Data sheet

Pressure flow controllers

AVPQ (PN16)

Return mounting, adjustable setting

Description

AVPQ is a self-acting differential pressure and flow controller primarily for use in district heating systems. The controller closes on rising differential pressure or when set max. flow is exceeded.

The controller has a control valve with adjustable flow restrictor, an actuator with two control diaphragms and handle for differential pressure setting (fixed setting version (available on special request) is without handle).

Main data:

- DN 15-32
- k_{VS} 1.6-10 m^3/h
- Flow range: 0.06–7.3 m^3/h
- PN 16
- Setting range (AVPQ): 0.1-0.5 bar / 0.2-1.0 bar
- Flow restrictor Δp_b: 0.2 bar
- Temperature:
  - Circ. water / glycolic water up to 30 %: 2 … 150 °C
- Connections:
  - Ext. thread (weld-on, thread and flange tailpieces)

Features & benefits

- Integrated control valve with adjustable flow restrictor and dual-diaphragm actuator (with optional fixed setting) enables precise flow limitation, accurate differential pressure control, and easy commissioning.
- Protects district heating systems from excessive pressure or flow, ensuring stable operation, improved energy efficiency, and long-term reliability.

Ordering

Product code numbers

Valve size	Connection types	Kvs values [m^3/h]	Connection size	Differential pressure setting [bar] [Min]	Differential pressure setting [bar] [Max]	Code number
DN 15	External thread ISO 228/1	1.60	G 3/4 A	0.10	0.50	003H6477
DN 15	External thread ISO 228/1	2.50	G 3/4 A	0.10	0.50	003H6478
DN 15	External thread ISO 228/1	4.00	G 3/4 A	0.10	0.50	003H6479
DN 20	External thread ISO 228/1	6.30	G 1 A	0.10	0.50	003H6480
DN 25	External thread ISO 228/1	8.00	G 1 1/4 A	0.10	0.50	003H6481
DN 32	External thread ISO 228/1	10.00	G 1 3/4 A	0.10	0.50	003H6482
DN 15	External thread ISO 228/1	1.60	G 3/4 A	0.20	1.00	003H6483
DN 15	External thread ISO 228/1	2.50	G 3/4 A	0.20	1.00	003H6484
DN 15	External thread ISO 228/1	4.00	G 3/4 A	0.20	1.00	003H6485
DN 20	External thread ISO 228/1	6.30	G 1 A	0.20	1.00	003H6486
DN 25	External thread ISO 228/1	8.00	G 1 1/4 A	0.20	1.00	003H6487
DN 32	External thread ISO 228/1	10.00	G 1 3/4 A	0.20	1.00	003H6488

Example:
Differential pressure and flow controller; return mounting; DN 15; k_{VS} 1.6; PN 16; setting range 0.2-1.0 bar; T_{max} 150 °C; ext. thread
– 1× AVPQ DN 15 controller
Code No: **003H6483**
– 1× Impulse tube set AV, R ⅛
Code No: **003H6852**

Option:
– 1× Weld-on tailpieces
Code No: **003H6908**
The controller will be delivered completely assembled, inclusive impulse tube between valve and actuator. External impulse tube (AV) must be ordered separately.

Accessories code numbers

003H6908

Weld-on tailpieces, PN 25, DN 15, G 3/4

Tailpiece weld-on PN25 DN15 (G3/4)

003H6902

Thread tailpieces, PN 25, DN 15, R 1/2; G 3/4, External Thread

Tailpiece ext.thr R1/2 PN25 (G3/4)

003H0276

Shut off valve 6 mm (Serto)

Shut off valve 6 mm (Serto)

003H6858

10 comp.fitt.imp.tube pipe fi 6x1mmR3/8

10 comp.fitt.imp.tube pipe fi 6x1mmR3/8

003H6915

Flange tailpieces, PN 25, DN 15, G 3/4

Tailpiece flange PN25 DN15 (G3/4)

003H6853

Impulse tubes, 6 mm, R 3/8, 1500 mm, Copper Cu-DHP CW024A H040, For product type: AV(P)QM (T)

