Data sheet

Pressure flow controllers

AFQ 2 / VFQ 2 / VFQ 22(1)

Description

The controller 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.
Further on two valve versions are available:

- VFQ 2 with metallic sealing cone
- VFQ 22 with metallic sealing cone
- VFQ 221 with soft sealing cone

Main data:

- DN 15-250
- k_{VS} 4.0-800 m³/h
- Flow limitation range 0.1-500 m^3/h
- PN 16, 25, 40
- Flow restrictor Δpb: 0.2 bar or 0.5 bar
- Temperature:

– Circulation water / glycolic water up to 30%: 2 ... 150 (200) °C

- Connections: Flange

Features & benefits

- Self-acting operation without external power supply
- Adjustable flow regulation mechanism for precise control
- Single control diaphragm actuator for reliable performance

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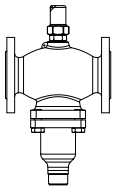
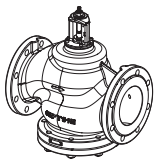
Ordering

Product code numbers

VFQ 2 /VFQ 22 Valve (metal sealing cone)

Picture	DN (mm)	k_{VS} (m^3/h)	Connections	$T_{max.}$ (°C)	Code No.		
					PN 16	PN 25	PN 40
	15[2)]	4.0	Flanges acc. to EN 1092-1	150 (PN16) 200[1)] (PN25,40)	**065B2654**	**065B2667**	**065B2677**
	20[2)]	6.3			**065B2655**	**065B2668**	**065B2678**
	25[2)]	8.0			**065B2656**	**065B2669**	**065B2679**
	32[2)]	16			**065B2657**	**065B2670**	**065B2680**
	40[2)]	20			**065B2658**	**065B2671**	**065B2681**
	50[2)]	32			**065B2659**	**065B2672**	**065B2682**
	65	60		150	**065B5570**	**065B5577**	**065B5584**
	80	80			**065B5571**	**065B5578**	**065B5585**
	100	160			**065B5572**	**065B5579**	**065B5586**
	125	250			**065B5573**	**065B5580**	**065B5587**
	150	380			**065B5574**	**065B5581**	**065B5588**
	200	650			**065B5575**	**065B5582**	**065B5589**
	250	800			**065B5576**	**065B5583**	**065B5590**

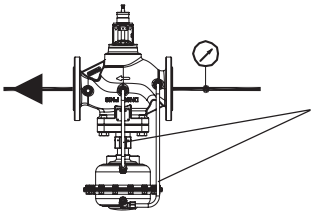
[1)] At temperatures above 150°C only with seal pots (see Accessories)

[2)] VFQ 2 valves require ordering of 003G1780 adapter for a combination with AFPQ 2(4) pressure actuators

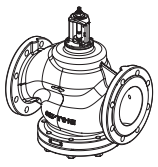
Example 1:
Flow controller; DN 65; k_{VS} 60; PN 16; metallic sealing; flow restrictor Δp_b 0.2 bar; T_{max} 150 °C; flange;

– 1× VFQ 22 DN 65 valve
Code no: **065B5570**
– 1× AFQ 2 actuator
Code no: **003G5600**
– 1× AFQ 2 DN 65 impulse tubes
Code no: **003G1843**

Products will be delivered separately.



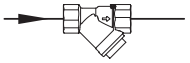
VFQ 221 Valve (soft sealing cone)

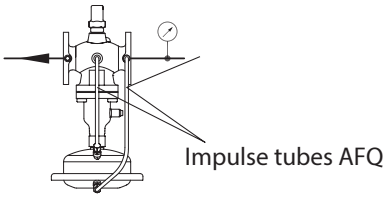
Picture	DN (mm)	k_{VS} (m^3/h)	Connections	$T_{max.}$ (°C)	Code No.		
					PN 16	PN 25	PN 40
	65	60	Flanges acc. to EN 1092-1	150	**065B5600**	**065B5607**	**065B5614**
	80	80			**065B5601**	**065B5608**	**065B5615**
	100	160			**065B5602**	**065B5609**	**065B5616**
	125	250			**065B5603**	**065B5610**	**065B5617**
	150	380			**065B5604**	**065B5611**	**065B5618**
	200	650			**065B5605**	**065B5612**	**065B5619**
	250	800			**065B5606**	**065B5613**	**065B5620**

Example 2:
Flow controller; DN 15; k_{VS} 4.0; PN 16; metallic sealing; flow restrictor Δp_b 0.2 bar; T_{max} 150 °C; flange;

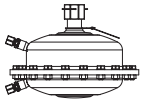
– 1× VFQ 2 DN 15 valve
Code no: **065B2654**
– 1× AFQ 2 actuator
Code no: **003G5600**
– 1× AFQ 2 DN 15 impulse tubes
Code no: **003G1824**
– 1× Adapter VFQ 2 - AFx 2
Code no: **003G1780**

Products will be delivered separately.





