Data sheet

Flow controller with integrated control valve (PN 25)

AVQM - return and flow mounting

Description

AVQM is a self-acting flow controller with integrated control valve primarily for use in district heating systems. The controller closes when set max. flow is exceeded. In combination with Danfoss electrical actuators AMV(E) can be controlled by ECL electronic controllers.

AVQM 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 150 [1]
- AMV(E) 10 [1] / AMV(E) 20 / AMV(E) 30
- AMV(E) 13 [1] / AMV(E) 23 / AMV(E) 33 with spring return function
- AMV 20 SL / AMV 23 SL / AMV 30 SL with stroke limitation

[1] *AMV 150 / AMV(E) 10 / AMV(E) 13 can be combined with DN 15 controller only.*

AVQM combined with AMV(E) 13, AMV(E) 23 (SL) or AMV(E) 33 (SL) has been approved according to DIN 32730.

Main data:
- DN 15-50
- k_{VS} 0,4-25 m³/h
- Flow range: 0,015-15 m³/h
- PN 25
- Flow restrictor Δp: 0,2 bar
- Temperature:
  - Circulation water / glycolic water up to 30 %: 2 …150 °C
- Connections:
  - Ext. thread (weld-on, thread and flange tailpieces)
  - Flange

Ordering

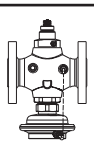
Example:
Flow controller with integrated control valve, DN 15; k_{VS} 1,6; PN 25; flow restrictor Δp 0,2 bar; T_{max} 150 °C; ext. thread

- *1× AVQM DN 15 controller*
  Code No: ***003H6748***

Option:
- *1× Weld-on tailpieces*
  Code No: ***003H6908***

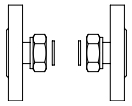
The controller will be delivered completely assembled, inclusive impulse tube between valve and actuator. Electrical actuator AMV(E) must be ordered separately.

AVQM Controller

Picture	DN (mm)	k_{VS} (m³/h)	Connection		Code No.
	15	0,4	Cylindr. ext. thread acc. to ISO 228 / 1	G ¾ A	003H6746
		1,0			003H6747
		1,6			003H6748
		2,5			003H6749
		4,0			003H6750
	20	6,3		G 1 A	003H6751
	25	8,0		G 1¼ A	003H6752
	32	12,5		G 1¾ A	003H6753
	40	16		G 2 A	003H6754
	50	20		G 2½ A	003H6755
	32	12,5	Flanges PN 25, acc. to EN 1092-2		003H6756
	40	20			003H6757
	50	25			003H6758

Ordering *(continuous)*

Accessories

Picture	Type designation	DN	Connection		Code No.
	Weld-on tailpieces	15	-		**003H6908**
		20			**003H6909**
		25			**003H6910**
		32			**003H6911**
		40			**003H6912**
		50			**003H6913**
	External thread tailpieces	15	Conical ext. thread acc. to EN 10226-1	R ½	**003H6902**
		20		R ¾	**003H6903**
		25		R 1	**003H6904**
		32		R 1¼	**003H6905**
		40		R 1½	**065F6061**
		50		R 2	**065F6062**
	Flange tailpieces	15	Flanges PN 25, acc. to EN 1092-2		**003H6915**
		20			**003H6916**
		25			**003H6917**

Service kits

Picture	Type designation	DN	k_{VS} (m^3/h)	Code No.
	Valve insert	15	0,4	**003H6861**
			1,0	**003H6862**
			1,6	**003H6863**
			2,5	**003H6864**
			4,0	**003H6865**
		20	6,3	**003H6866**
		25	8,0	**003H6867**
		32 / 40 / 50	12,5 / 16 / 20 / 25	**003H6868**
	Control valve insert	15	0,4	**003H6878**
			1,0	**003H6879**
			1,6	**003H6880**
			2,5	**003H6881**
			4,0	**003H6882**
		20	6,3	**003H6883**
		25	8,0	**003H6884**
		32 / 40 / 50	12,5 / 16 / 20 / 25	**003H6885**

