓ | ✓ | ✓ | - |
| DN 25, 32 | 4.50 | ✓ [2] | ✓ | ✓ [4] | ✓ | - |
| DN 40, 50 | 10 | - | - | - | - | ✓ |
| DN 65-100 | 15 | - | - | - | - | ✓ |

*[1] Minimum recommended AB-QM setting is 20 %*
*[2] up to 60 % of $Q_{nom}$*
*[3] Please be aware that only this type of TWA actuator is to be used with AB-QM*
*[4] up to 60% od $Q_{nom}$*
*Additional actuator's functionality available, for more info please contact your local Danfoss organization.*

## Ordering *(continued)*

### Combinations AB-QM with electrical actuators (AB-QM, DN 125-250)

| Valve type | Stroke (mm) | AME 55 QM | AME 85 QM |
|---|---|---|---|
| | | Recommended ordering code numbers (for details refer to data sheets for these actuators) | |
| | | **082H307800** 24 V, 8 s/mm, 0-10 V | **082G145300** 24 V, 8 s/mm, 0-10 V |
| DN 125 | 30 | ✓ | - |
| DN 150 | 30 | ✓ | - |
| DN 200 | 27 | - | ✓ |
| DN 250 | 27 | - | ✓ |

*Operational pressure for all AB-QM valves is 4 bar. Closing pressure for all actuators is 16 bar.*
*Additional actuator's functionality available, for more info please contact your local Danfoss organization.*

## Technical data

**AB-QM** (*thread version*)

| **Nominal diameter** | | **DN** | **10 Low Flow** | **10** | **15 Low Flow** | **15** | **20** | **25** | **32** | **40** | **50** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow range | $Q_{nom}$ (100 %) [1] | l/h | 150 | 275 | 275 | 450 | 900 | 1.700 | 3.200 | 7.500 | 12.500 |
| | $Q_{high}$ [4] | | 180 | 330 | 330 | 540 | 1080 | 1.870 [5] | 3.520 [5] | 7.500 | 12.500 |
| Setting range [2] | | % | 20-120 | | | | | 20-110 | | 40-100 | |
| Diff. pressure [3, 4] | $\Delta p_{Qnom}$ ($\Delta p_{Qhigh}$) | kPa | 16-400 (18-400) | | | | | 20-400 (25-400) | | 30-400 | |
| Pressure stage | | PN | 16 | | | | | | | | |
| Control range | | | Acc. to standard IEC 534 control range is high as Cv characteristic is linear (1:1000) | | | | | | | | |
| Control valve's characteristic | | | Linear (could be converted by actuator to equal percentage) | | | | | | | | |
| Leakage acc. to standard IEC 534 | | | No visible leakage (at 100N) | | | | | | | max. 0.05 % of $Q_{nom}$ at 500N | |
| For shut off function | | | Acc. to ISO 5208 class A - no visible leakage | | | | | | | | |
| Flow medium | | | Water and water mixture for closed heating and cooling systems according to plant type I for DIN EN 14868. When used in plant Type II for DIN EN 14868 appropriate protective measures are taken. The requirements of VDI 2035, part 1 + 2 are observed. | | | | | | | | |
| Medium temperature | | °C | –10 ... +120 | | | | | | | | |
| Stroke | | mm | 2.25 | | | | | 4.5 | | 10 | |
| Connection | ext. thread (ISO 228/1) | | G ½ A | G ½ A | G ¾ A | G ¾ A | G 1 A | G 1¼ A | G 1½ A | G 2 A | G 2½ A |
| | actuator | | M30 × 1.5 | | | | | | | Danfoss standard | |
| **Materials in the water** | | | | | | | | | | | |
| Valve bodies | | | DZR Brass (CuZn36Pb2As - CW 602N) | | | | | | | Grey iron EN-GJL-250 (GG 25) | |
| Membranes and O-rings | | | EPDM | | | | | | | | |
| Springs | | | W.Nr. 1.4568, W.Nr. 1.4310 | | | | | | | | |
| Cone (Pc) | | | W.Nr. 1.4305 | | | | | | | CuZn40Pb3-CW 614N, W.Nr. 1.4305 | |
| Seat (Pc) | | | EPDM | | | | | | | W.Nr. 1.4305 | |
| Cone (Cv) | | | CuZn40Pb3 - CW 614N | | | | | | | | |
| Seat (Cv) | | | DZR Brass (CuZn36Pb2As - CW 602N) | | | | | | | W.Nr. 1.4305 | |
| Screw | | | Stainless Steel (A2) | | | | | | | | |
| Flat gasket | | | NBR | | | | | | | | |
| Sealing agent (only for valves with test plugs) | | | Dimethacrylate Ester | | | | | | | | |
| **Materials out of the water** | | | | | | | | | | | |
| Plastic parts | | | PA | | | | | | | POM | |
| Insert parts and outer screws | | | CuZn39Pb3 - CW 614N; W.Nr. 1.4310; W.Nr. 1.4401 | | | | | | | - | |

[1] *factory setting of the valve is done at nominal setting range.*
[2] *Regardless of the setting, the valve can modulate below 1% of set flow.*
[3] *Δp = (P1–P3) min~max*
[4] *When set above 100%, minimum starting pressure needed is higher, see figures in the ().*
[5] *When set above 100%, it can be used as a flow limiter only.*

*According suitability and usage especially in not oxygen tight systems please mind the instructions given by the coolant producer.*

*Pc - pressure controller part*
*Cv - Control valve part*

## Technical data *(continued)*

**AB-QM** (flange version)

| Nominal diameter | | DN | 50 | 65 | 80 | 100 |
|---|---|---|---|---|---|---|
| Flow range | $Q_{nom}$ (100 %) [1] | l/h | 12.500 | 20.000 | 28.000 | 38.000 |
| | $Q_{high}$ [4] | | 12.500 | 20.000 | 28.000 | 38.000 |
| Setting range [2] | | % | 40-100 | | | |
| Diff. pressure [3, 4] | $\Delta p_{Qnom}$ ($\Delta p_{Qhigh}$) | kPa | 30-400 (30-400) | | | |
| Pressure stage | | PN | 16 | | | |
| Control range | | | Acc. to standard IEC 534 control range is high as Cv characteristic is linear. (1:1000) | | | |
| Control valve's characteristic | | | Linear (could be converted by actuator to equal percentage) | | | |
| Leakage acc. to standard IEC 534 | | | max. 0.05 % of $Q_{nom}$ at 500 N | | | |
| For shut off function | | | Acc. to ISO 5208 class A - no visible leakage | | | |
| Flow medium | | | Water and water mixture for closed heating and cooling systems according to plant type I for DIN EN 14868. When used in plant Type II for DIN EN 14868 appropriate protective measures are taken. The requirements of VDI 2035, part 1 + 2 are observed. | | | |
| Medium temperature | | °C | –10 ... +120 | | | |
| Stroke | | mm | 10 | 15 | | |
| Connection | flange | | PN 16 | | | |
| | actuator | | Danfoss standard | | | |
| **Materials in the water** | | | | | | |
| Valve bodies | | | Grey iron EN-GJL-250(GG25) | | | |
| Membranes/ Bellow | | | EPDM | | | |
| O-rings | | | EPDM | | | |
| Springs | | | W.Nr. 1.4568, W.Nr. 1.4310 | | | |
| Cone (Pc) | | | CuZn40Pb3 - CW 614N, W.Nr. 1.4305 | | | |
| Seat (Pc) | | | W.Nr. 1.4305 | | | |
| Cone (Cv) | | | CuZn40Pb3 - CW 614N | | | |
| Seat (Cv) | | | W.Nr. 1.4305 | | | |
| Screw | | | Stainless Steel (A2) | | | |
| Flat gasket | | | NBR | | | |

