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, radiation panels and heat exchangers).

Description

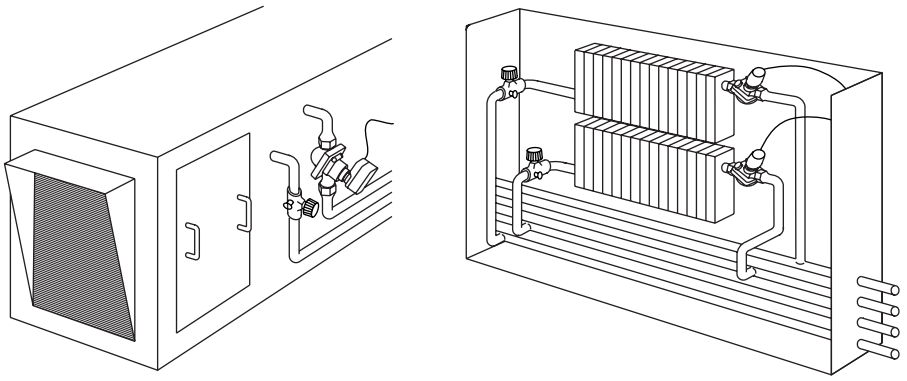
Benefits:
The AB-QM provides the lowest Total Cost of Ownership because of savings made on the following points:

- Efficient energy transfer and minimal pumping costs since there are no overflows at partial loads because of exact and pressure independent flow limitation.
- Smaller pumps and lower energy consumption because the pump head needed is lower than in the traditional setup. With the built in pressure ports it's easy to find the optimal setpoint for the pump.
- Stable temperatures in the room and greatly reduced movement of the actuator because pressure fluctuations don't influence the room temperature but are controlled by the built-in differential pressure controller.
- No complaints from end-users because the installation works as designed.
- Commissioning costs are close to zero because of easy setting procedure without the need for 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.
- Mounting costs are halved because the AB-QM valve covers two functions, Balancing & Control.
- The valves are less susceptible to blockage because of the membrane design, which doesn't rely on cartridge type constrictions.
- Easy segmentation of the project. When sections of a project are finished they can be handed over to the customer with a fully functional installation. The AB-QM will automatically control the flow, even when other parts of the installation are still unfinished. It's not needed to adjust the AB-QM after finalisation of the project.

Easy implementation:

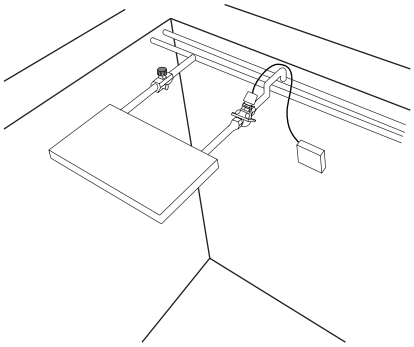
- No Kv or authority calculations needed. Flow is the only parameter to be considered when designing.
- AB-QM always fits the application because the maximum setting of the AB-QM corresponds with international standards for flow speeds in pipes.
- The AB-QM can be used for all applications because it can have a linear or logarithmic characteristic when combined with gear actuators.
- Compact design, essential when only limited space is available. For example in fan-coil units.
- Easy commissioning. No specialized staff or measuring equipment needed.
- Easy trouble shooting.
- Fast start-up because AB-QM valves don't need to be flushed or de-aired before use.

Applications - variable flow systems



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

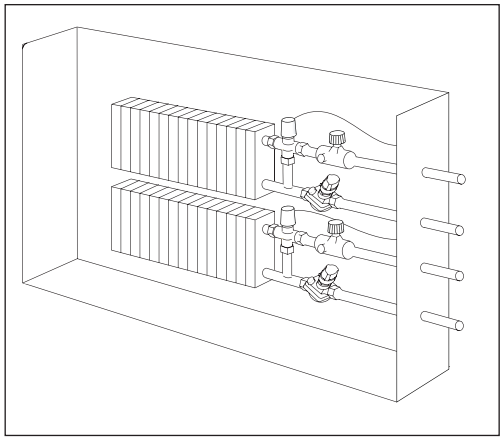
An AB-QM with an actuator can be used as a control valve with full authority and built-in automatic flow limiter for terminal units, like an AHU (Air Handling Unit), FCU (Fan Coil Unit) or radiation panel. The AB-QM ensures the required flow on every terminal unit and maintains hydronic balance in the system.
Because of the integrated differential pressure controller the control valve always has 100 % authority and therefore offers always 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 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.

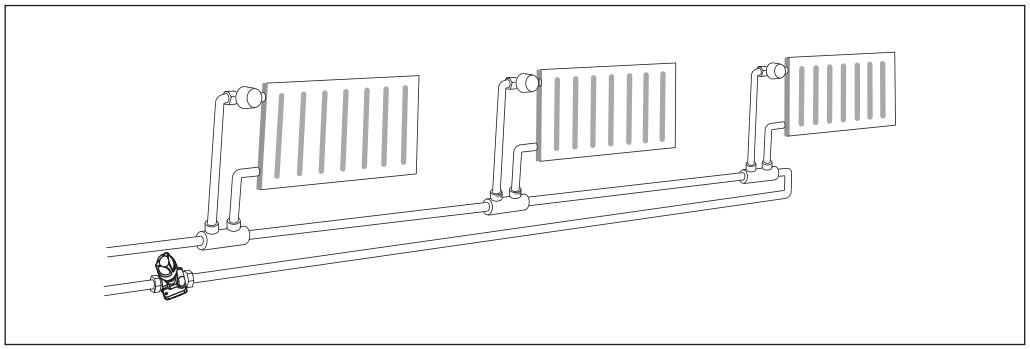


Radiation panel

Using the AB-QM in the installation will reduce the total cost of ownership (TCO):
- No calculations but easy selection
- Lower investment because only one valve is needed for two functions, balancing and control
- Fast construction time because mounting one valve needs less time than mounting two valves
- Short commissioning time because the setting is easy and fast

Applications
- constant flow systems





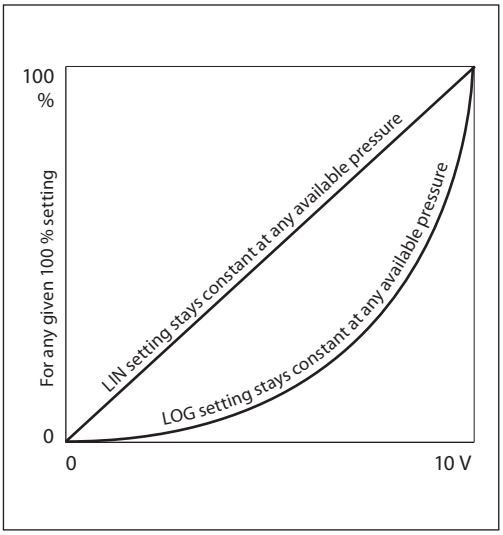
In constant flow system with FCUs or in a one pipe heating system the AB-QM can be installed as an automatic balancing valve in every riser. The AB-QM limits the flow to the set value, thus automatically achieving hydronic balance in the system.