	Type designation	**Δp setting range** (bar)	Code No.
	Actuator	0,2	**003H6841**

Technical data

Valve

Nominal diameter			DN	15					20	25	32	40	50
k_{VS} value				0,4	1,0	1,6	2,5	4,0	6,3	8,0	12,5	16/20 [4]	20/25 [4]
Range of max. flow setting	Δp_b [1] = 0,2 bar	from	m^3/h	0,015	0,02	0,03	0,07	0,07	0,16	0,2	0,4	0,8	0,8
		to		0,18	0,4	0,86	1,4	2,2	3,0	3,5	8,0	10	12
		or to [3]		-	-	0,9	1,6	2,4	3,5	4,5	10	12	15
Stroke			mm	5					7		10		
Control ratio				> 1:30									
Control characteristic				Logarithmic									
Cavitation factor z				≥ 0,6						≥ 0,55		≥ 0,5	
Leakage acc. to standard IEC 534			% of k_{VS}	≤ 0,02							≤ 0,05		
Nominal pressure			PN	25									
Min. differential pressure			bar	see remark [2]									
Max. differential pressure				20							16		
Medium				Circulation water / glycolic water up to 30 %									
Medium pH				Min. 7, max. 10									
Medium temperature			°C	2 …150									
Connections	valve			External thread							Ext. thread and flange		
	tailpieces			Weld-on and external thread									
				Flange							-		
Materials													
Valve body	thread			Red bronze CuSn5ZnPb (Rg5)							Ductile iron EN-GJS-400-18-LT (GGG 40.3)		
	flange			-									
Valve seat				Stainless steel, mat. No. 1.4571									
Valve cone				Dezincing free brass CuZn36Pb2As									
Sealing DP				EPDM									
Sealing CV				Metal							EPDM		
Pressure relieve system	Control valve insert			-							Piston		
	Valve insert			Piston									

Note:
DP - diff. pressure controller, CV - control valve

[1] *Δp_b - differential pressure over flow restrictor*

[2] *Depends on the flow rate and valve k_{VS}; For $Q_{set} = Q_{max}$ -> $\Delta p_{min} \geq 0,5$ bar; For $Q_{set} < Q_{max}$ ->* $\Delta p_{min} = \left(\frac{Q}{k_{VS}}\right)^2 + \Delta p_b$

[3] *Higher max flow are achieved at higher differential pressures over AVQM controller. In general at Δp > 1-1,5 bar*

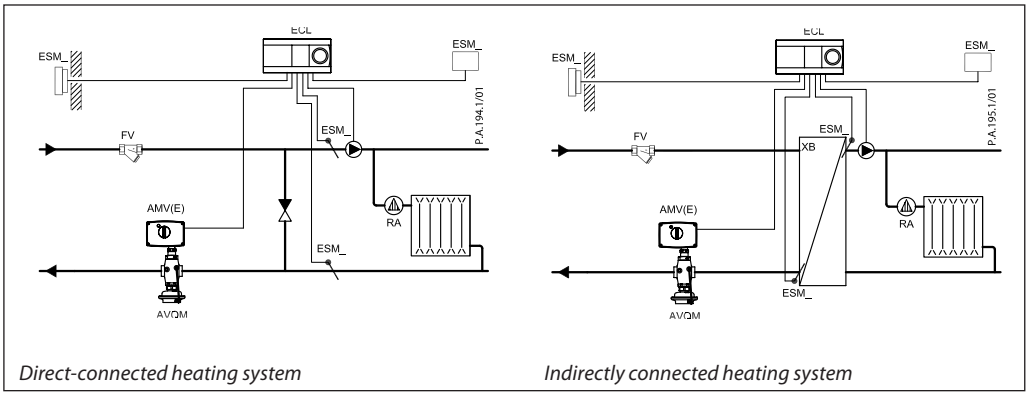
[4] *Flange valve body*

Actuator

Type			AVQM
Actuator size		cm^2	54
Nominal pressure		PN	25
Flow restrictor diff. pressure		bar	0,2
Materials			
Housing	Upper housing of actuator		Stainless steel, mat. No. 1.4301
	Lower housing of actuator		Dezincing free brass CuZn36Pb2As
Diaphragm			EPDM
Impulse tube			Copper tube Ø 6 × 1 mm