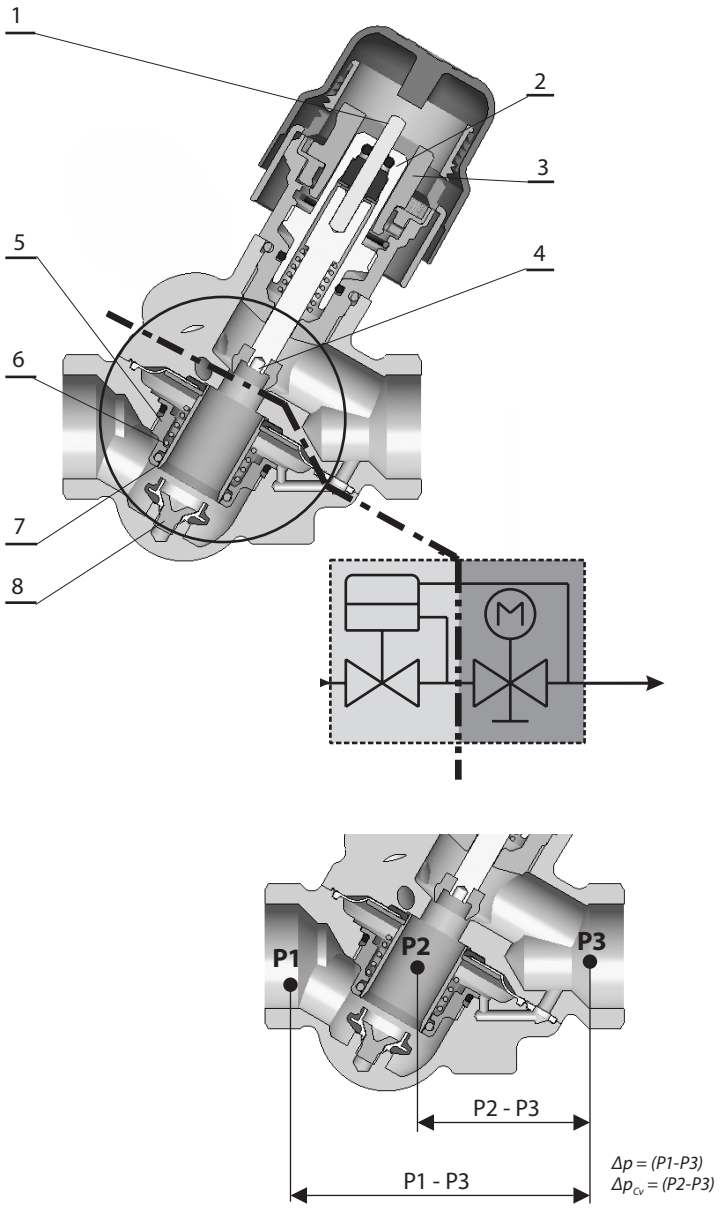
| Nominal diameter | | DN | 125 | 125 HF | 150 | 150 HF | 200 | 200 HF | 250 | 250 HF |
|---|---|---|---|---|---|---|---|---|---|---|
| Flow range | $Q_{nom}$ (100 %) [1] | l/h | 90.000 | 110.000 | 145.000 | 190.000 | 190.000 | 250.000 | 280.000 | 370.000 |
| | $Q_{high}$ [4] | | 100.000 | 120.000 | 160.000 | 229.000 | 228.000 | 300.000 | 336.000 | 444.000 |
| Setting range [2] | | % | 40-110 | | | | 40-120 | | | |
| Diff. pressure [3, 4] | $\Delta p_{Qnom}$ ($\Delta p_{Qhigh}$) | kPa | 30-400 (50-400) | 60-400 (80-400) | 30-400 (50-400) | 60-400 (80-400) | 30-400 (50-400) | 60-400 (80-400) | 30-400 (50-400) | 60-400 (80-400) |
| Pressure stage | | PN | 16 | | | | | | | |
| Control range | | | Acc. to standard IEC 534 control range is high as Cv characteristic is linear. | | | | | | | |
| Control valve's characteristic | | | Linear (could be converted by actuator to equal percentage) | | | | | | | |
| Leakage acc. to standard IEC 534 | | | max.0.01 % of $Q_{nom}$ at 650N | | max. 0.01 % of $Q_{nom}$ at 1000N | | | | | |
| Flow medium | | | Water and water mixture for closed heating and cooling systems according to plant type I for DIN EN 14868. When used in plant Type II for DIN EN 14868 appropriate protective measures are taken. The requirements of VDI 2035, part 1 + 2 are observed. | | | | | | | |
| Medium temperature | | °C | –10 ... +120 | | | | | | | |
| Stroke | | mm | 30 | | 30 | | 27 | | 27 | |
| Connection | flange | | PN 16 | | | | | | | |
| | actuator | | Danfoss standard | | | | | | | |
| **Materials in the water** | | | | | | | | | | |
| Valve bodies | | | Grey iron EN-GJL-250 (GG 25) | | | | | | | |
| Membranes/ Bellow | | | W.Nr.1.4571 | | EPDM | | | | | |
| O-rings | | | EPDM | | | | | | | |
| Springs | | | W.Nr.1.4401 | | W.Nr.1.4310 | | | | | |
| Cone (Pc) | | | W.Nr.1.4404NC | | W.Nr.1.4021 | | | | | |
| Seat (Pc) | | | W.Nr.1.4027 | | | | | | | |
| Cone (Cv) | | | W.Nr.1.4404NC | | W.Nr.1.4021 | | | | | |
| Seat (Cv) | | | W.Nr.1.4027 | | | | | | | |
| Screw | | | W.Nr.1.1181 | | | | | | | |
| Flat gasket | | | Graphite gasket | | Non asbestos | | | | | |