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. That includes systems with (floor) heating/cooling, concrete core activation or radiation panels.

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

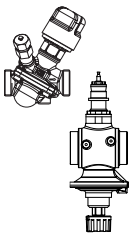
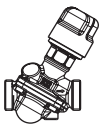
Control performance

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 independent 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.

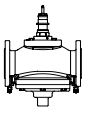
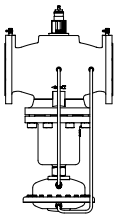


Ordering

AB-QM threaded version

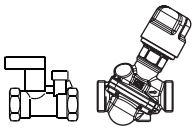
Picture	DN	$Q_{max.}$ (l/h)	Ext. thread (ISO 228/1)	Code No.	AB-QM	Ext. thread (ISO 228/1)	Code No.
	10 LF	150	G ½	**003Z0261**		G ½	**003Z0251**
	10	275		**003Z0211**			**003Z0201**
	15 LF	275	G ¾	**003Z0262**		G ¾	**003Z0252**
	15	450		**003Z0212**			**003Z0202**
	20	900	G 1	**003Z0213**		G 1	**003Z0203**
	25	1.700	G 1 ¼	**003Z0214**		G 1 ¼	**003Z0204**
	32	3.200	G 1 ½	**003Z0215**		G 1 ½	**003Z0205**
	40	7.500	G 2	**003Z0700**	*AB-QM (DN 10-32) can not be upgraded to AB-QM with nipples!*		
	50	12.500	G 2 ½	**003Z0710**			

AB-QM flanged version

Picture	DN	$Q_{max.}$ (l/h)	Flange connection	Code No.
	50	12.500	PN 16	**003Z0711**
	65	20.000		**003Z0702**
	80	28.000		**003Z0703**
	100	38.000		**003Z0704**
	125	90.000	PN 16 [1)]	**003Z0705**
	150	145.000		**003Z0706**
	200	190.000		**003Z0707**
	250	280.000		**003Z0708**

[1)] *For more details please refer to data sheet AB-QM 125-150*

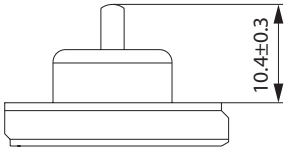
Set-pack (one MSV-S and one AB-QM without nipples)

Picture	DN	$Q_{max.}$ (l/h)	External thread (ISO 228/1)	Code No.
	10	275	G ½ A	
	15	450	G ¾ A	
	20	900	G 1 A	
	25	1.700	G 1 ¼ A	
	32	3.200	G 1 ½ A	

Ordering *(continuous)*

Accessories & spare parts

Type	Comments		Code No.
	To pipe	To valve	
Union connection (1 pcs.) 	R 3/8	DN 10	**003Z0231**
	R 1/2	DN 15	**003Z0232**
	R 3/4	DN 20	**003Z0233**
	R 1	DN 25	**003Z0234**
	R 1 1/4	DN 32	**003Z0235**
	R 1 1/2	DN 40	**003Z0279**
	R 2	DN 50	**003Z0278**
Tailpiece welding (1 pcs.) 	Weld.	DN 15	**003Z0226**
		DN 20	**003Z0227**
		DN 25	**003Z0228**
		DN 32	**003Z0229**
		DN 40	**003Z0270**
		DN 50	**003Z0276**
Tailpieces for soldering (2 nuts, 2 gaskets, 2 soldering nipples	12x1 mm	DN 10	**065Z7016**
	15x1 mm	DN 15	**065Z7017**
Locking ring		DN 10-32	**003Z0236**
Shut-off & protection piece (max. closing pressure 16 bar)			**003Z0230**
Shut-off - plastic (max. closing pressure 1 bar)			**003Z0240**
Handle AB-QM (for details refer to instructions)		DN 40-100	**003Z0695**
		DN 125-250	**003Z0696**



Closing point (measure) for DN 10-DN 32

Combinations AB-QM with electrical actuators (AB-QM DN 10-100)

Valve type	Stroke (mm)	TWA-Z [2]	AMI 140	ABNM-Z	AMV 110 NL AME 110 NL [3]	AME 15 QM
		Recommended ordering code numbers (for details refer to data sheets for these actuators)				
		082F1226 NC, 230 V	**082H8048** AMI 140 24 V, 12 s/mm, 2-point control	**082F1094** Thermal actuator 24 V (0- 0 V) **082F1072** Adapter for AB-QM (M30 × 1.5)	**082H8056** AMV 110 NL 24 V, 24 s/mm, 3-point control **082H8057** AME 110 NL 24 V, 24 s/mm, 0-10 V	**082H3075** AME 15 QM 24 V, 11 s/mm, 0-10 V
DN 10-20	2.25	✓	✓	✓	✓	-
DN 25, 32	4.50	✓ [1]	✓	✓ [4]	✓	-
DN 40, 50	10	-	-	-	-	✓
DN 65-100	15	-	-	-	-	✓

[1] up to 60 % of Q_{max}
[2] Please be aware that only this type of TWA actuator is to be used with AB-QM
[3] Minimum recommended AB-QM setting is 20 %
[4] up to 80 % od Q_{max}
Additional actuator's functionality available, for more info please contact your local Danfoss organization.