Impulse tube set AV R 3/8##,fi 6x1,5m

003H0277

Seal pot, 0.3 l, MD range

Seal pot, 0.3 l, MD range

003H6931

10 comp.fitt.imp.t.act fi6x1mmG1/8#fi1

10 comp.fitt.imp.t.act fi6x1mmG1/8#fi1

003H6857

10 comp.fitt.imp.tube pipe fi 6x1mmR1/8

10 comp.fitt.imp.tube pipe fi 6x1mmR1/8

003H6855

Combination Piece K2, M45 / 2 x M45

Combination Piece K2, M45 / 2 x M45

003H6854

Impulse tubes, 6 mm, R 1/2, 1500 mm, Copper Cu-DHP CW024A H040, For product type: AV(P)QM (T)

Impulse tube set AV R 1/2##,fi 6x1,5m

003H6859

10 comp.fitt.imp.tube pipe fi 6x1mmR1/2

10 comp.fitt.imp.tube pipe fi 6x1mmR1/2

003H6852

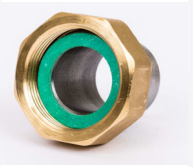
Impulse tubes, 6 mm, R 1/8, 1500 mm, Copper Cu-DHP CW024A H040, For product type: AV(P)QM (T)

Impulse tube set AV R 1/8##,fi 6x1,5m

003H6856

Combination Piece K3, M45 / 3 x M45

Combination Piece K3, M45 / 3 x M45



003H6910

Weld-on tailpieces, PN 25, DN 25, G 1 1/4

Tailpiece weld-on PN25 DN25 (G11/4)

003H6904

Thread tailpieces, PN 25, DN 25, R 1; G 1 1/4, External Thread

Tailpiece ext.thr R1 PN25 DN25 (G11/4)

003H6917

Flange tailpieces, PN 25, DN 25, G 1 1/4

Tailpiece flange PN25 DN25 (G11/4)

003H6905

Thread tailpieces, PN 25, DN 32, G 1 3/4; Rp 1 1/4, External Thread

Tailpiece ext.th R11/4 PN25 DN32 (G13/4)

003H6914

Weld-on tailpieces, PN 25, DN 32, G 1 1/2

Tailpiece weld-on PN25 DN32 (G 1 1/2)

003H6906

Thread tailpieces, PN 25, DN 32, G 2 1/2; R 1 1/4, External Thread

Tailpiece ext.th R11/4 PN25 DN32 (G11/2)

003H6911

Weld-on tailpieces, PN 25, DN 32, G 1 3/4

Tailpiece weld-on PN25 DN32 (G13/4)

003H6916

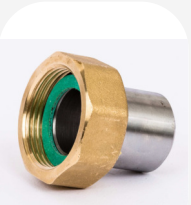
Flange tailpieces, PN 25, DN 20, G 1

Tailpiece flange PN25 DN20 (G1)

003H6903

Thread tailpieces, PN 25, DN 20, R 3/4; G 1, External Thread

Tailpiece ext.thr R3/4 PN25 DN20 (G1)



003H6909

Weld-on tailpieces, PN 25, DN 20, G 1

Tailpiece weld-on PN25 DN20 (G1)

* for codes: **003H6857, 003H6858, 003H6859, 003H6931**
Compression fitting consists of a nipple, compression ring and nut

Spare parts code numbers

003H6865

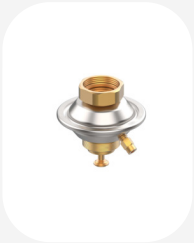
Valve Inserts, For product type: AV(P)QM (T), PN 25, DN 15, 4 m³/h

Valve ins. PN25 15/4,0 20/4,0 VG-ret VQM

003H6822

Actuators and adjustment parts, For product type: AVP, 0.2 bar - 1 bar, 0.2 bar - 1 bar, Mounting version: Return

Act. & adj.part PN25 0,2-1,0 AV return



003H6827

Actuators and adjustment parts, For product type: AVPQ, Mounting version: Return

Actuator PN25 intermed. AVPQ return

003H6863

Valve Inserts, For product type: AV(P)QM (T), PN 25, DN 15, 1.6 m³/h

Valve insert PN25 15/1,6 VG-return VQM

003H6867

Valve Inserts, For product type: AV(P)QM (T), PN 25, DN 25, 8 m³/h

Valve ins. PN25 25/8 32/10 VG-return VQM

003H6821

Actuators and adjustment parts, For product type: AVP, 0.05 bar - 0.5 bar, 0.05 bar - 0.5 bar, Mounting version: Return