[1] *factory setting of the valve is done at nominal setting range.*
[2] *Regardless of the setting, the valve can modulate below 1% of set flow.*
[3] *Δp = (P1–P3) min~max*
[4] *When set above 100%, minimum starting pressure needed is higher, see figures in the ().*

*Pc - pressure controller part*
*Cv - Control valve part*

## 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)




*AB-QM DN 10-32*

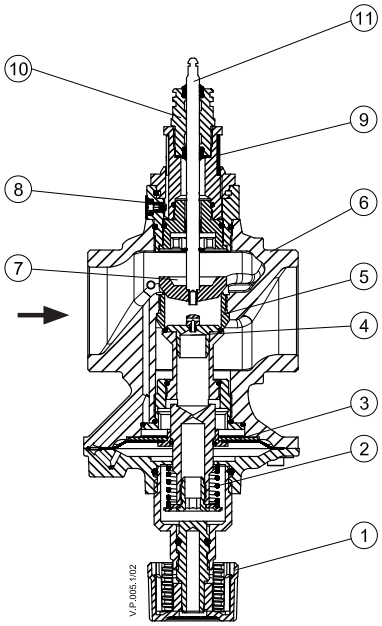
**Function:**
The AB-QM valve consists of two parts:
1. Differential pressure controller
2. Control valve

**1. Differential pressure controller DPC**
The differential pressure controller maintains a constant differential pressure across the control valve. The pressure difference $\Delta p_{cv}$ (P2-P3) on the membrane is balanced with the force of the spring. Whenever the differential pressure across the control valve changes (due to a change in available pressure, or movement of the control valve) the hollow cone is displaced to a new position which brings a new equilibrium and therefore keeps the differential pressure at a constant level.

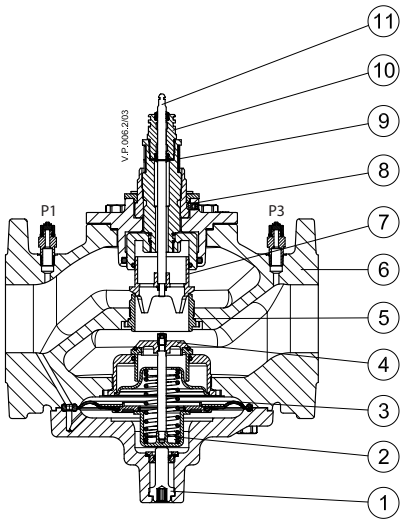
**2. Control valve Cv**
The control valve has a linear characteristic. It features a stroke limitation function that allows adjustment of the Kv value. The percentage marked on the scale equals the percentage of 100 % flow marked on the pointer. Changing the stroke limitation is done by lifting the blocking mechanism and turning the top of the valve to the desired position, shown on the scale as a percentage. A locking mechanism automatically prevents unwanted changing of the setting.

**Design** *(continued)*

1. Shut off screw
2. Main spring
3. Membrane
4. DP cone
5. Seat
6. Valve body
7. Control valves cone
8. Locking screw
9. Scale
10. Stuffing box
11. Spindle

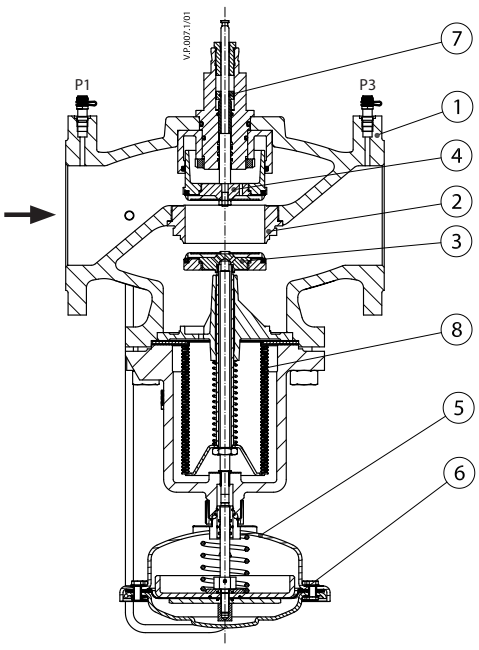



*AB-QM DN 40, 50*

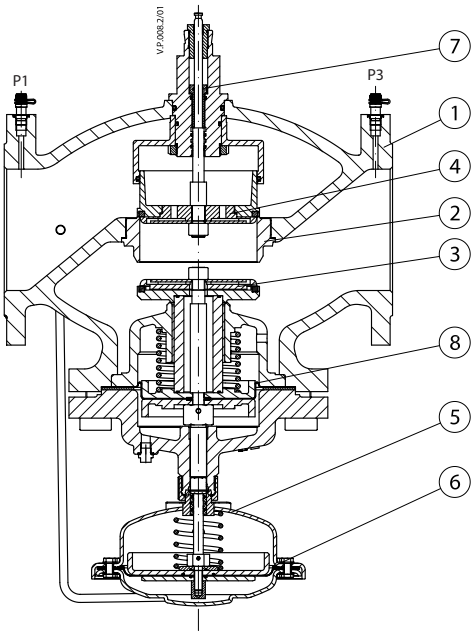



*AB-QM DN 50-100*

1. Valve body
2. Valve seat
3. DPC cone
4. CV cone
5. Controller casting
6. Rolling diaphragm
7. Adjusting screw
8. Bellow for pressure relief on DPC cone