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)	
		082H3078 24 V, 8 s/mm, 0-10 V	**082G1453** 24 V, 8 s/mm, 0-10 V
DN 125	25	✓	
DN 150	25	✓	
DN 200	27	-	✓
DN 250	27	-	✓

Operational pressure for all AB-QM valves is 4 bar.
Closing pressure for all actuators is 6 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_{min} (20 %) [3]	l/h	30	55	55	90	180	340	640	1.500	-
	Q_{min} (40 %) [3]		-	-	-	-	-	-	-	-	5.000
	Q_{max} (100 %)		150	275	275	450	900	1.700	3.200	7.500	12.500
Diff. pressure [1]		kPa	16-400					20-400		30-400	
Pressure stage		PN	16								
Control range			Acc. to standard IEC 534 control range is high as Cv characteristic is linear. (1:3000)								
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 k_v 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 I 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"	G ½"	G ¾"	G ¾"	G 1"	G 1¼"	G 1½"	G 2"	G 2½"
	actuator		M30 × 1.5							Danfoss standard	
Materials in the water											
Valve bodies			Brass (CuZn40Pb2 - CW 617N)							Grey iron EN-GJL-250(GG25)	
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)			CuZn40Pb2 - CW 617N							W.Nr. 1.4305	
Screw			Stainless Steel (A2)								
Flat gasket			NBR								
Sealing agent (only for valves with measuring nipples)			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							-	

[1] Δp = (P1–P3) min~max
[2] according suitability and usage especially in not oxygen tight systems please mind the instructions given by the coolant producer
[3] Flow limitations below Q_{min} is possible. Regardless of the flow limitations valve can modulate till 0 % of the settings.
Pc - pressure controller part
Cv - Control valve part

Technical data *(continuous)*

AB-QM (flange version)

Nominal diameter		**DN**	**50**	**65**	**80**	**100**
Flow range	Q_{min} (40 %) [2]	l/h	5.000	8.000	11.200	15.200
	Q_{max} (100 %)		12.500	20.000	28.000	38.000
Diff. pressure [1]		kPa	30-400			
Pressure stage		PN	16			
Control range			Acc. to standard IEC 534 control range goes to infinity as Cv characteristic is linear. (1:3000)			
Control valve's characteristic			Linear (could be converted by actuator to equal percentage)			
Leakage acc. to standard IEC 534			max.0.05 % of k_v 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 I 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			

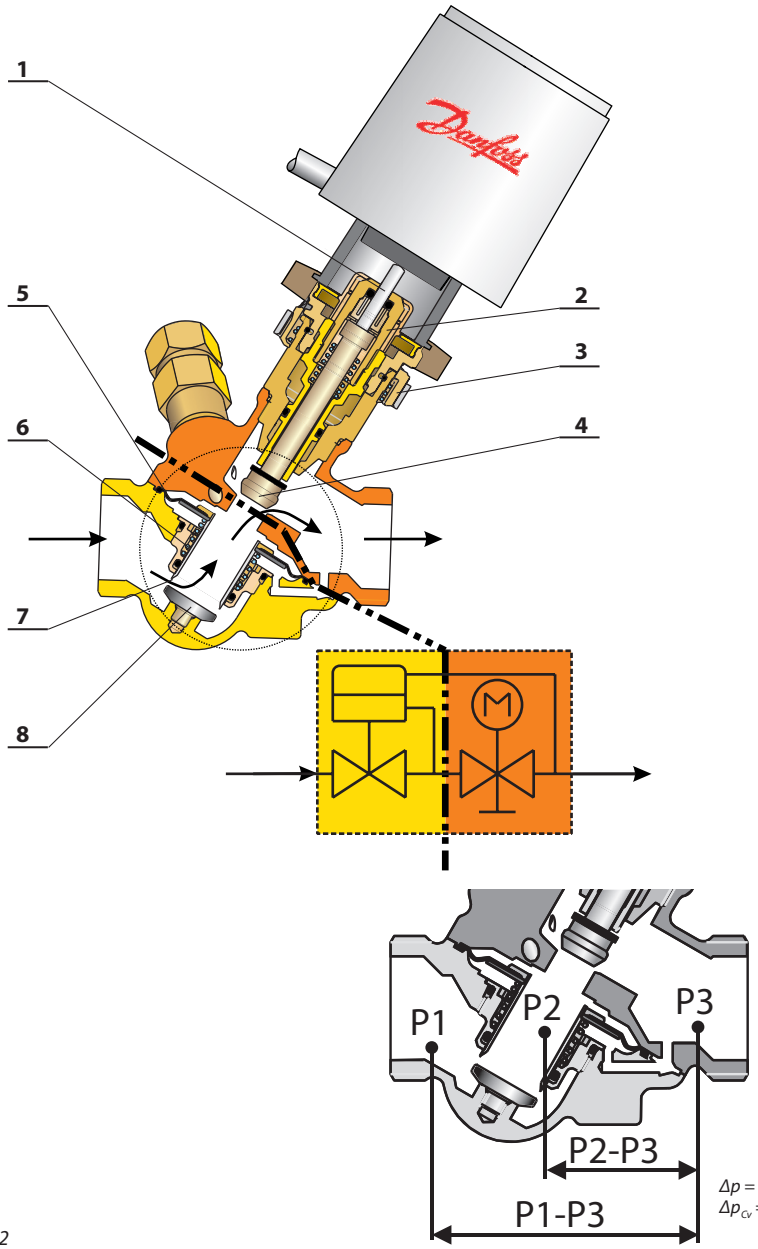
Nominal diameter		**DN**	**125**	**150**	**200**	**250**
Flow range	Q_{min} (40 %) [2]	l/h	36.000	58.000	76.000	112.000
	Q_{max} (100 %)		90.000	145.000	190.000	280.000
Diff. pressure [1]		kPa	30-400			
Pressure stage		PN	16			
Control range			Acc. to standard IEC 534 control range goes to infinity as 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 k_v at 650N	max. 0.01 % of k_v 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 I 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	25	25	27	27
Connection	flange		PN 16			
	actuator		Danfoss standard			
Materials in the water						
Valve bodies			Grey iron EN-GJL-250 (GG25)			
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] *Δp = (P1–P3) min~max*
[2] *Flow limitations below Q_{min} is possible. Regardless of the flow limitations valve can modulate till 0 % of the settings.*
[3] *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

Design

1 Spindle
2 Stuffing box
3 Plastic ring
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

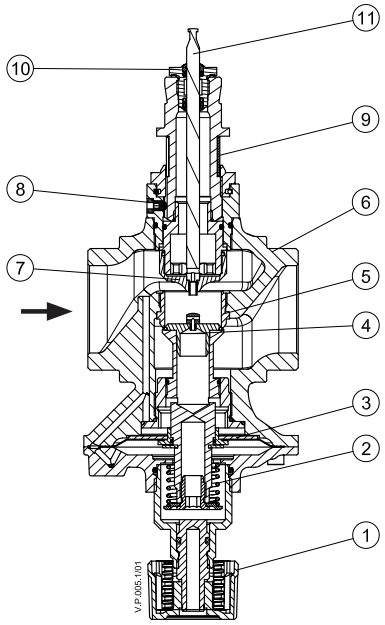
Function:
The AB-QM valve consists of two parts:
1. Differential pressure controller
2. Control valve

1. Differential pressure controller DPC
The differential pressure controller maintains a constant differential pressure across the control valve. The pressure difference Δp_{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.

