ENGINEERING
TOMORROW

Data sheet

Flow controller (PN 16)
AVQ - return and flow mounting

Description

AVQ is a self-acting flow controller primarily for use in district heating systems. The controller closes when set max. flow is exceeded.

The controller has a control valve with adjustable flow restrictor and an actuator with one control diaphragm.

Main data:
- DN 15-32
- k_{VS} 1.6-10 m³/h
- Flow range 0.06-7.3 m³/h
- PN 16
- 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)

Ordering

Example:
Flow controller; DN 15; k_{VS} 1.6; PN 16; flow restrictor Δp 0.2 bar; T_{max} 150 °C, ext. thread

- 1× AVQ DN 15 controller
Code No: ***003H6711***

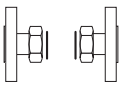
Option:
- 1× Weld-on tailpieces
Code No: ***003H6908***

The controller will be delivered completely assembled, inclusive impulse tube between valve and actuator.

AVQ Controller

Picture	DN (mm)	k_{VS} (m³/h)	Connection		Code No.
	15	1.6	Cylindr. ext. thread acc. to ISO 228/1	G ¾ A	003H6711
		2.5			003H6712
		4.0			003H6713
	20	6.3		G 1 A	003H6714
	25	8.0		G 1¼ A	003H6715
	32	10		G 1¾ A	003H6716

Accessories

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

Ordering *(continuous)*

Service kits

Picture	Type designation	DN	k_{VS} (m^3/h)	Code No.
	Valve insert	15	1.6	**003H6863**
			2.5	**003H6864**
			4.0	**003H6865**
		20	6.3	**003H6866**
		25	8.0	**003H6867**
		32	10	

Picture	Type designation	Fixed setting (bar)	Code No.
	Actuator	0.2	**003H6825**

Technical data

Valve

Nominal diameter			**DN**	**15**			**20**	**25**	**32**
k_{VS} value			m³/h	1.6	2.5	4.0	6.3	8.0	10
Range of max. flow setting	Δp_b [1] = 0.2 bar	from		0.06	0.08	0.09	0.1	0.1	0.15
		to		1.4	1.8	2.7	4.5	6.0	7.3
Cavitation factor z				≥ 0.6				≥ 0.55	
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				12					
Medium				Circulation water / glycolic water up to 30%					
Medium pH				Min. 7, max. 10					
Medium temperature			°C	2 … 150					
Connections	valve			External thread					
	tailpieces			Weld-on and external thread					
				Flange					-
Materials									
Valve body				Red bronze CuSn5ZnPb (Rg5)					
Valve seat				Stainless steel, mat. No. 1.4571					
Valve cone				Dezincing free brass CuZn36Pb2As					
Sealing				EPDM					
Pressure relieve system				Piston					

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

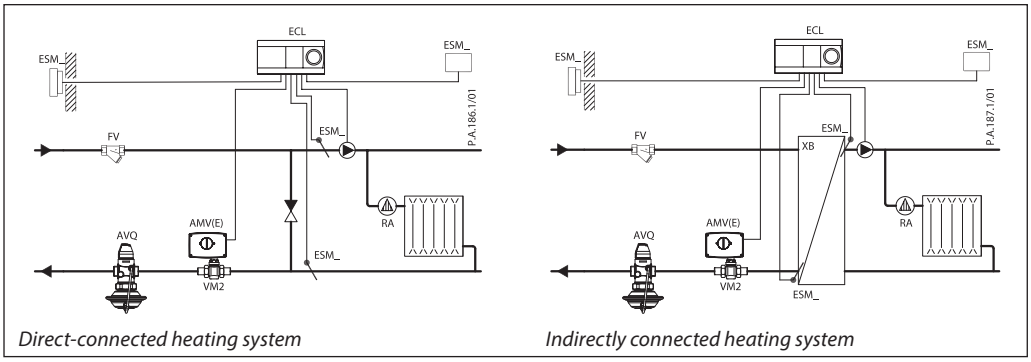
[2] *Depends on the flow rate and valve k_{VS}; For $Q_{set} = Q_{max}$ -> $\Delta p_{min} \geq 0.5$ bar; For $Q_{set} < Q_{max}$ ->* $\Delta p_{min} = \left(\frac{Q}{k_{VS}}\right)^2 + \Delta p_b$