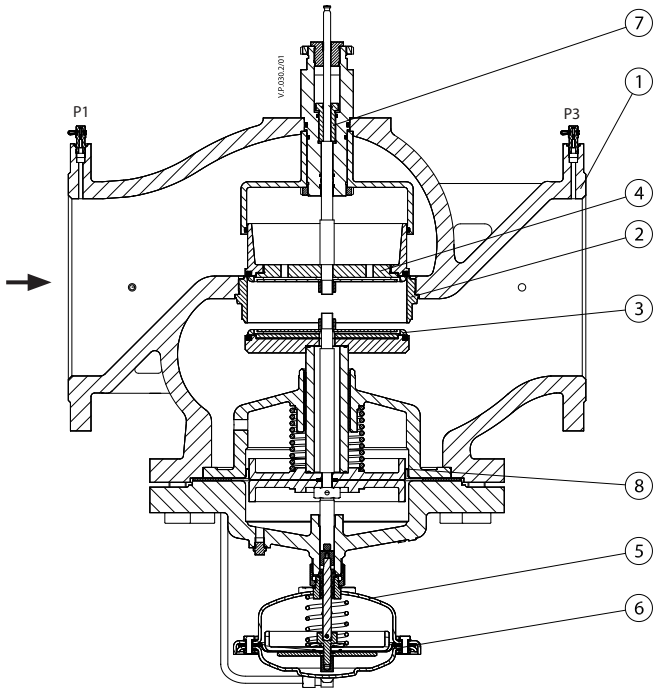

*AB-QM DN 125*




*AB-QM DN 150*

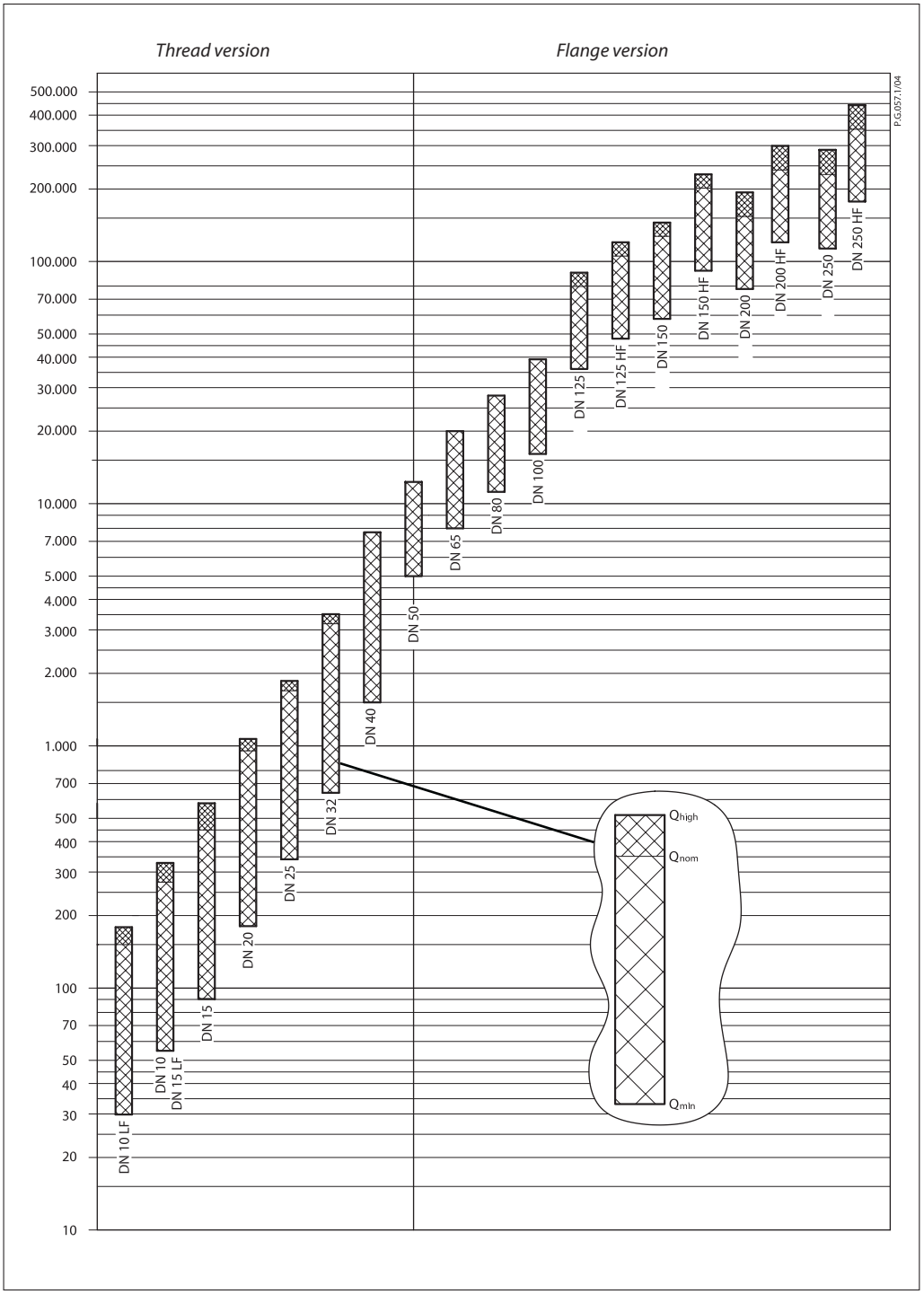
**Design** *(continued)*

1. Valve body
2. Valve seat
3. DPC cone
4. CV cone
5. Controller casting
6. Rolling diaphragm
7. Adjusting screw
8. Bellow for pressure relief on DPC cone




*AB-QM DN 200, 250*

## Sizing


Thread version
Flange version
P-G.057.1.04
500.000
400.000
300.000
200.000
100.000
70.000
50.000
40.000
30.000
20.000
10.000
7.000
5.000
4.000
3.000
2.000
1.000
700
500
400
300
200
100
70
50
40
30
20
10
DN 10 LF
DN 10
DN 15 LF
DN 15
DN 20
DN 25
DN 32
DN 40
DN 50
DN 65
DN 80
DN 100
DN 125
DN 125 HF
DN 150
DN 150 HF
DN 200
DN 200 HF
DN 250
DN 250 HF
Qhigh
Qnom
Qmin

**Sizing** *(continued)*

### Example 1: Variable flow system

*Given:*
Cool requirement per unit : 1000 W
Flow temperature in the system: 6 °C
Return temperature in the system: 12 °C

*Required - **control and balancing valves:***
AB-QM and actuators type for BMS system.
*Solution:*
Flow in the system: Q (l/h)
Q = 0.86×1000/(12–6 ) = 143 l/h

*Selected:*
AB-QM DN 10 mm with $Q_{nom}$ = 275 l/h presetting on 143/275 = 0.52 = 52 % of nominal opening.
Actuators: AMV 110NL - 24 V
*Remarks:*
required minimum differential pressure across the AB-QM DN 10: 16 kPa.

---

### Example 2: Constant flow system

*Given:*
Cool requirement per unit : 4000 W
Flow temperature in the system : 6 °C
Return temperature in the system : 12 °C

*Required - **automatic flow limiter:***
AB-QM and presetting.

*Solution:*
Flow in the system : Q (l/h)
Q = 0.86 × 4000 / ( 12 – 6 ) = 573 l/h

*Selected:*
AB-QM DN 20 mm with $Q_{nom}$ = 900 l/h presetting on 573/900 = 0.64 = 64 % of maximum opening.

*Remarks:*
required minimum differential pressure across the AB-QM DN 20: 16 kPa.

---

### Example 3: Sizing AB-QM according pipe dimension

*Given:*
Flow in system 1.4 $m^3$/h (1400 l/h = 0.38l/s), pipe dimension DN 25 mm

*Required - **automatic flow limiter:***
AB-QM and presetting.