Act. & adj.part PN25 0,05-0,5 AV return

003H6864

Valve Inserts, For product type: AV(P)QM (T), PN 25, DN 15, 2.5 m³/h

Valve insert PN25 15/2,5 VG-return VQM

003H6866

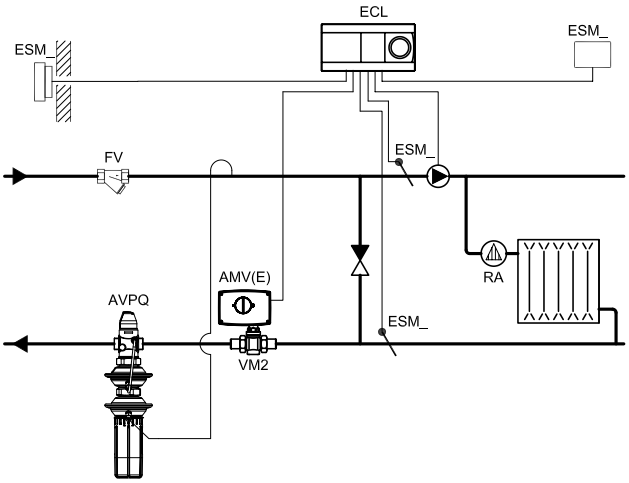
Valve Inserts, For product type: AV(P)QM (T), PN 25, DN 20, 6.3 m³/h

Valve ins. PN25 20/6,3 25/6,3 VG-ret VQM

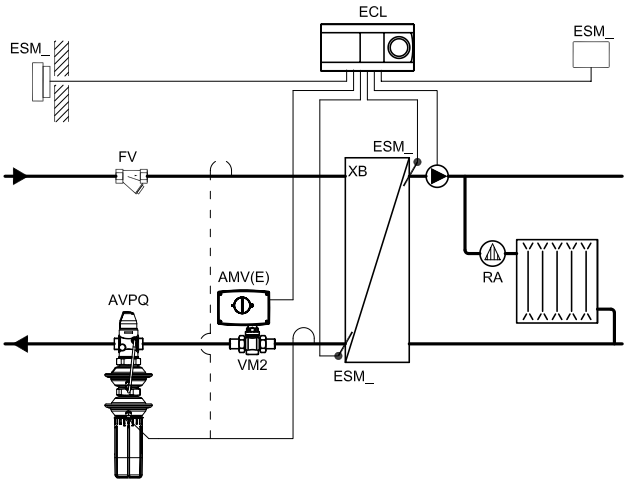
Overview

Application examples

The controller AVPQ must be installed in the return pipe only.



Direct-connected heating system



Indirectly connected heating system

Functions

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.

Pressure changes from flow and return pipes are being transferred through the impulse tubes to the actuator chambers and act on control diaphragm for diff. pressure control. The diff. pressure is controlled by means of setting spring for diff. pressure control. Control valve closes on rising differential pressure and opens on falling differential pressure to maintain constant differential pressure.

Controller is equipped with excess pressure safety valve, which protect control diaphragm for diff. pressure 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.

Differential pressure setting

Differential pressure setting (valid for AVPQ controller only) is being done by the adjustment of the setting spring for diff. pressure control. The adjustment can be done by means of handle for diff. pressure setting and/or pressure indicators.

Adjustment diagram

Relation between scale figures and differential pressure. Values given are approximate.

Product details

General 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		0.03	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* $Q_{set} = Q_{max} \Rightarrow \Delta p_{min} \geq 0.5\,\text{bar}$; For $Q_{set} < Q_{max} \Rightarrow \Delta p_{min} = \left(\frac{Q}{k_{vs}}\right)^2 + \Delta p_b$

Actuator

Type		AVPQ	
Actuator size	cm^2	39	
Nominal pressure	PN	16	
Flow restrictor diff. pressure, Δp_b	bar	0.2	
Diff. pressure setting ranges and spring colours		0.1-0.5	0.2-1.0
		grey	black
Materials			
Actuator housing		Zinc plated, DIN 1624, No. 1.0338	
Control diaphragm		EPDM	
Impulse tube		Copper tube Ø6 × 1 mm	