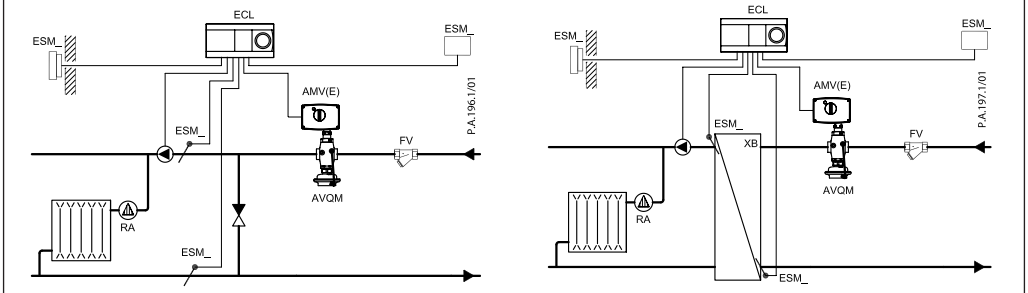
Application principles

- Return mounting



Direct-connected heating system *Indirectly connected heating system*

- Flow mounting

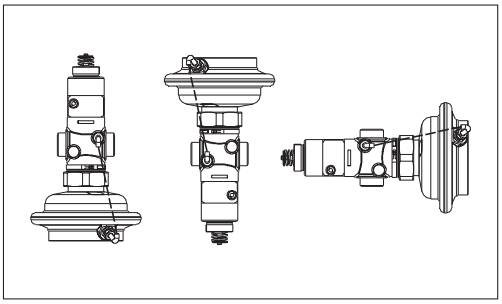


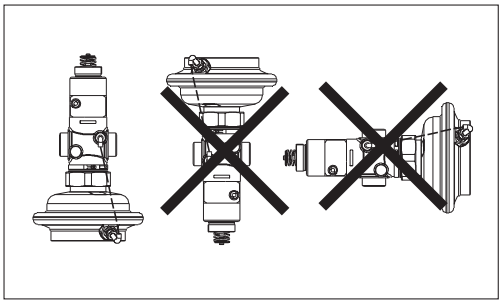
Direct-connected heating system *Indirectly connected heating system*

Installation positions

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

For higher temperatures the controllers have to be installed in horizontal pipes only, with a pressure actuator oriented downwards.

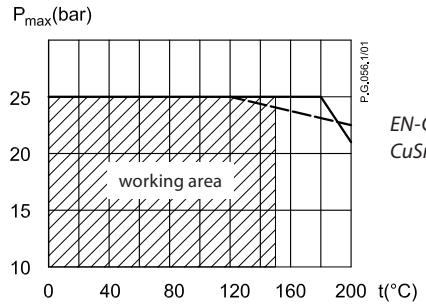




Electrical actuator

Note!
Installation positions for electrical actuators AMV(E) have to be observed as well. Please see relevant Data sheet.