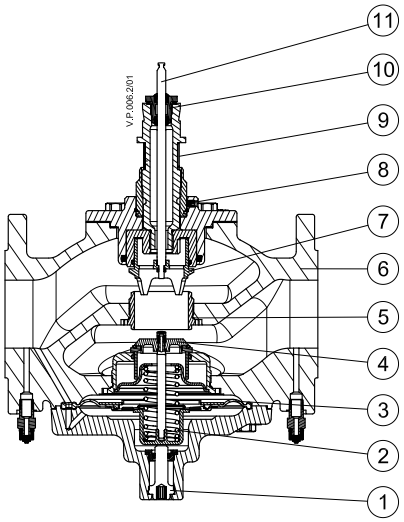
2. Control valve Cv
The control valve has a linear characteristic. It features a stroke limitation function that allows adjustment of the Kv value. The percentage marked on the scale equals the percentage of 100 % flow marked on the pointer. Changing the stroke limitation is done by lifting the blocking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

Design *(continuous)*

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

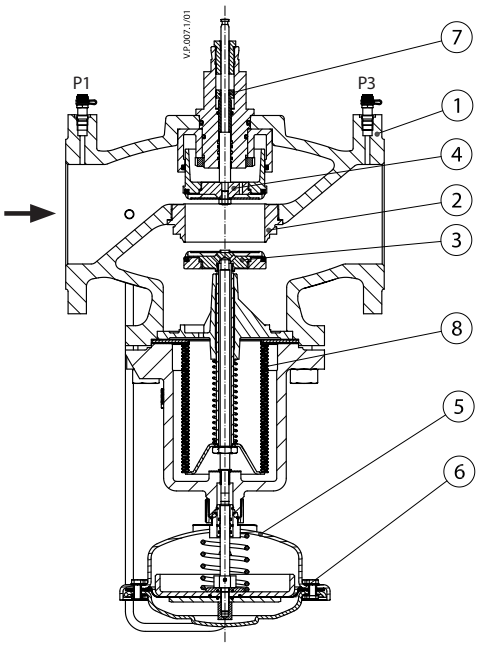


AB-QM DN 40, 50

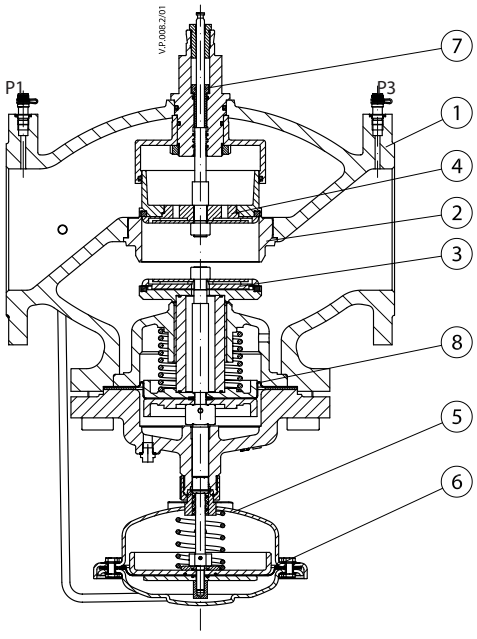


AB-QM DN 50-100

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



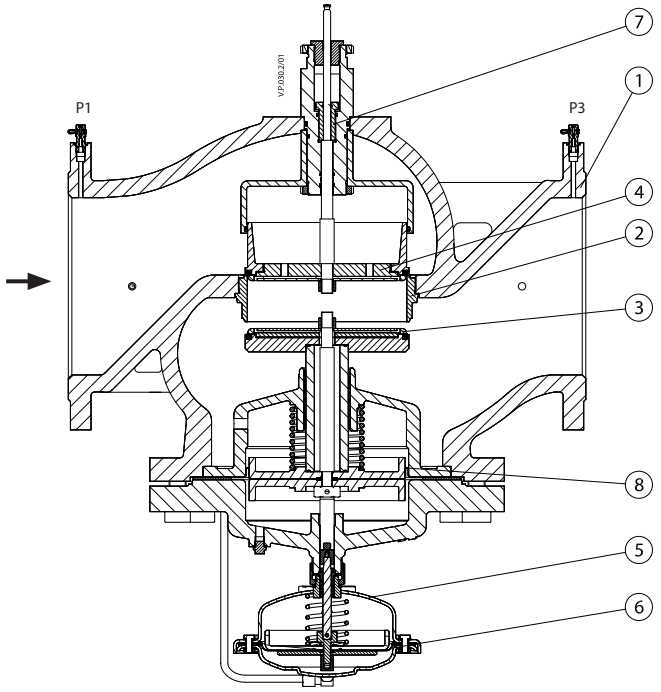
AB-QM DN 125



AB-QM DN 150

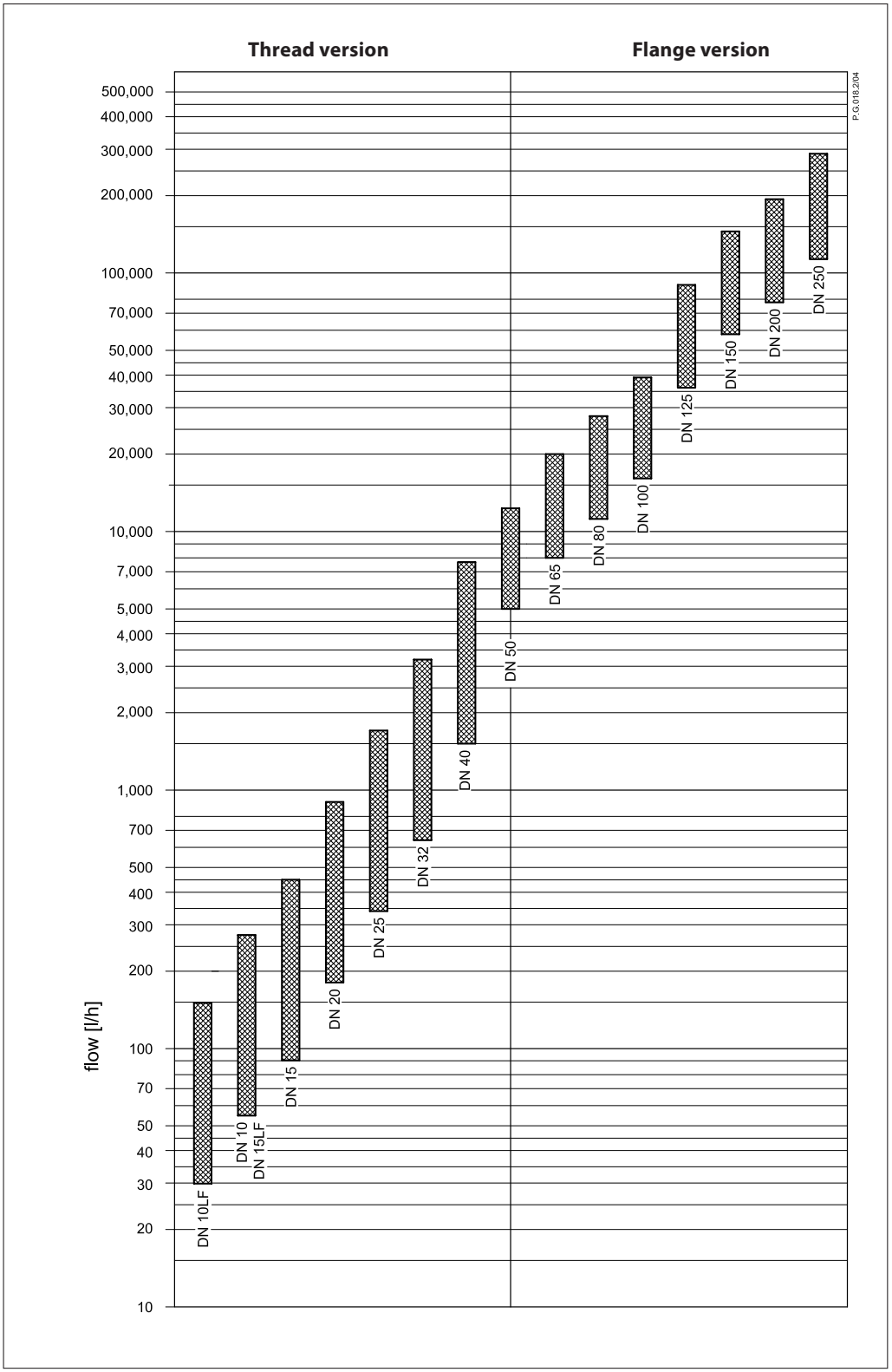