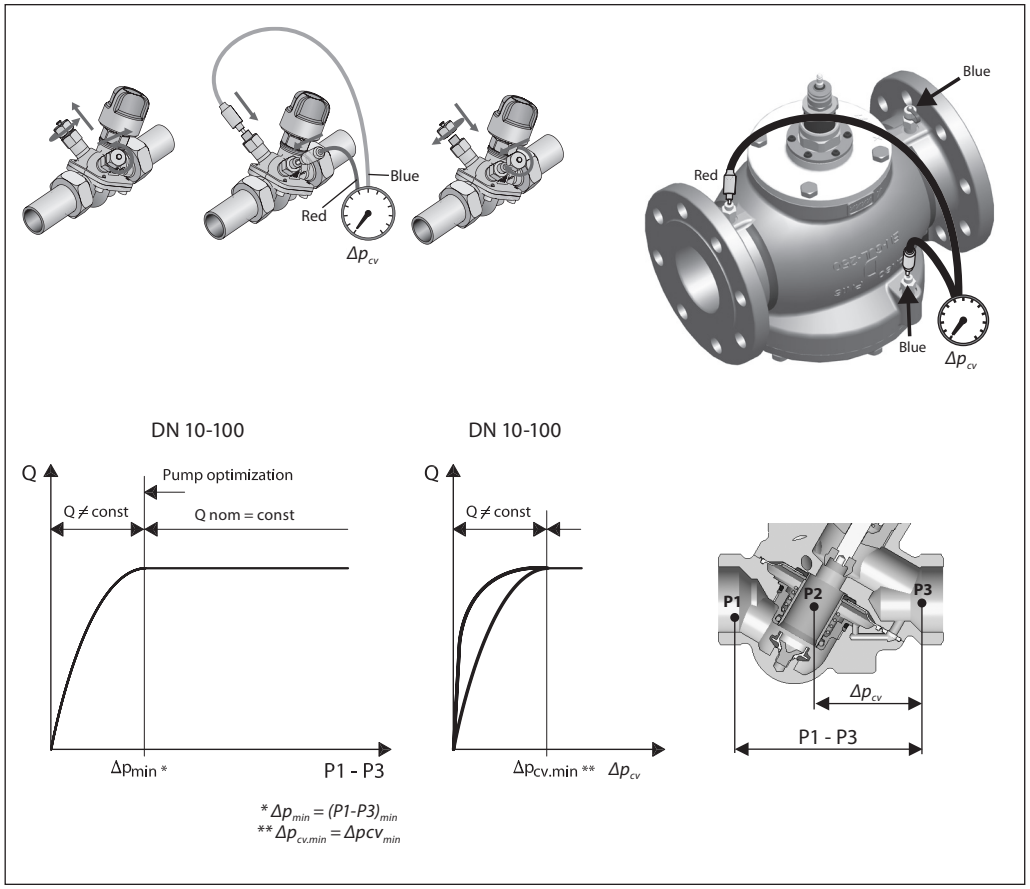
*Solution:*
In this case we have selected the AB-QM DN 25 mm with $Q_{nom}$ = 1700 l/h

In this case it will be recommended to check the maximum velocity in the pipe. For this we calculate velocity in the pipe for condition:
DN 25 mm – Di 27.2 mm

Dimension and condition acceptable, veloscity below 1.0 m/s.

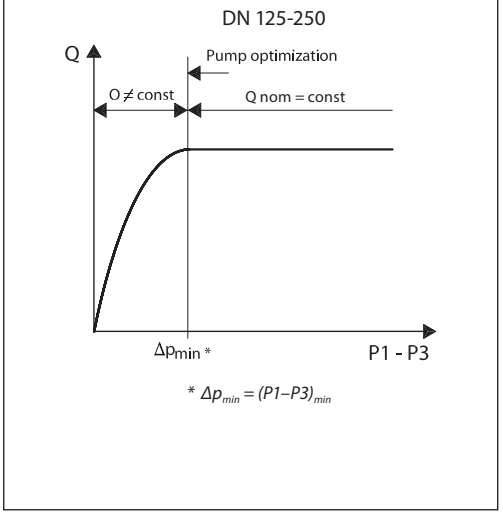
Preseting on the valve AB-QM DN 25 mm
1400/1700 = 0.82 = 82 % of nominal opening.
*Remarks:*
required minimum differential pressure across the AB-QM DN 25: 20 kPa.

## Pump optimising / Trouble shooting




The AB-QM (DN 10-100) features test plugs that allow measuring of the pressure difference Δpcv across the control valve while AB-QM (DN 125-250) measuring is done between P1 and P3. If the pressure difference exceeds the minimum required pressure the valve is operational and the flow limitation is achieved. The measuring function can be used to verify if enough pressure difference is available and thus verify the flow or measure the flow directly (only for DN40-100). For detailed information on how to measure flow on DN40-100 valves, please refer to the Flow checker document VF.A7.A1.02.

It can also be used to optimize the pump head. The pump head can be decreased until no more than the minimum required pressure is available on the most critical valve (in terms of hydronic). This optimal point is found when proportionality between the pump head and the measured differential pressure cease to exist.
Verifying the pressure can be done by using for example a Danfoss PFM device (for more details please refer to AB-QM Tech Note).



**Presetting**
DN 10-32

The calculated flow can be adjusted easily without using special tools.