Main functionalities

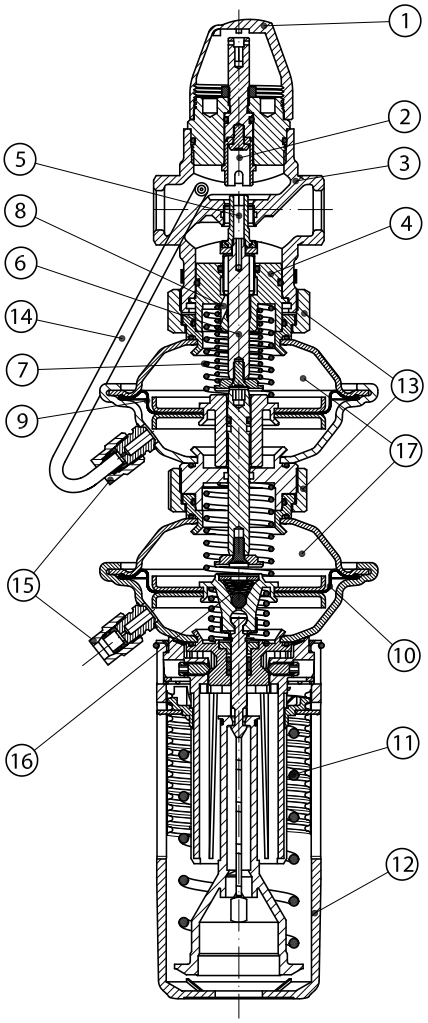
Flow volume causes pressure drop across the adjustable flow restrictor. Resulting pressures are being transferred through the impulse tubes and/or control drain in the actuator stem to the actuator chambers and act on control diaphragm for flow control. The flow restrictor diff. pressure is controlled 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.

Pressure changes from flow and return pipes are being transferred through the impulse tubes to the actuator chambers and act on control diaphragm for diff. pressure control. The diff. pressure is controlled by means of setting spring for diff. pressure control. Control valve closes on rising differential pressure and opens on falling differential pressure to maintain constant differential pressure.

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

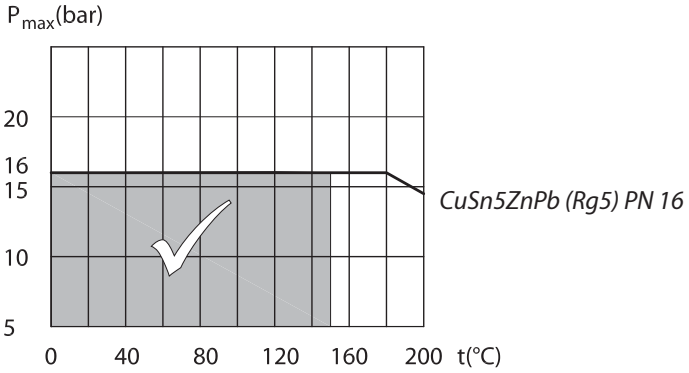
Design

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 control
8. Control drain
9. Control diaphragm for flow control
10. Control diaphragm for diff. pressure control
11. Setting spring for diff. pressure control
12. Handle for diff. pressure setting, prepared for sealing
13. Union nut
14. Impulse tube
15. Compression fitting for impulse tube
16. Excess pressure safety valve
17. Actuator