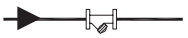
AFQ 2 Actuators

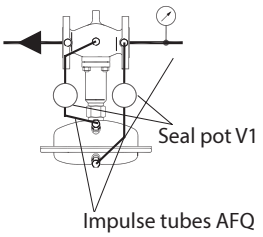
Picture	Δp setting range (bar)	for DN	Actuator size (cm2)	Code No.	
				AFPQ 2 (return)	AFPQ 24 (flow)
	0.2	DN 15-125	160	**003G5600**	**003G5602**
	0.5			**003G5601**	**003G5603**
	0.2	DN 150-250	320	**003G5596**	**003G5598**
	0.5			**003G5597**	**003G5599**

Example 3:
Flow controller; DN 15; k_{VS} 4.0; PN 25; metallic sealing; flow restrictor Δp_b 0.2 bar; T_{max} 200 °C; flange;

– 1× 1× VFQ 2 DN 15 valve
Code no: **065B2667**
– 1× AFQ 2 actuator
Code no: **003G5602**
– 2× AFQ DN 15 impulse tubes
Code no: **003G1391**
– 2× Seal pot V1
Code no: **003G1392**
– 1× Adapter VFQ 2 - AFx 2
Code no: **003G1780**

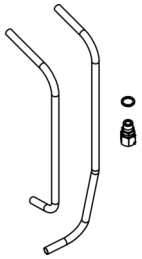
Products will be delivered separately.

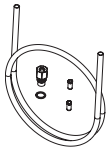
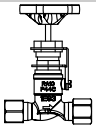
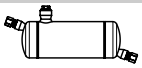
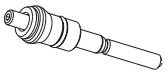
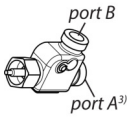




Accessories code numbers

Impulse tubes

Picture	Type	Actuator size (cm2)	Valve (DN)	Code No.
	Impulse tubes	160	15	**003G1824**
			20	
			25	**003G1825**
			32	
			40	**003G1826**
			50	**003G1827**
			65	**003G1843**
			80	**003G1850**
			100	**003G1851**
			125	**003G1852**
		320	150	**003G1853**
			200	**003G1854**
			250	**003G1855**

Picture	Type designation	Description	Connections	Code No.
	Impulse tube set AF	– 1× Copper tube Ø10 × 1 × 1500 mm – 1× compression fitting for imp. tube connection to pipe (G 1/4) – 2× socket	–	**003G1391**
	Compression fitting	For impulse tube Ø10 connections to controller	G $^{1}/_{4}$	**003G1468**
	Shut off valve	For impulse tube Ø10	–	**003G1401**
	Static throttle valve			**065B2909**
	Seal pot V1	Capacity 1 liter; with compression fittings for imp. tube Ø10	–	**003G1392**
	Adapter DN 15-50	For combination of new Virtus pressure actuators AFx 2, with old generation of valves VFx 2	–	**003G1780**
	Combination piece KF3	For combination with pressure actuators. Electrical actuator connected on side (port B) only for ON/OFF function	G 1 $^{1}/_{4}$ 2× G 1 $^{1}/_{4}$	**003G1441**
	Combination piece KF2	For combination with thermostat - side connection to port B		**003G1440**

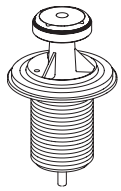
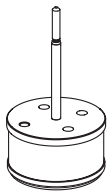
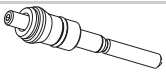
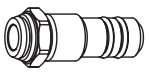
1) Seal pot has to be used on impulse tubes always when $T_{max} \geq 150°C$

2) Consist of a nipple, compression ring and nut

3) Port A - for connection of any type of actuator

Spare parts code numbers

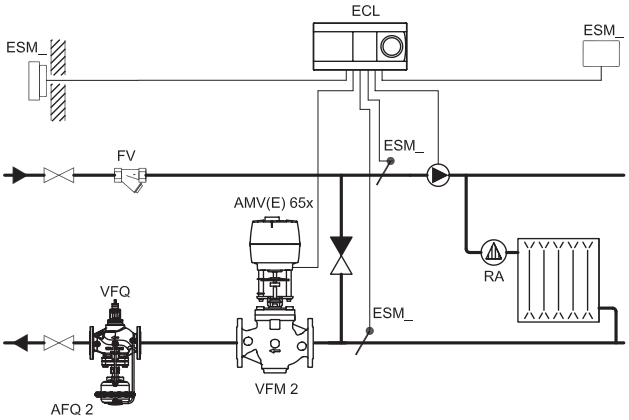
Service kits

Picture	Type designation	DN	k_{VS} (m^3/h)	Code No.
	Valve insert for VFQ 2	15	4.0	**065B2796**
		20	6.3	**065B2797**
		25	8.0	**065B2798**
		32	16	
		40	20	**065B2799**
		50	32	
	Pressure control insert VFG/Q 22	65	60	**003G1800**
		80	80	**003G1801**
		100	160	**003G1802**
		125	250	**003G1803**
		150	380	**On demand**
		200	650	**On demand**
		250	800	**On demand**
	Pressure control insert VFG/Q 221	65	60	**003G1807**
		80	80	**003G1808**
		100	160	**003G1809**
		125	250	**003G1810**
		150	380	**On demand**
		200	650	**On demand**
		250	800	**On demand**
	Adapter (sealing cone) VFQ 2 - AFQ 2	15-250	-	**003G1780**
	Pressure stuffing box VFG/Q 22(1)	65-125	-	**003G1730**
		150-200		**003G1731**
		250		**003G1732**