Design *(continuous)*

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.018.2/04
flow [l/h]
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 10LF
DN 10
DN 15LF
DN 15
DN 20
DN 25
DN 32
DN 40
DN 50
DN 65
DN 80
DN 100
DN 125
DN 150
DN 200
DN 250

Sizing *(continuous)*

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_{max} = 275 l/h presetting on 143/275 = 0.52 = 52 % of maximum 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_{max} = 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.

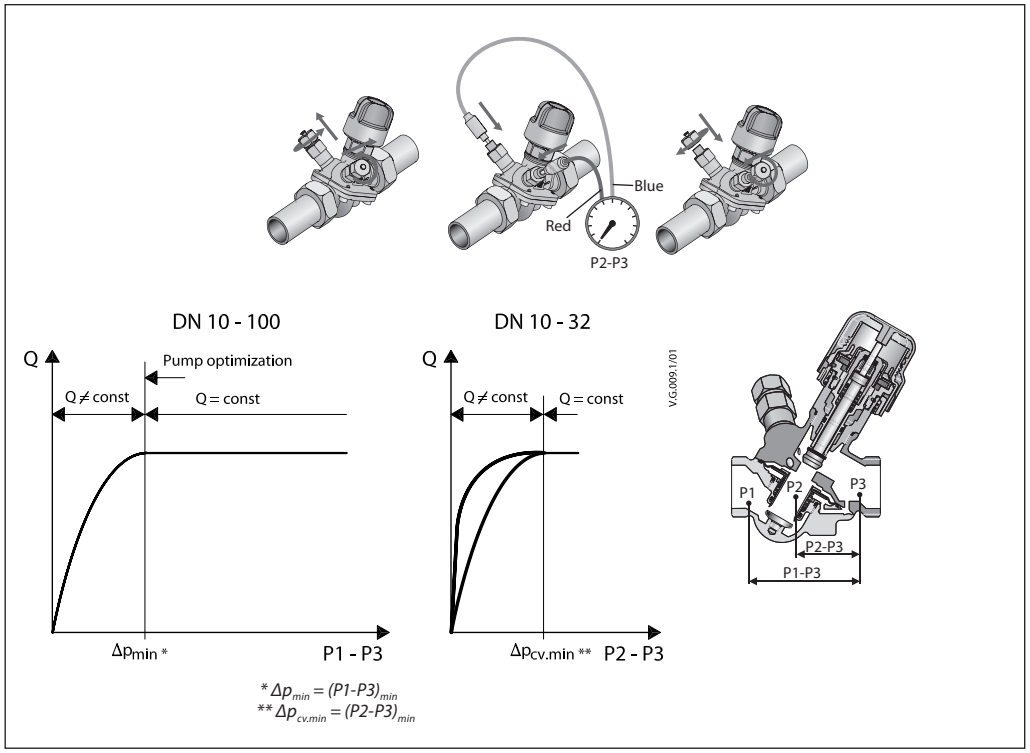
Solution:
In this case we can selected AB-QM DN 25 mm with Q_{max} = 1700 l/h

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 maximum opening.
Remarks:
required minimum differential pressure across the AB-QM DN 25: 20 kPa.