Pressure temperature diagram

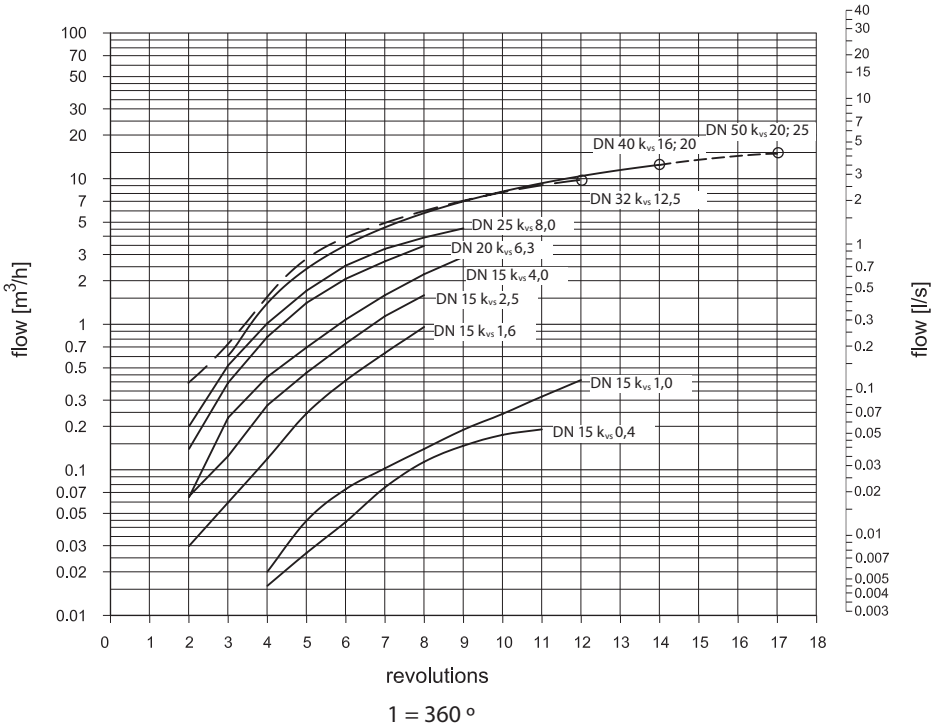


EN-GJS-400-18-LT (GGG 40.3) PN 25
CuSn5ZnPb (Rg5) PN 25

Maximum allowed operating pressure as a function of medium temperature (according to EN 1092-2 and EN 1092-3).

Flow diagram

Sizing and setting diagram
Relation between actual flow and number of revolutions on flow restictor. Values given are approximate.



Flow can be adjusted by turning flow restrictor screw counter-clockwise as shown in this diagram

Water flow shown at differential pressure across flow restrictor 0,2 bar (20 kPa) and across the controller from 0,5 bar (50 kPa) to 16/20 bar (1600/2000 kPa).

Note:
For max flow setting on the controller diagrams from Instructions should be used.

Sizing

- *Directly connected heating system*

Example 1
Motorised control valve (MCV) for mixing circuit in direct-connected heating systems requires differential pressure of 0,2 bar (20 kPa) and flow less than 600 l/h.

Given data:
Q_{max} = 0,6 m³/h (600 l/h)
Δp_{min} = 0,9 bar (90 kPa)
$\Delta p_{circuit}$ [1)] = 0,1 bar (10 kPa)
Δp_{MCV} = 0,2 bar (20 kPa) selected

Remark:
[1)] *$\Delta p_{circuit}$ corresponds to the required pump pressure in the heating circuit and is not to be considered when sizing the AVQM.*

The total (available) pressure loss across the controller is:
$\Delta p_{AVQM,A} = \Delta p_{min}$
$\Delta p_{AVQM,A}$ = 0,9 bar (90 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 m³/h

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

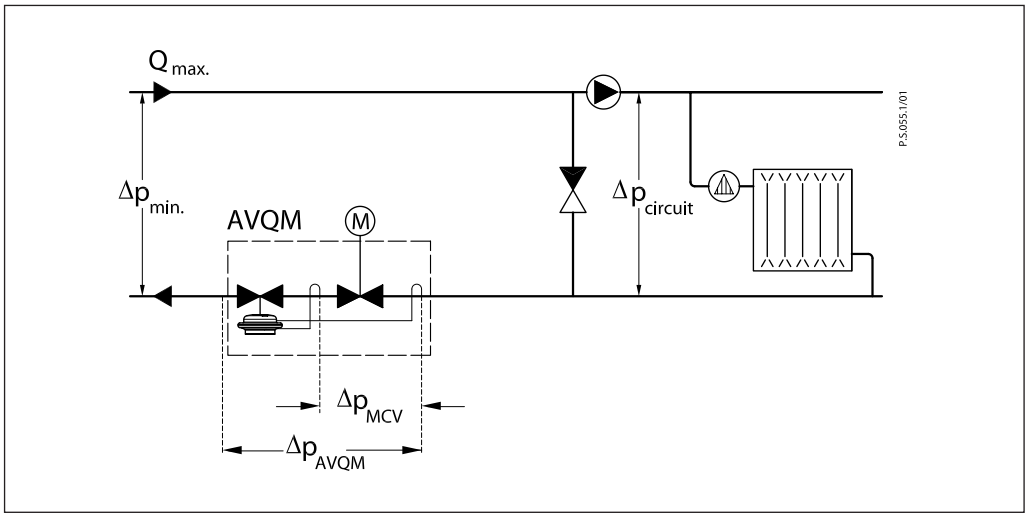
$$\Delta p_{AVQM,MIN} = \left(\frac{Q_{max}}{k_{VS}}\right)^2 + \Delta p_{MCV} = \left(\frac{0,8}{1,6}\right)^2 + 0,2$$