Pressure and temperature data

Pressure temperature diagram

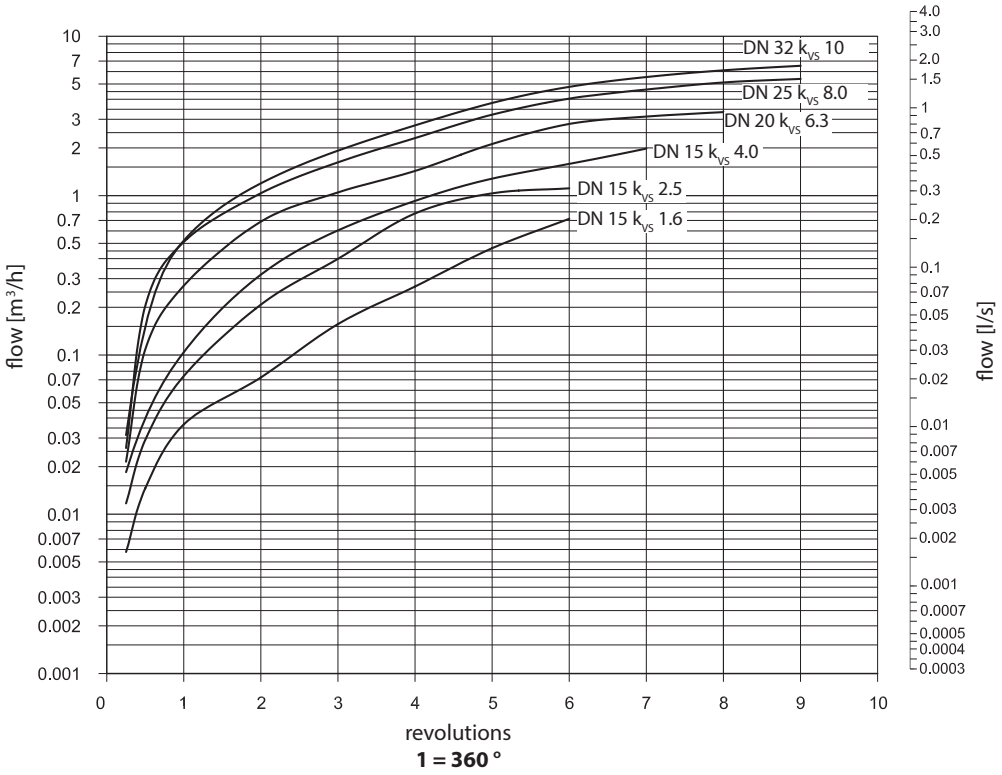


Maximum allowed operating pressure as a function of medium temperature (according to EN 1092-3).

Flow diagram

Sizing and setting diagram

Relation between actual flow and number of revolutions on flow restrictor. 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

Motorized control valve (MCV) for mixing circuit in direct-connected heating system requires differential pressure of 0.2 bar (20 kPa) and flow less than 1300 l/h.

Given data:

Q_{max} = 1.3 m³/h (1300 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 AVPQ.

[2)] Δp_b is differential pressure over flow restrictor.

The differential pressure set value is:

$\Delta p_{set\ value} = \Delta p_{MCV}$
$\Delta p_{set\ value}$ = 0.2 bar (20 kPa)

The total pressure loss across the controller is:

$\Delta p_{AVPQ} = \Delta p_{min} - \Delta p_{MCV} = 0.8 - 0.2$
Δp_{AVPQ} = 0.6 bar (60 kPa)

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

k_v value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AVPQ} - \Delta p_b}} = \frac{1.3}{\sqrt{0.6-0.2}}$$

k_v = 2.0 m³/h

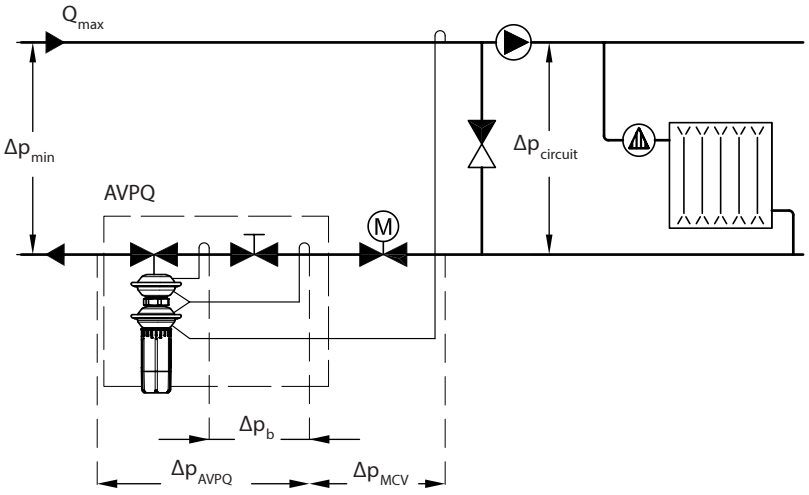
or read from the sizing diagram, page 8, by taking a line from Q-scale (1.3 m³/h) through Δp_v-scale ($\Delta p_v = \Delta p_{AVPQ} - \Delta p_b = 0.6 - 0.2 = 0.4$ bar) to intersect k_v-scale at 2.0 m³/h.