Actuator

Type		**AVQ**
Actuator size	cm^2	39
Nominal pressure	PN	16
Flow restrictor diff. pressure	bar	0.2
Materials		
Actuator housing		Zinc plated, DIN 1624, No. 1.0338
Diaphragm		EPDM
Impulse tube		Copper tube Ø 6 × 1 mm

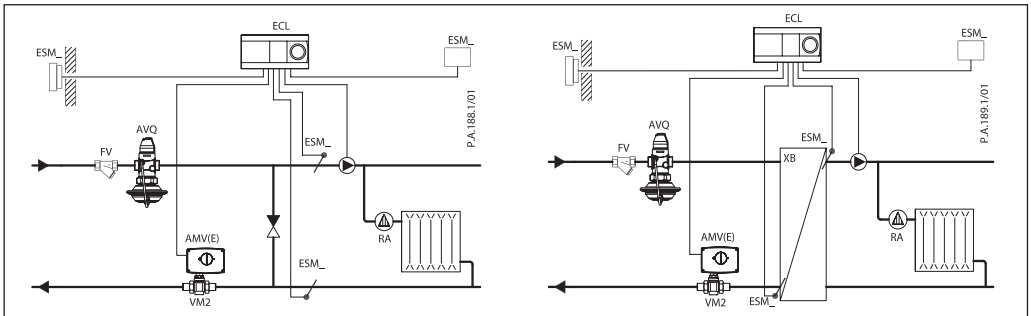
Application principles

- Return mounting



Direct-connected heating system *Indirectly connected heating system*

- Flow mounting

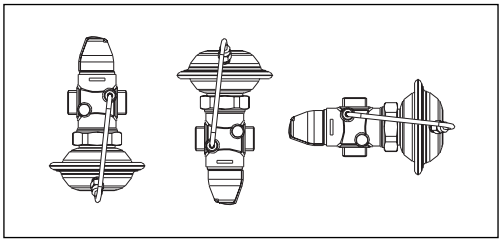


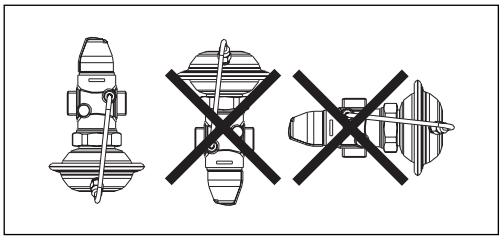
Direct-connected heating system *Indirectly connected heating system*

Installation positions

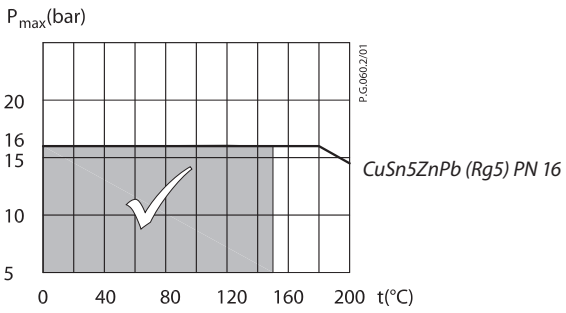
Up to medium temperature of 100 °C the controllers can be installed in any position.