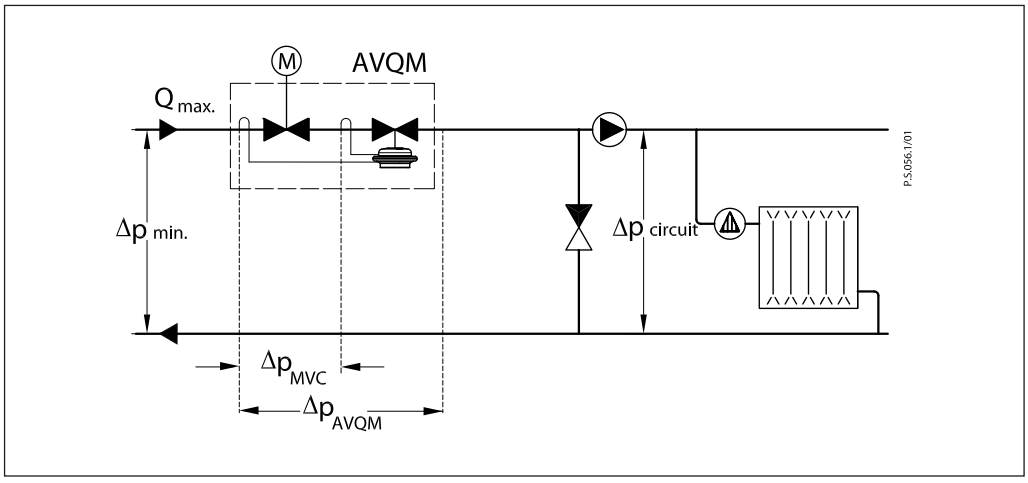
$\Delta p_{AVQM,MIN}$ = 0,34 bar (34 kPa)

$\Delta p_{AVQM,A} > \Delta p^{AVQM,MIN}$

0,9 bar > 0,34 bar

Solution:
The example selects AVQM DN 15; k_{VS} value 1,6; flow setting range 0,03-0,9 m³/h.





Sizing *(continuous)*

- *Indirectly connected heating system*

Example 2
Motorised control valve (MCV) for indirectly connected heating system control requires differential pressure of 0,2 (20 kPa) bar and flow less than 1900 l / h.

Given data:
Q_{max} = 1,9 m³/h (1900 l/h)
Δp_{min} = 1,1 bar (110 kPa)
$\Delta p_{exchanger}$ = 0,1 bar (10 kPa)
Δp_{MCV} = 0,2 bar (20 kPa) selected

The total (available) pressure loss across the controller is:
$\Delta p_{AVQM,A} = \Delta p_{min} - \Delta p_{exchanger} = 1,1 - 0,1$

$\Delta p_{AVQM,A}$ = 1,0 bar (100 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} = 4,0 m³/h

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

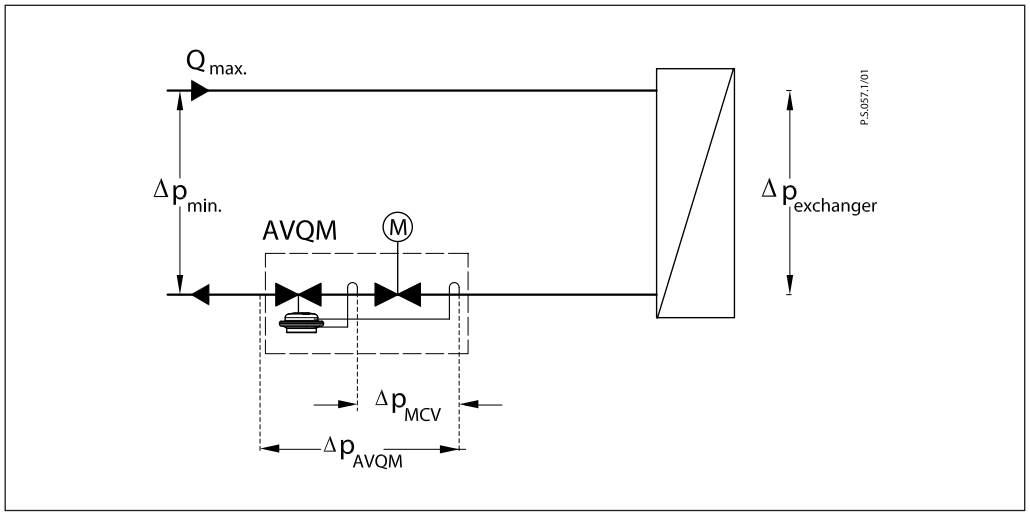
$$\Delta p_{AVQM,MIN} = \left(\frac{Q_{max}}{k_{vs}}\right)^2 + \Delta p_{MCV} = \left(\frac{1.9}{4.0}\right)^2 + 0.2$$