Solution:

The example selects AVPQ DN 15, k_{VS} value 2.5, with differential pressure setting range 0.1 - 0.5 bar, flow setting range 0.08-1.8 m³/h.

The P-band (Xp) can also be read from the sizing diagram.

Take a horizontal line from the kv-scale (2.0 m³/h) to the right to intersect the Xp-scale (0.045 bar). At a set value of 0.2 bar and a Xp of 0.045 bar the AVPQ controller controls between bar with open motorized control valve and 0.2 + 0.045 = 0.245 bar at almost closed motorized control valve (i.e. total pressure loss across the motorized control valve).



Indirectly connected heating system

Example 2

Motorized control valve (MCV) for indirectly connected heating system requires differential pressure of 0.3 (30 kPa) bar and flow less than 800 l/h.

Given data:

Q_{max} = 0.8 m^3/h (800 l/h)
Δp_{min} = 1.1 bar (110 kPa)
$\Delta p_{exchanger}$ = 0.05 bar (5 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 differential pressure set value is:

$\Delta p_{set\ value} = \Delta p + \Delta p_{MCV} = 0.05 + 0.3$
$\Delta p_{set\ value}$ = 0.35 bar (35 kPa)

The total pressure loss across the controller is:

$\Delta p_{AVPQ} = \Delta p_{min} - \Delta p_{exchanger} - \Delta p_{MCV}$
$= 1.1 - 0.05 - 0.3$
Δp_{AVPQ} = 0.75 bar (75 kPa)

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

k_v value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AVPQ} - \Delta p_b}} = \frac{0.8}{\sqrt{0.75 - 0.2}}$$