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





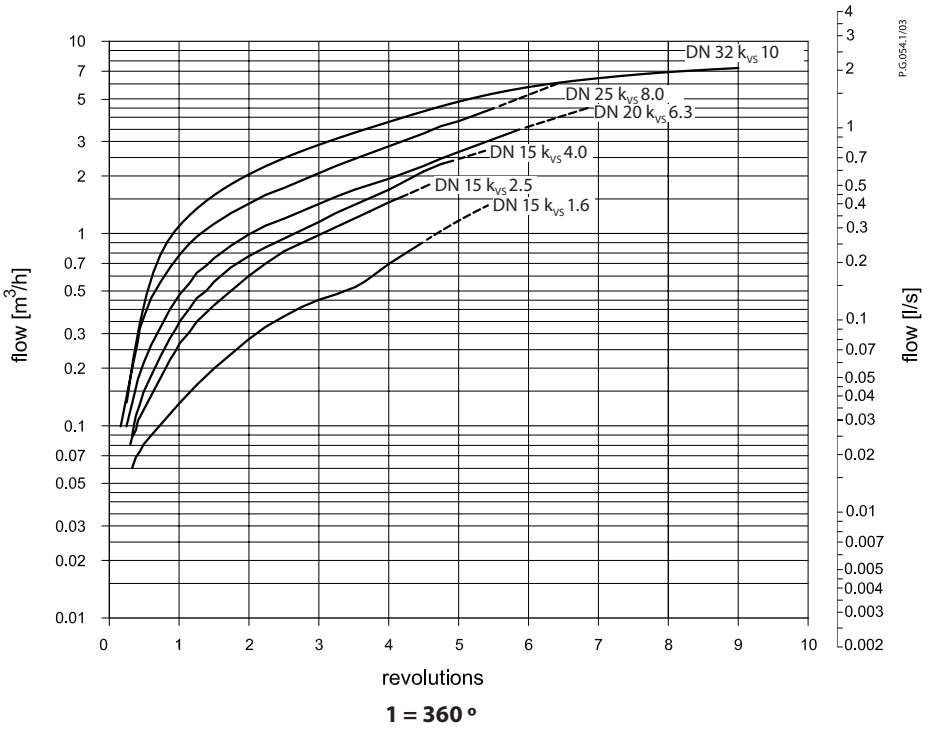
Pressure temperature diagram



Maximum allowed operating pressure as a function of medium temperature (according to 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 12 bar (1200 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 system requires differential pressure of 0.2 bar (20 kPa) and flow less than 900 l/h.

Given data:
Q_{max} = 0.9 m³/h (900 l/h)
Δp_{min} = 0.8 bar (80 kPa)
$\Delta p_{circuit}$ [1)] = 0.1 bar (10 kPa)
Δp_{MCV} = 0.2 bar (20 kPa) selected
Δp_b [2)] = 0.2 bar (20 kPa)
Remark:
[1)] *$\Delta p_{circuit}$ corresponds to the required pump pressure in the heating circuit and is not to be considered when sizing the AVQ.*
[2)] *Δp_b is differential pressure over flow restrictor.*

The total (available) pressure loss across the controller is:
$\Delta p_{AVQ,A} = \Delta p_{min} - \Delta p_{MCV} = 0.8 - 0.2$
$\Delta p_{AVQ,A}$ = 0.6 bar (60 kPa)

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

Select controller from flow diagram, page 4, 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:

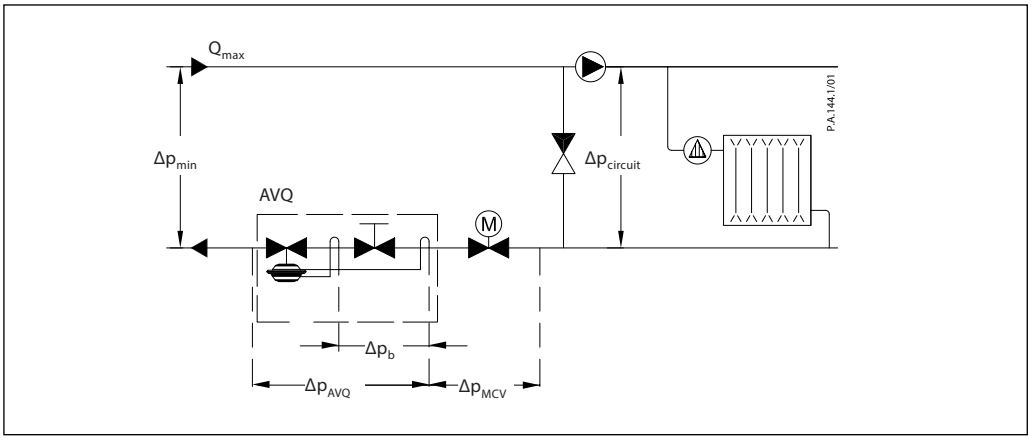
$$\Delta p_{AVQ,MIN} = \left(\frac{Q_{max}}{k_{VS}}\right)^2 + \Delta p_b = \left(\frac{0.9}{1.6}\right)^2 + 0.2$$