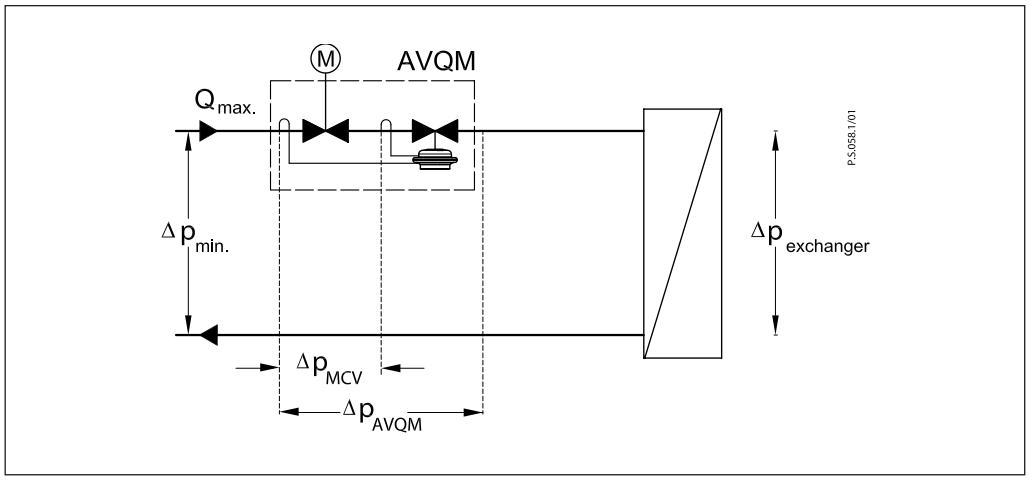
$\Delta p_{AVQM,MIN}$ = 0,43 bar (43 kPa)

$\Delta p_{AVQM,A} > \Delta p_{AVQM,MIN}$

1,0 bar > 0,43 bar

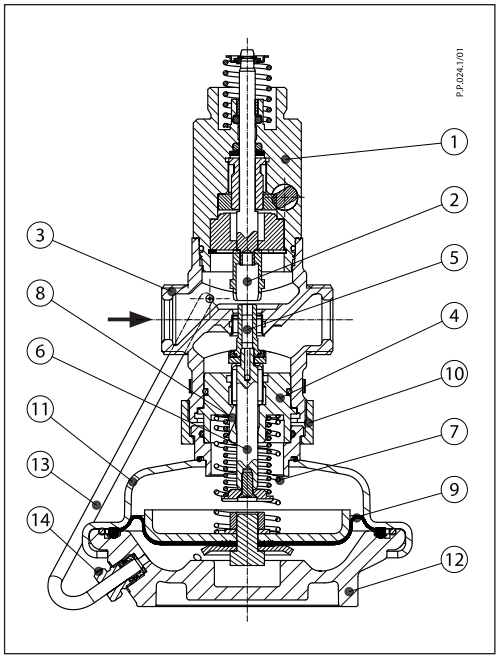
Solution:
The example selects AVQM DN 15; k_{VS} value 4,0; flow setting range 0,07-2,4 m³/h.





Design

1. Control valve insert
2. Adjustable flow restrictor
3. Valve body
4. Valve insert
5. Pressure relieved valve cone
6. Valve stem
7. Built-in spring for flow rate control
8. Control drain
9. Control diaphragm
10. Union nut
11. Upper casing of diaphragm
12. Lower casing of diaphragm
13. Impulse tube
14. Compression fitting for impulse tube



Function

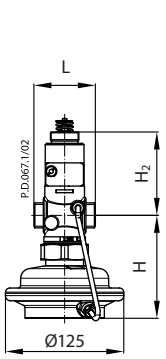
Flow volume causes pressure drop across the adjustable flow restrictor. Resulting pressures are being transferred through the impulse tubes and/or control drain in the actuator stem to the actuator chambers and act on control diaphragm for flow control. The flow restrictor diff. pressure is controlled and limited by means of built-in spring for flow control. Control valve closes on rising differential pressure and opens on falling differential pressure to control max flow.