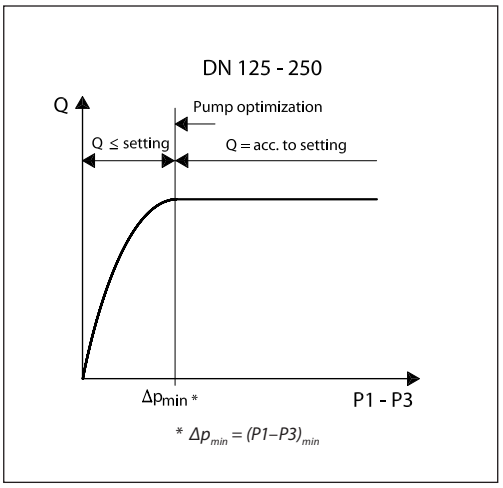
Pump optimising / Trouble shooting



The AB-QM (DN 10-32) features measuring nipples that allow measuring of the pressure difference Δp_{cv}(P2-P3) across the control valve while AB-QM (DN 40-100) measuring is done between P1 to P3. If the pressure difference exceeds certain value it means the differential pressure controller 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.

AB-QM (DN 40-250) measuring is done between p1 to p3. If the pressure difference exceeds certain value it means the differential pressure controller 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.

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



Presetting
DN 10-32

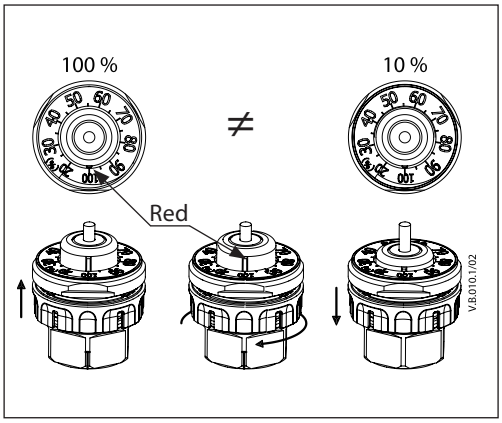
The calculated flow can be adjusted easily without using special tools.
To change the presetting:
- Remove the blue protective cap or the mounted actuator.
- Raise the grey plastic ring and turn to the new presetting.
- Release the white plastic ring and the presetting is locked.

The presetting scale indicates a values from 100 % flow to 0 % closed.
Counter clock wise turning would increase the flow value while clock wise would decrease it.

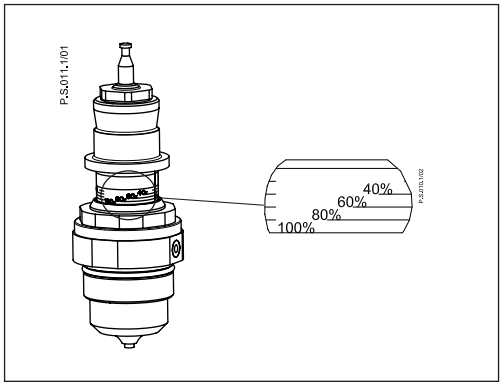
When valve is set to 80 % or more the red ring (below "DN max flow " sign) becomes visible.

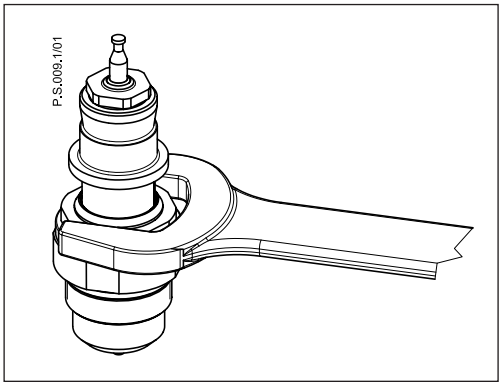
If the valve is a DN 15 then the max flow = 450 l/h =100 % presetting. To set a flow of 270 l/h you have to set: 270/450 = 60 %.

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

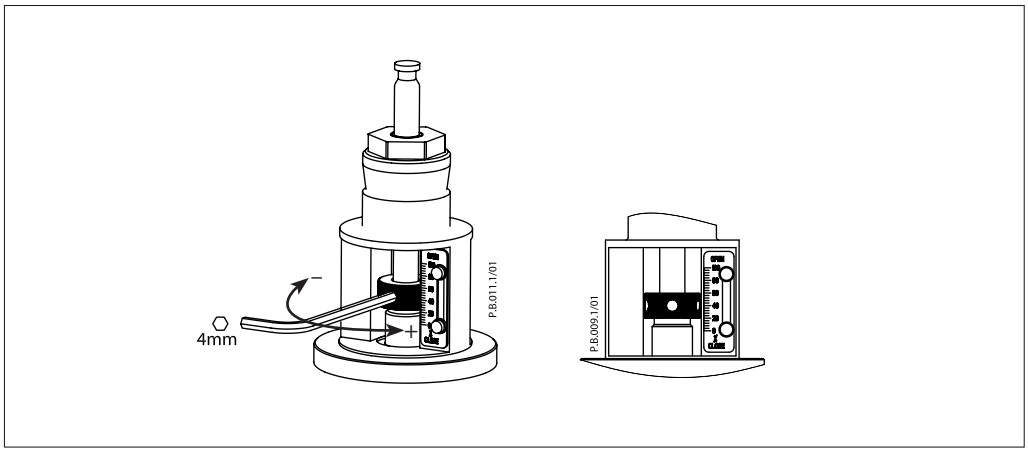


DN 40-100





DN 125-250



Service

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

The valve features a service function that allows changing of the "stuffing box (**code 065F0006**)" under water pressure.

Valves are equipped with plastic shut-off mechanism that is to be used for isolating function up to 1 bar differential pressure. When closing against higher differential pressure please use accessory - shut-off & protection piece (003Z0230) or set the value to 0 %.

Unwanted change of the setting is provided by locking ring (**code 003Z0236**) which is inserted in the groove below the scale. The locking ring would not allow one to lift the grey plastic ring thus no change of the setting is possible.