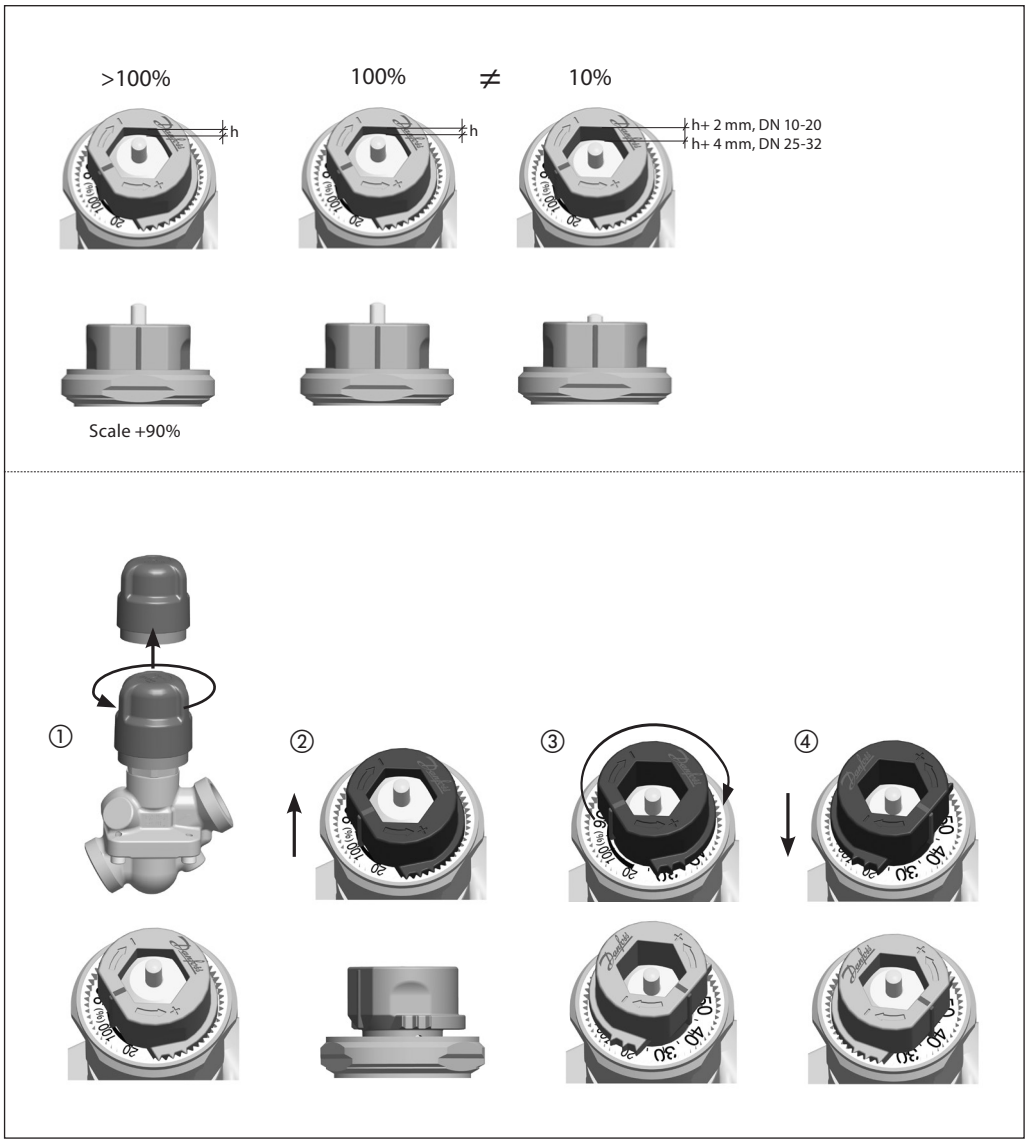
To change the presetting (factory setting is 100%) follow the four steps below:

- Remove the blue protective cap or the mounted actuator
- Raise the grey pointer
- Turn (clockwise to decrease) to the new pre-setting
- Push the grey pointer back into the lock position. After it clicks pre-setting is locked.

The presetting scale indicates a value between 100 % flow to 0 %. Turning the cap clockwise decreases the flow value while counter clockwise increases it.

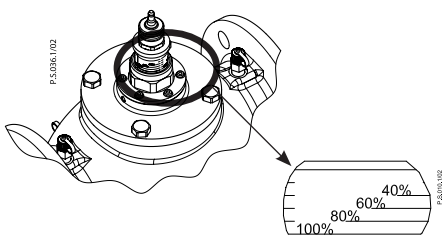
If the valve is a DN 15 then the nominal flow = 450 l/h =100 % presetting. To set a flow of 270 l/h you have to set: 270/450 = 60 %.

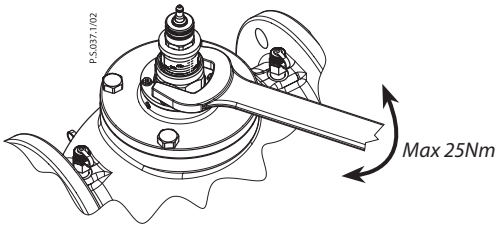
Danfoss recomends a pre-setting/flow from 20 % to 100 %. Factory presetting is 100 %.



**Pre-setting** *(continued)*

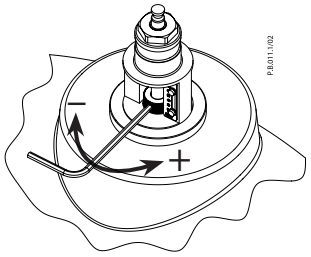
DN 40-100

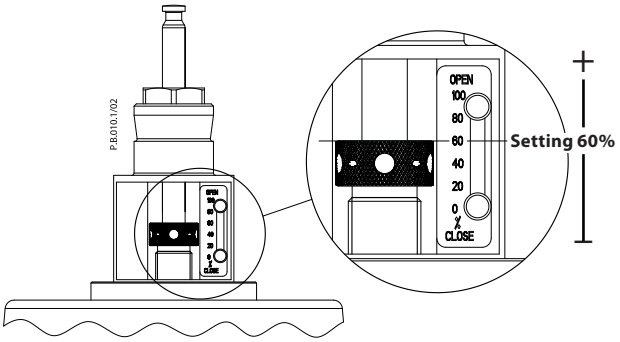



*Note: 1 turn = 10%*

DN 125-250




*Note:*
*DN 125 & 150: 1 turn = 5.0 %*
*DN 200 & 250: 1 turn = 5.5 %*

**Service**

**DN 10-32**
For the service shut off function, it is recommended to install the valve in the supply water pipe.

Valves are equipped with a plastic shut-off mechanism that is used as an isolating function up to 1 bar differential pressure. When closing against higher differential pressure a shut-off & protection cap is available as an accessory (code: 003Z123000) or set the value to 0%.

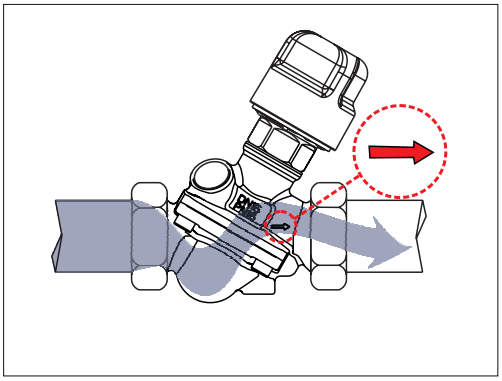
**DN 40-100**
For the service shut off function, the valve can be installed in either the supply or return pipe.

Valves are equipped with manual shut-off for isolating function up to 16 bar.

**Installing**

The AB-QM valve is mono-directional meaning that the valve operates when the arrow on the valve body is aligned with the flow direction. When this rule is disobeyed the valve acts like a variable orifice that causes water hammer on sudden closing when the available pressure has increased or the valve have been set to a lower value.

When system conditions allow backflow it is strongly recommended to use a backflow preventer in order to avoid possible water hammer that can damage the valve as well as other elements in the system.