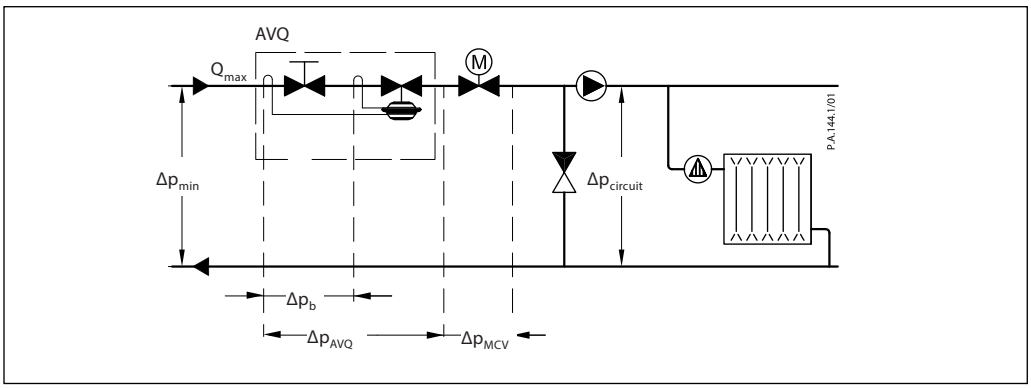
$\Delta p_{AVQ,MIN}$ = 0.52 bar (52 kPa)

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

0.6 bar > 0.52 bar

Solution:
The example selects AVQ DN 15, k_{VS} value 1.6, flow setting range 0.06-1.4 m³/h.





Sizing *(continuous)*

- *Indirectly connected heating system*

Example 2
Motorised control valve (MCV) for indirectly connected heating system requires differential pressure of 0.3 (30 kPa) bar and flow less than 1500 l/h.

Given data:
Q_{max} = 1.5 m³/h (1500 l/h)
Δp_{min} = 1.1 bar (110 kPa)
$\Delta p_{exchanger}$ = 0.1 bar (10 kPa)
Δp_{MCV} = 0.3 bar (30 kPa) selected
Δp_b [1)] = 0.2 bar (20 kPa)
Remark:
[1)] *Δp_b is differential pressure over flow restrictor*

The total (available) pressure loss across the controller is:
$\Delta p_{AVQ,A} = \Delta p_{min} - \Delta p_{exchanger} - \Delta p_{MCV}$
$= 1.1 - 0.1 - 0.3$
$\Delta p_{AVQ,A}$ = 0.7 bar (70 kPa)

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

Select controller from flow diagram, page 4, with the smallest possible k_{VS} value considering available flow ranges.

k_{VS} = 2.5 m³/h

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

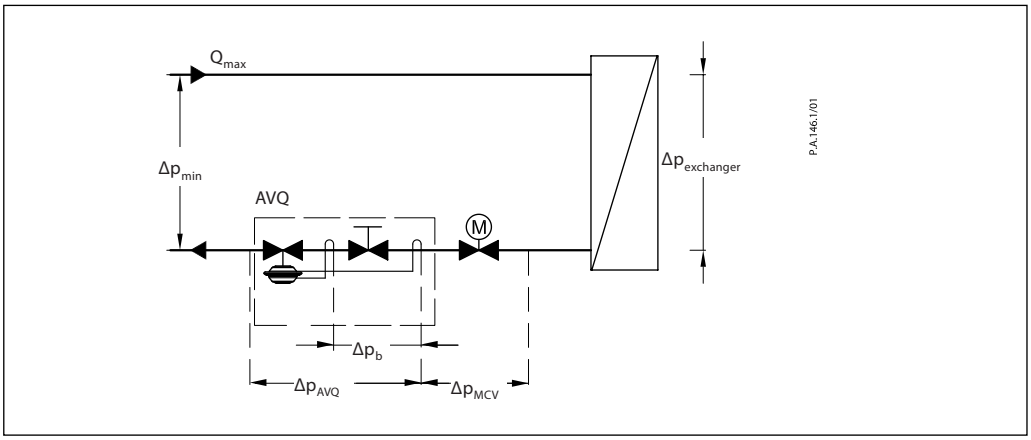
$$\Delta p_{AVQ,MIN} = \left(\frac{Q_{max}}{k_{VS}}\right)^2 + \Delta p_b = \left(\frac{1.5}{2.5}\right)^2 + 0.2$$