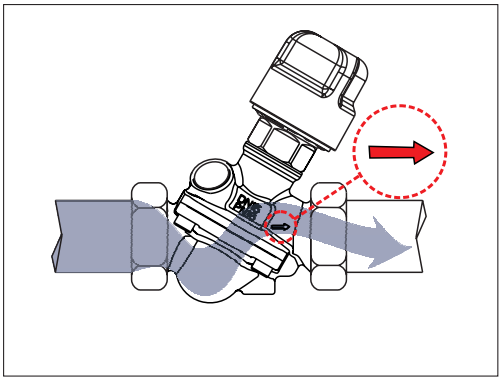
DN 40-100
For the service shut off function there is no pipe side installation recommendation.

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

Installing

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

In case when system condition allows backflows it is strongly recommended to use backflow preventer in order to avoid possible water hammer that can damage the valve as well as other elements in the system.



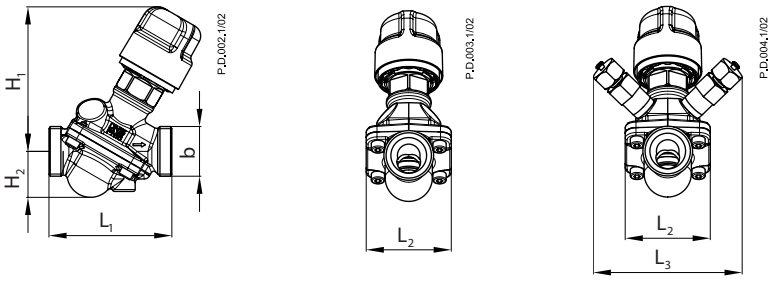
Tender text

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 to adjust the flow stepless from 100 to 0 % of the maximum flow.
5. Minimum possible flow in combination with a modulating actuator should be 30 l/h.
6. At the minimum setting of 30 l/h modulation to 0 % of the flow 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 40-250.
10. The control valve stuffing box should be serviceable under pressure for valves up to DN 32.
11. The valves should have a shut-off function (positive), separated from the setting mechanism, for valves DN 40-250.
12. The leakage rate should be: No visible leakage at force of the thermal actuator (90 N) for valves up to DN 32 and for valves up to DN 100 0.05 % of the kv at 500 N. All actuators should be able to close against 600 kPa differential pressure.
13. The authority of the pressure independent control valve should be 1 at all settings (control valve characteristic is not changed).
14. Control valve should have flow – control signal as a linear characteristic at all settings. Control ratio of the pressure independent balancing and control valve should be higher than 1:300 (**Supplier of the valve should provide lab test results** [1]).
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. (**Supplier of the valve should provide lab test results** [1]). Nominal pressure rating 16 bar (PN 20 on request), maximal test pressure 25 bar.
17. Measuring points for pump optimization and flow verification should be available for DN 10-250.

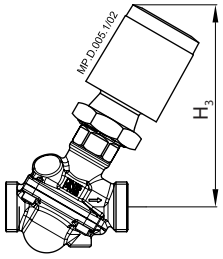
Nominal diameter:	_____
Connection:	_____
Adjustment range from - to	_____ m^3/h
Produced by:	Danfoss
Type:	AB-QM
Ordering no.:	003Z ____

[1] *Since there is no standard for testing procedure, Danfoss recommends verification by independent*

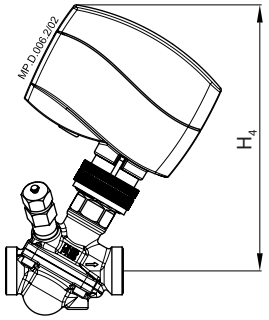
Dimensions



AB-QM DN 10-32

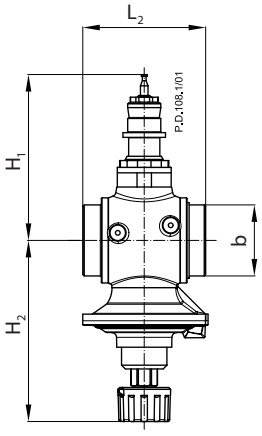


TWA-Z + AB-QM
ABNM + AB-QM

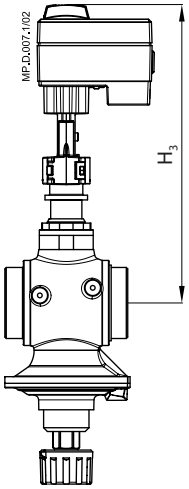


AMV (E) 110 NL + AB-QM
AMI 140 + AB-QM

Type	L_1 mm	L_2 mm	L_3 mm	H_1 mm	H_2 mm	H_3 mm	H_4 mm	b ISO 228/1	Weight kg
AB-QM DN 10	53	36	79	73	20	105	140	G ½	0.38
AB-QM DN 15	65	45	79	75	25	110	145	G ¾	0.48
AB-QM DN 20	82	56	79	77	33	115	150	G 1	0.65
AB-QM DN 25	104	71	79	88	42	130	165	G 1 ¼	1.45
AB-QM DN 32	130	90	79	102	50	145	180	G 1 ½	2.21



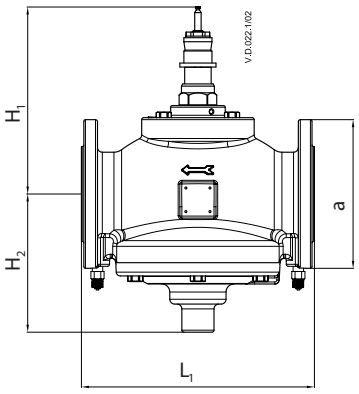
AB-QM DN 40, DN 50



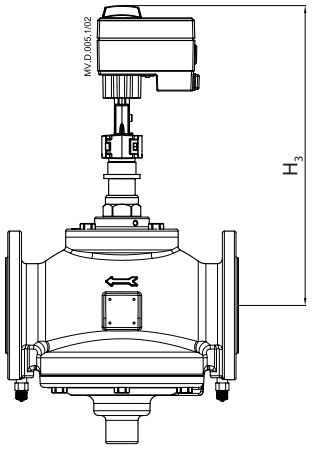
AME 15 QM + AB-QM

Type	L_1 mm	H_1 mm	H_2 mm	H_3 mm	b ISO 228/1	Weight kg
AB-QM DN 40	110	192	174	315	G 2	6.9
AB-QM DN 50	130	192	174	315	G 2 ½	7.8