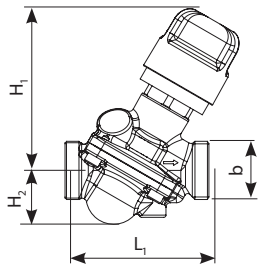
**Tender text**

1. The pressure independent balancing and control valve should be comprised of a linear control valve and an integrated membrane based pressure controller.
2. The pressure independent balancing and control valve should be available in the range from DN 10- 250.
3. The valve could be used as an automatic flow limiter.
4. The valve should have a mechanism (flow setting) to adjust the flow stepless from 100 to 0 % of the nominal flow.
5. Minimum possible flow pre-setting should be 30l/h.
6. At the minimum setting modulation below 1% should be possible.
7. Shut off service function should be possible with setting mechanism.
8. The adjustment should be performed without a tool for dimensions up to DN 32 or a standard tool for valves bigger than DN 32.
9. The setting, which can be locked, should be visible from the top for valves DN 32 and from the side for DN 100.
10. The valves should have a shut-off function, separated from the setting mechanism, for valves DN 40-100.
11. The leakage rate should be: No visible leakage at force of the thermal actuator (90 N) for valves up to DN 32. Leakage of 0.05 % of the Qnom for valves up to DN 100 and up DN 250 at 500N and 1.000N respectively. All actuators should be able to close against 16 bar of differential pressure.
12. The authority of the pressure independent control valve should be 1 at all settings (control valve characteristic is not changed).
13. Control valve should have linear flow characteristic at all settings. (**Supplier of the valve should provide lab test results** [1]).
14. Control ratio of the pressure independent balancing and control valve should be higher than 1:1000
15. Control valve should have the possibility to change linear characteristic to equal percentage characteristic at all sizes and settings by adjusting actuator settings.
16. Minimum starting differential pressure for flow limitation should be 16 kPa for valves up to DN 20, 20 kPa valves up to DN 32 and 30 kPa for valves up to DN250. (Supplier of the valve should provide lab test results [1]). Nominal pressure rating 16 bar.
17. Test plug for pump optimization and flow verification should be available for DN 10-250.
18. Valve sizes from DN10-DN250 should be available from one supplier.

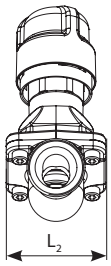
| | |
|---|---|
| Nominal diameter: | _____ |
| Connection: | _____ |
| Adjustment range from - to | _____ $m^3/h$ |
| Produced by: | Danfoss |
| Type: | AB-QM |
| Ordering no.: | 003Z ____ |

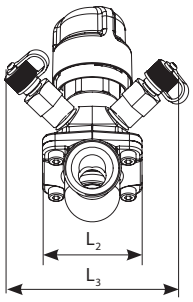
[1] *Since there is no standard for testing procedure, Danfoss recommends verification by independent lab to compare control and flow limitation function of different PIBCVs at the same basis.*

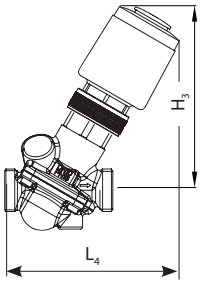
## Dimensions



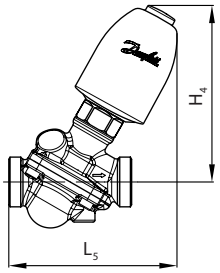

*AB-QM DN 10-32*



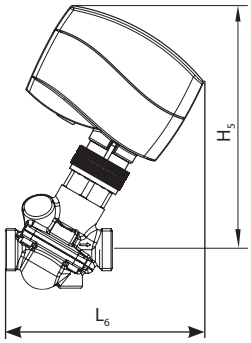




*TWA-Z + AB-QM*

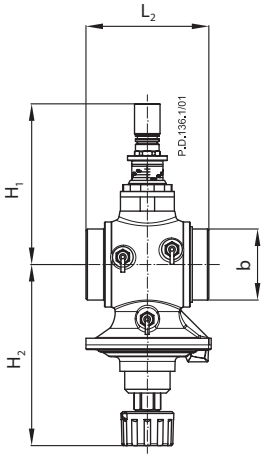



*ABNM + AB-QM*

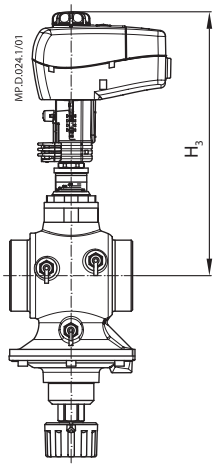



*AMV (E) 110 NL + AB-QM*
*AMI 140 + AB-QM*

| Type | $L_1$ | $L_2$ | $L_3$ | $L_4$ | $L_5$ | $L_6$ | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | b | Valve weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | | | | | | | | | | | ISO 228/1 | (kg) |
| DN 10 | 53 | 36 | 79 | 92 | 104 | 109 | 73 | 20 | 100 | 104 | 138 | G ½ | 0.38 |
| DN 15 | 65 | 45 | 79 | 98 | 110 | 116 | 75 | 25 | 102 | 108 | 141 | G ¾ | 0.48 |
| DN 20 | 82 | 56 | 79 | 107 | 120 | 125 | 77 | 33 | 105 | 112 | 143 | G 1 | 0.65 |
| DN 25 | 104 | 71 | 79 | 124 | 142 | 142 | 88 | 42 | 117 | 124 | 155 | G 1 ¼ | 1.45 |
| DN 32 | 130 | 90 | 79 | 142 | 154 | 160 | 102 | 50 | 128 | 136 | 166 | G 1 ½ | 2.21 |



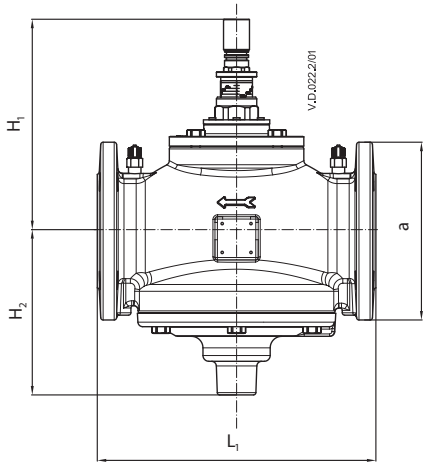

*AB-QM DN 40, 50*



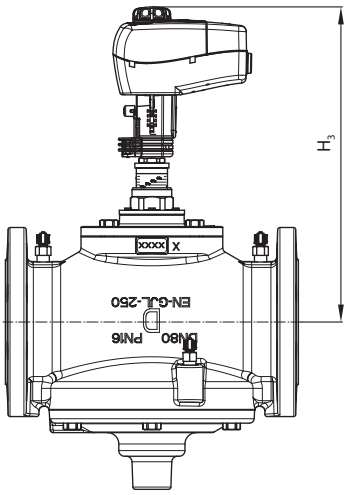

*AME 435 QM + AB-QM*

| Type | $L_1$ | $H_1$ | $H_2$ | $H_3$ | b | Weight |
|---|---|---|---|---|---|---|
| | mm | | | | ISO 228/1 | kg |
| DN 40 | 110 | 170 | 174 | 280 | G 2 | 6.9 |
| DN 50 | 130 | 170 | 174 | 280 | G 2 ½ | 7.8 |