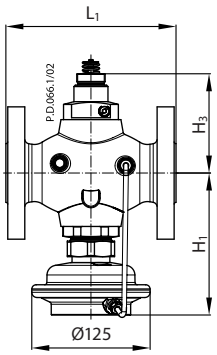
Additionally the electrical actuator will operate from zero to set max. flow according to the load.

Settings

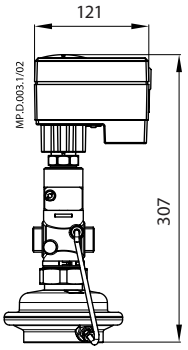
Flow setting
Flow setting is being done by the adjustment of the flow restrictor position. The adjustment can be performed on the basis of flow adjustment diagram (see relevant instructions) and / or by the means of heat meter.

Dimensions

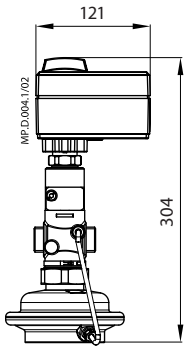




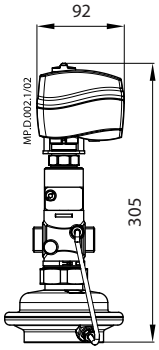
DN	L	L_1	H	H_1	H_2	H_3	Weight (kg)	
	mm						thread	flange
15	65	-	109	-	88	-	3,0	-
20	70	-	109	-	88	-	3,0	-
25	75	-	109	-	91	-	3,2	-
32	100	180	150	150	105	105	5,8	10,3
40	110	200	150	150	105	105	5,9	11,8
50	130	230	150	150	105	105	6,6	13,9



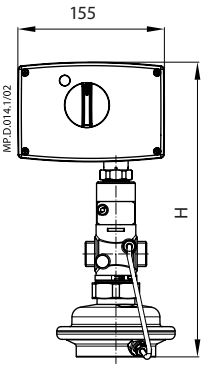
AMV(E) 10 + AVQM (DN 15)



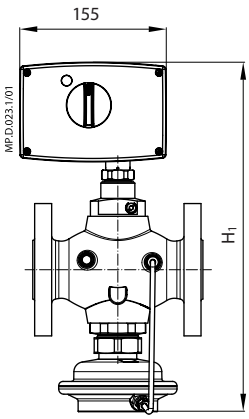
AMV(E) 13 + AVQM (DN 15)



AMV 150 + AVQM (DN 15)



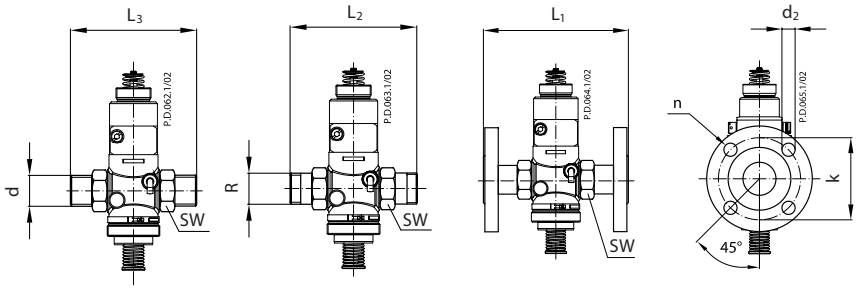
AMV(E) 2./3. + AVQM (DN 15-50)



AMV(E) 2./3. + AVQM (DN 32-50)

DN	H	H_1
	mm	
15	317	-
20	317	-
25	320	-
32	375	390
40	375	390
50	375	390

Dimensions *(continuous)*



DN	R [1]	SW	d	L_1 [2]	L_2	L_3	k	d_2	n
		mm							
15	½	32 (G ¾A)	21	130	131	139	65	14	4
20	¾	41 (G 1A)	26	150	144	154	75	14	4
25	1	50 (G 1¼A)	33	160	160	159	85	14	4
32	1¼	63 (G 1¾A)	42	-	177	184	100	18	4
40	1 ½	70 (G 2A)	47	-	195	204	110	18	4
50	2	82 (G 2½A)	60	-	252	234	125	18	4

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