Dimensions *(continuous)*



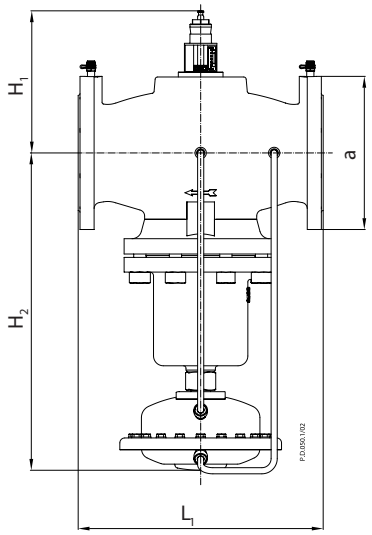
AB-QM DN 50-100



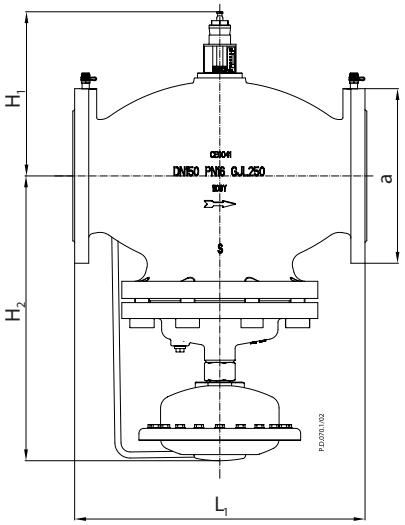
AME 15 QM + AB-QM

Type	L_1 mm	H_1 mm	H_2 mm	H_3 mm	a (EN 1092-2)	Weight kg
AB-QM DN 50	230	192	174	315	165	14.2
AB-QM DN 65	290	233	172	373	185	38.0
AB-QM DN 80	310	236	177	376	200	45.0
AB-QM DN 100	350	249	187	389	220	57.0

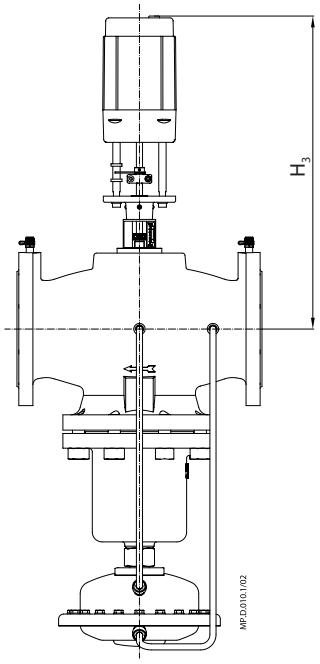
Dimensions *(continuous)*



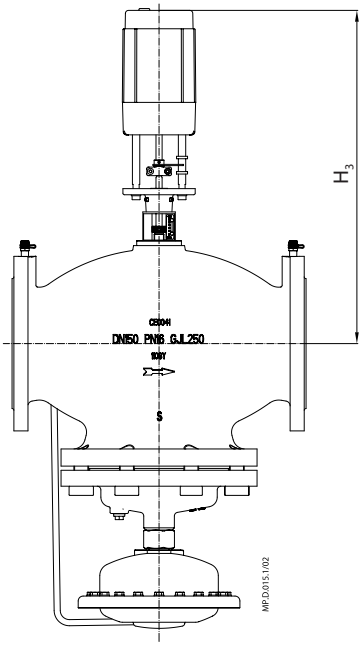
AB-QM DN 125



AB-QM DN 150



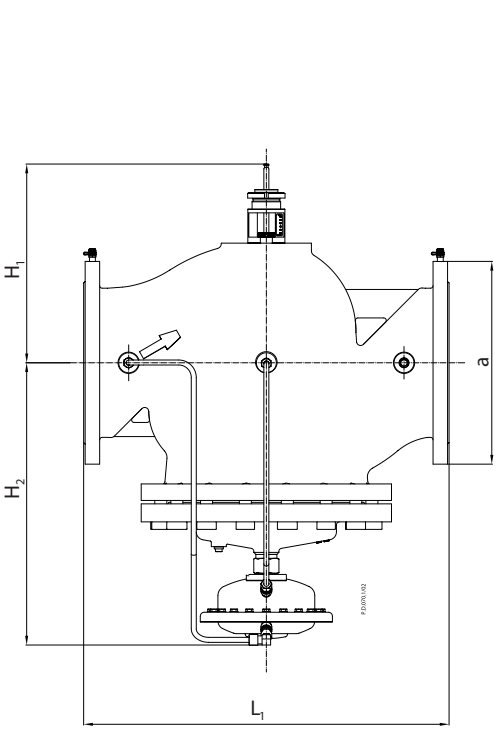
AME 55 QM + AB-QM DN 125



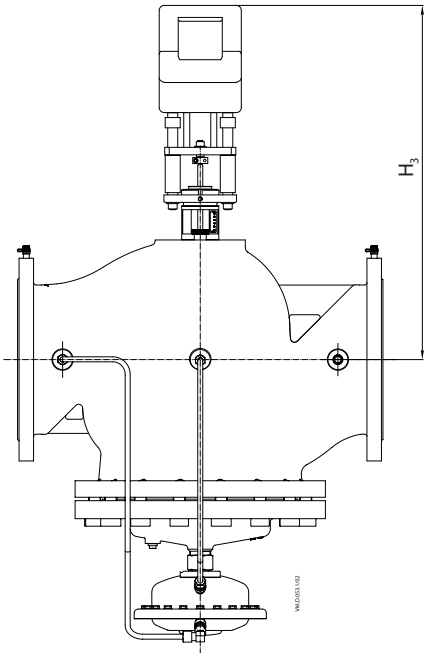
AME 55 QM + AB-QM DN 150

Type	L_1 mm	H_1 mm	H_2 mm	H_3 mm	a (EN 1092-2)	Weight kg
AB-QM DN 125	400	232	518	507	250	85.3
AB-QM DN 150	480	268	465	518	285	138

Dimensions *(continuous)*



AB-QM DN 200, 250



AME 85 QM + AB-QM DN 200, 250

Type	L_1 mm	H_1 mm	H_2 mm	H_3 mm	a (EN 1092-2)	Weight kg
AB-QM DN 200	600	401	483	618	340	219
AB-QM DN 250	730	397	533	708	405	342