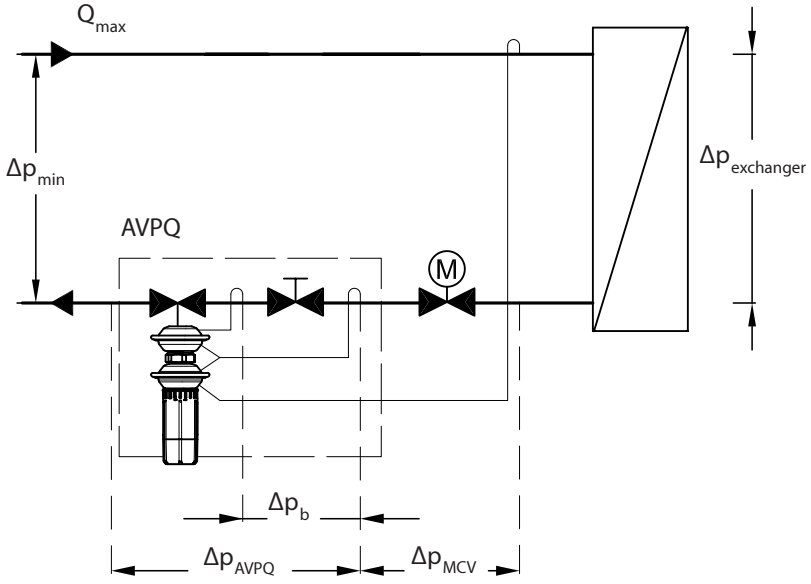
k_v = 1.1 m^3/h

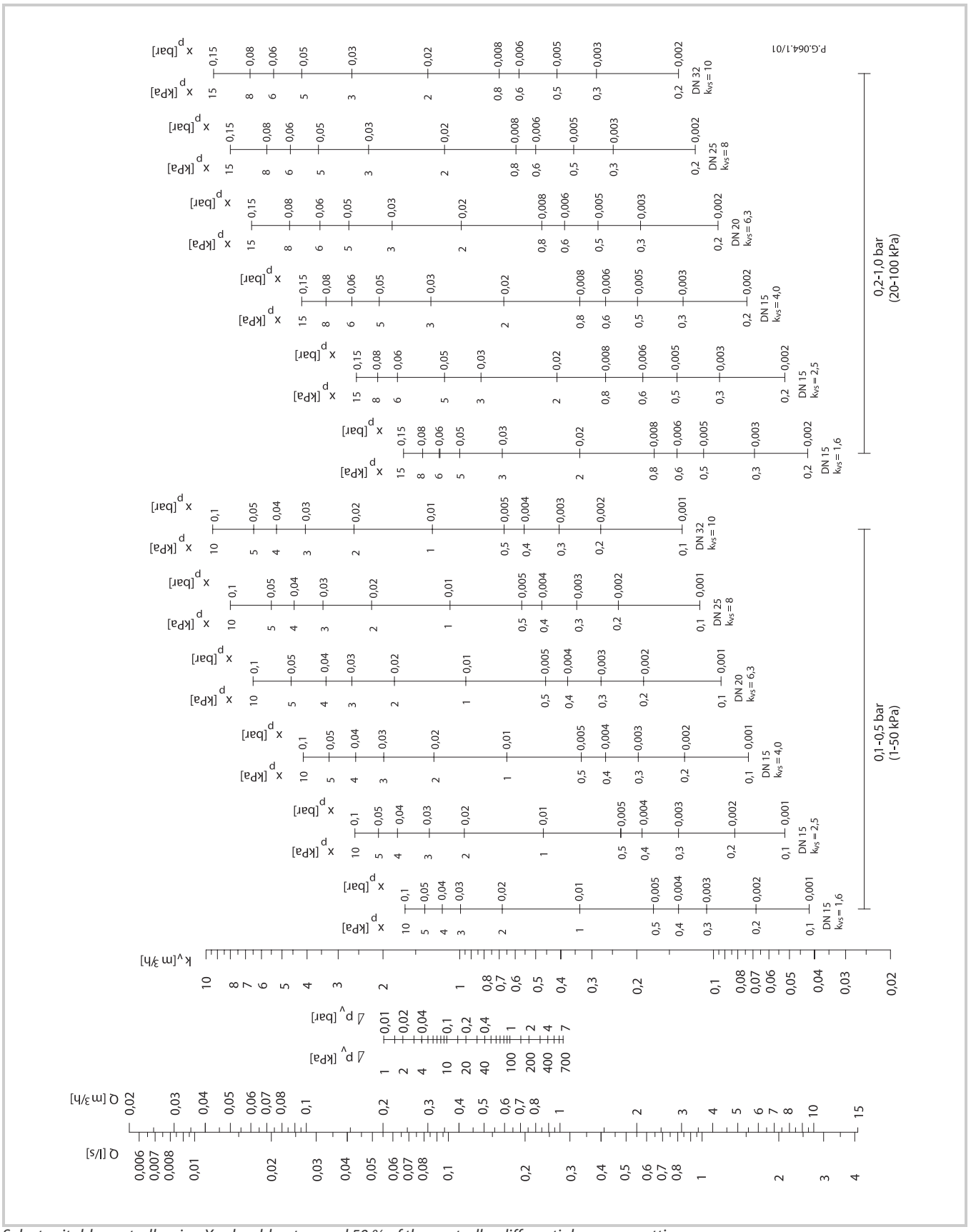
or read from the sizing diagram, page 8, by taking a line from Q-scale (0.8 m^3/h) through Δp_v- scale ($\Delta p_v = \Delta p_{AVPQ} - \Delta p_b = 0.75 - 0.2 = 0.55$ bar) to intersect k_v-scale at 1.1 m^3/h.

Solution:

The example selects AVPQ DN 15, k_{VS} value 1.6, with differential pressure setting range 0.1-0.5 bar, flow setting range 0.06-1.4 m^3/h.

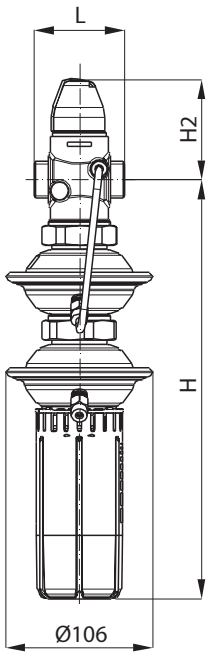
The P-band (Xp) can also be read from the sizing diagram. Take a horizontal line from the kv-scale (1.0 m^3/h) to the right to intersect the Xp-scale (0.035 bar). At a set value of 0.35 bar and a Xp of 0.035 bar the AVPQ controller controls between 0.35 bar with open motorized control valve and 0.35 + 0.035 = 0.385 bar at almost closed motorized control valve (i.e. total pressure loss across the motorized control valve).