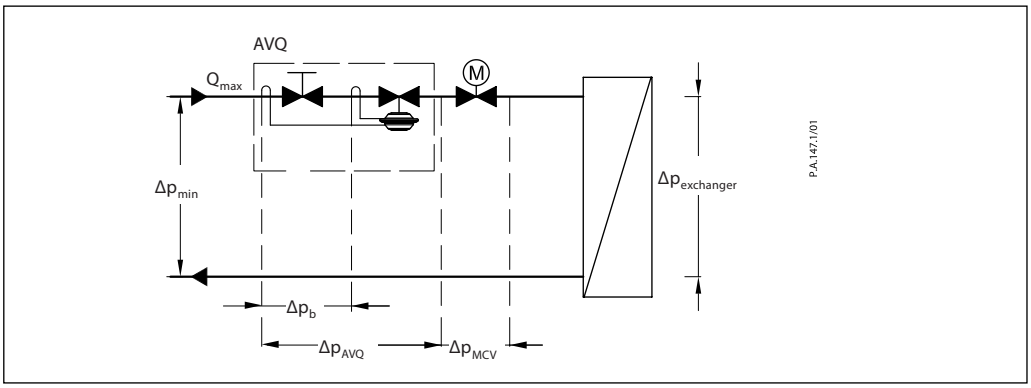
$\Delta p_{AVQ,MIN}$ = 0.56 bar (56 kPa)

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

0.7 bar > 0.56 bar

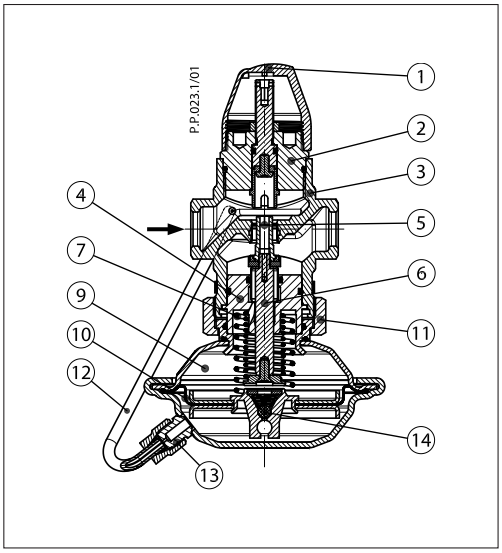
Solution:
The example selects AVQ DN 15, k_{VS} value 2.5, flow setting range 0.08-1.8 m³/h.





Design

1. Cover
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. Actuator
10. Control diaphragm for flow control
11. Union nut
12. Impulse tube
13. Compression fitting for impulse tube
14. Excess pressure safety valve



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.

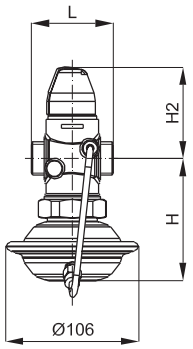
Controller is equipped with excess pressure safety valve, which protects control diaphragm for flow control from too high differential pressure.

Settings

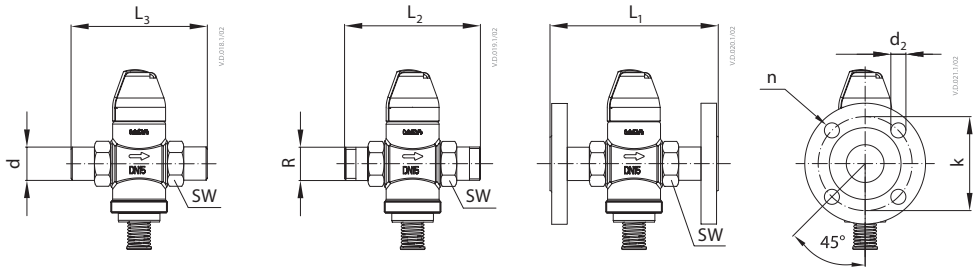
Flow setting
Flow setting is being done by the adjustment of the flow restrictor position. The adjustment can be performed on the basis of flow adjustment diagram (see relevant instructions) and/or by the means of heat meter.

Data sheet **AVQ (PN 16)**

Dimensions



DN	L	H	H2	Weight
	mm			(kg)
15	65	97	73	1.7
20	70	97	73	1.9
25	75	97	76	1.9
32	100	97	76	2.4



DN	R [1]	SW	d	L_1 [2]	L_2	L_3	k	d_2	n
		mm							
15	½	32 (G ¾A)	21	130	120	139	65	14	4
20	¾	41 (G 1A)	26	150	131	154	75	14	4
25	1	50 (G 1¼A)	33	160	145	159	85	14	4
32	1¼	63 (G 1¾A)	42	-	177	184	100	18	4

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

Danfoss A/S
Climate Solutions • danfoss.com • +45 7488 2222