**Dimensions** *(continued)*



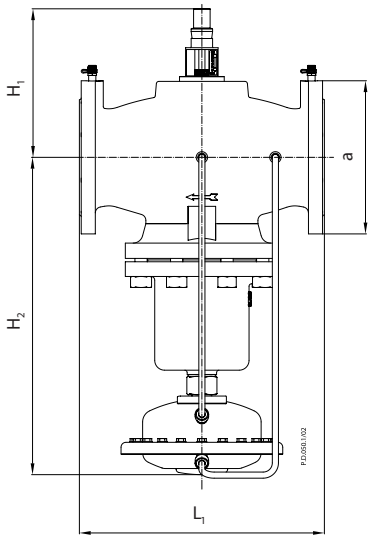

*AB-QM DN 50-100*



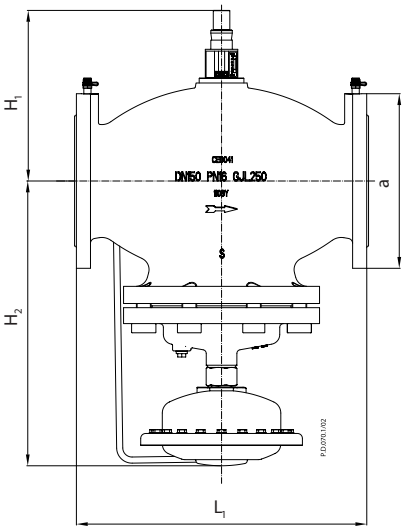

*AME 435 QM + AB-QM*

| Type | $L_1$ | $H_1$ | $H_2$ | $H_3$ | a (EN 1092-2) | Weight (kg) |
|---|---|---|---|---|---|---|
| | mm | | | | | |
| DN 50 | 230 | 170 | 174 | 280 | 165 | 14.2 |
| DN 65 | 290 | 220 | 172 | 330 | 185 | 38.0 |
| DN 80 | 310 | 225 | 177 | 335 | 200 | 45.0 |
| DN 100 | 350 | 240 | 187 | 350 | 220 | 57.0 |

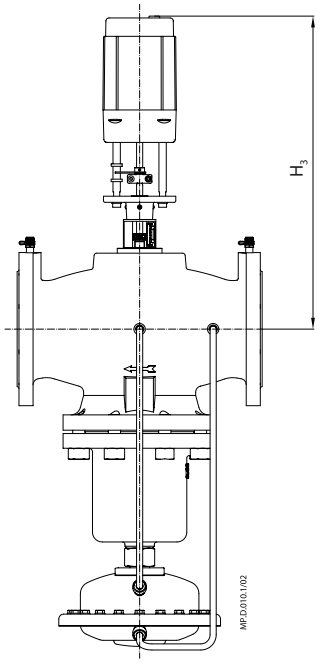
**Dimensions** *(continued)*



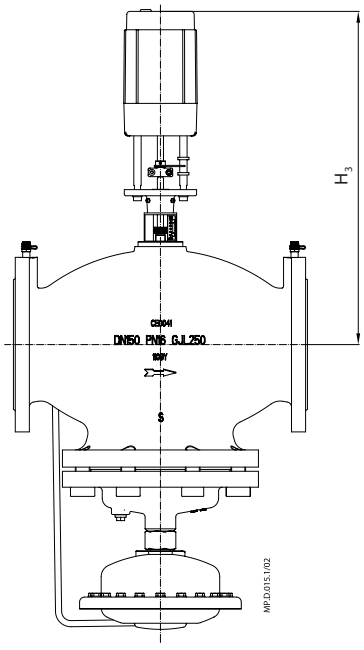

*AB-QM DN 125*




*AB-QM DN 150*



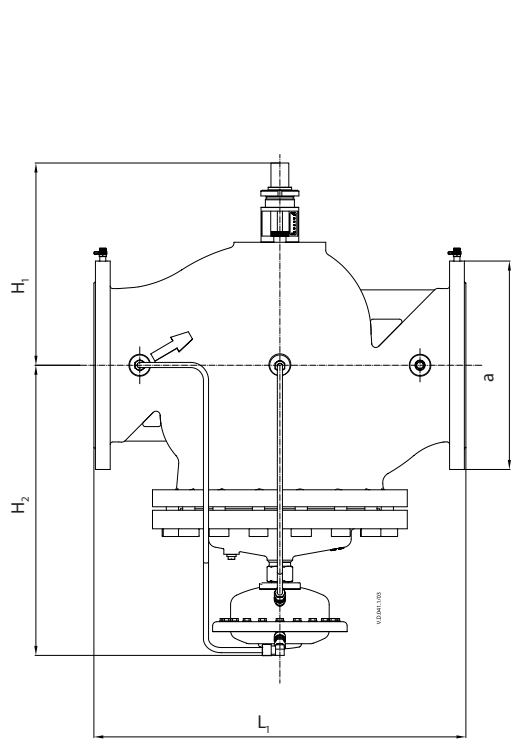

*AME 55 QM + AB-QM DN 125*



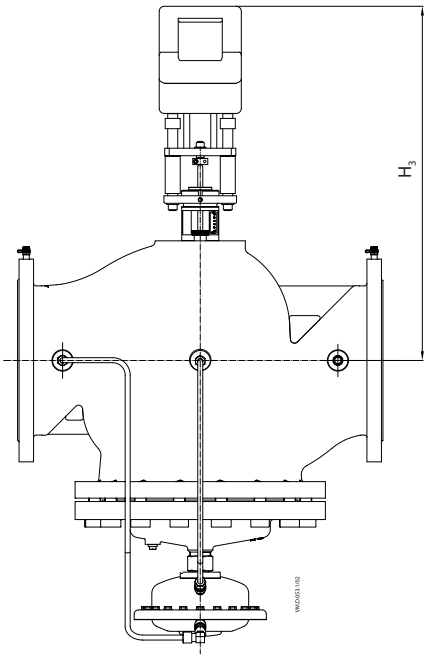

*AME 55 QM + AB-QM DN 150*

| Type | $L_1$ | $H_1$ | $H_2$ | $H_3$ | a | Weight |
|---|---|---|---|---|---|---|
| | mm | | | | (EN 1092-2) | (kg) |
| DN 125 | 400 | 272 | 518 | 507 | 250 | 85.3 |
| DN 150 | 480 | 308 | 465 | 518 | 285 | 138 |

**Dimensions** *(continued)*




*AB-QM DN 200, 250*




*AME 85 QM + AB-QM DN 200, 250*

| Type | $L_1$ | $H_1$ | $H_2$ | $H_3$ | a | Weight |
|---|---|---|---|---|---|---|
| | mm | | | | (EN 1092-2) | (kg) |
| DN 200 | 600 | 434 | 483 | 618 | 340 | 219 |
| DN 250 | 730 | 430 | 533 | 708 | 405 | 342 |