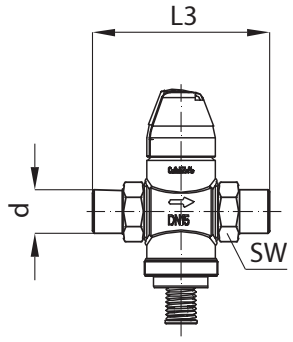


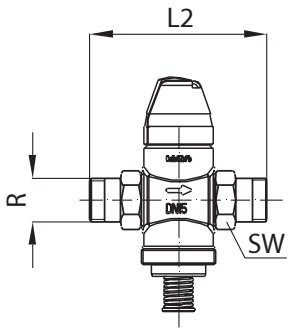
Select suitable controller size. Xp should not exceed 50 % of the controller differential pressure setting.

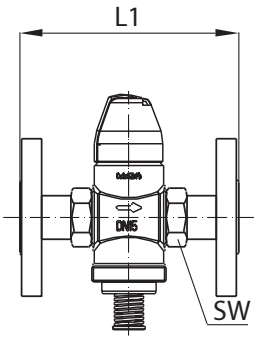
Dimensions

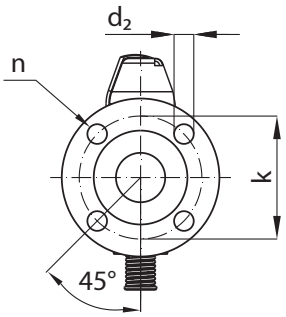


DN		15	20	25	32
L	mm	65	70	75	100
H		301	301	301	301
H2		73	73	76	77
Weight	kg	2.6	2.6	2.8	3.1







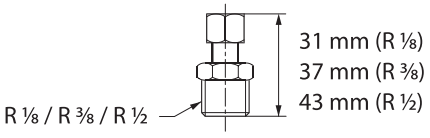


DN		15	20	25	32
SW	mm	32 (G ¾A)	41 (G 1A)	50 (G 1¼A)	63 (G 1¾A)
d		21	26	33	42
R [1]		½	¾	1	1 ¼
L1 [2]		130	150	160	-
L2		120	131	145	177
L3		139	154	159	184
k		65	75	85	-
d_2		14	14	14	-
n		4	4	4	-

[1] Conical ext. thread acc. to EN 10226-1

[2] Flanges PN 25, acc. to EN 1092-2

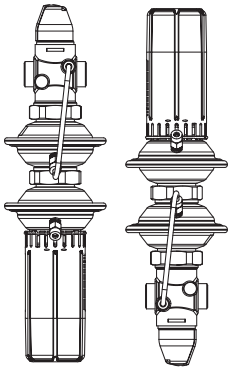
Compression fittings

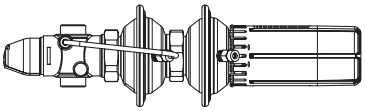


Installation

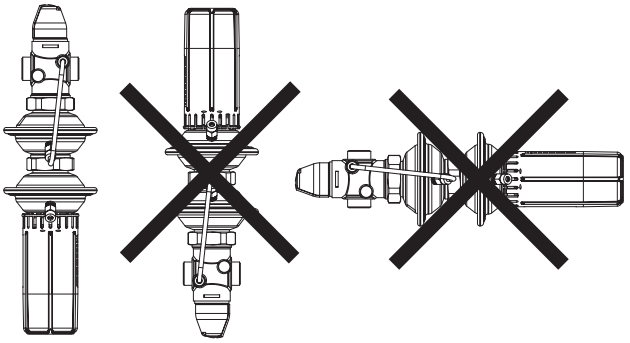
Installation positions

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.



Certificates, declarations and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

When you click on the link you will be directed to the latest version of the 'Declaration of Conformity'. Products developed and sold before this date of issue conform to the directives/standards in force at the time of their sale.

Approval type	Title	Certification body	Approval topic
EAC Declaration	EAC KZ 7100841.13.12.02375	EAC - Eurasian Customs Union	MD
Export Control Declaration	Actuators pressure flow and temperature	Danfoss	
UA Declaration	Danfoss UA 10.01.23 Heat Control Valves	Danfoss	

Contact details

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