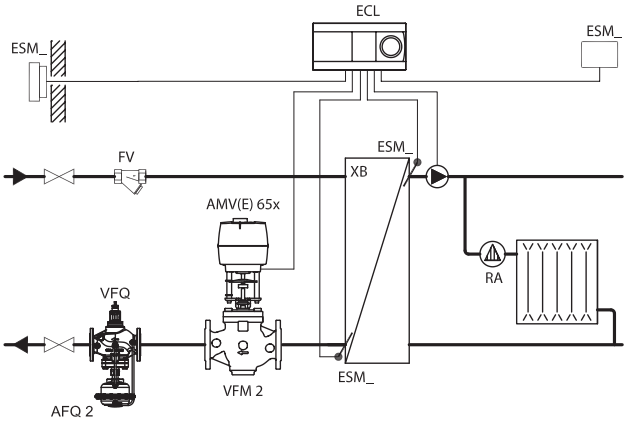
Overview

Application examples

Return mounting

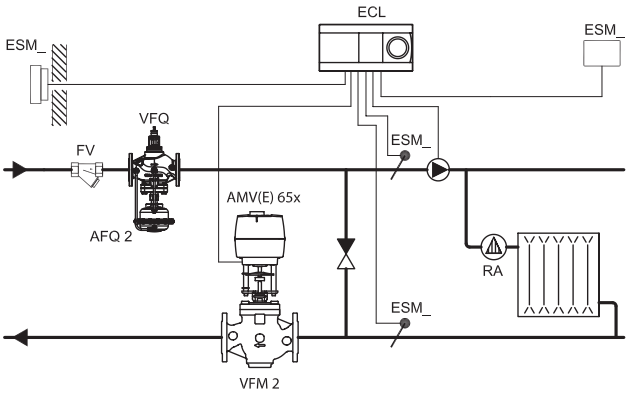


Direct-connected heating system

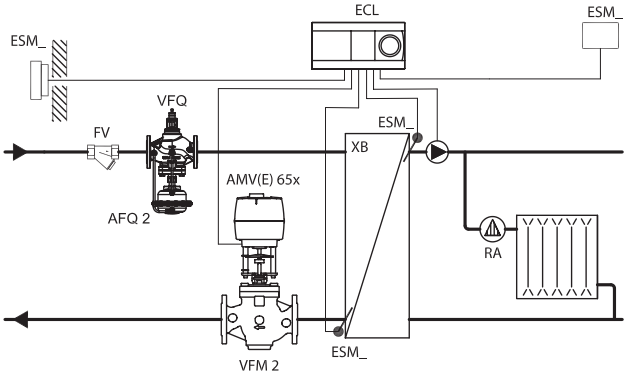


Indirectly connected heating system

Flow mounting



Direct-connected heating system



Indirect connected heating system

Product details

General data

VFQ 22(1) Valve

Nominal diameter		DN	15	20	25	32	40	50	65	80	100	125	150	200	250
kVS value of Δp controller			4.0	6.3	8.0	16	20	32	60	80	160	250	380	650	800
Range of max. flow setting	Δp_b [1] = 0.2 bar	from	0.1	0.2	0.2	0.4	0.6	0.8	3	4	8	12	19	27	36
		to	2	3	4	7	11	16	3	40	63	100	160	270	360
	Δp_b [1] = 0.5 bar	from	0.2	0.3	0.3	0.5	0.8	1.2	3	6	11	18	24	31	45
		to	3	4.5	6	10	16	24	42	60	95	150	240	340	500
Cavitation factor z			0.6	0.6	0.6	0.55	0.55	0.5	0.65	0.55	0.4	0.4	0.4	0.35	0.3
Leakage acc. to standard IEC 534 (% of kVS)	VFQ 2 / VFQ 22		≤ 0.03										≤ 0.05		
	VFQ 221		≤ 0.01												
Nominal pressure		PN	16, 25, 40												
Min. differential pressure		bar	see remark [2]												
Max. differential pressure PN 16			16						16						
Max. differential pressure PN 25/40			20						20		15	15	12	10	10
Pressure relieve system			Bellows (Stainless steel 1.4571)						Chamber relieved						
Pressure relieve system			Circulation water / glycolic water up to 30 %												
Media pH			Min. 7, max. 10												
Media temperature		°C	VFQ 2 : 2 ... 150 (200 °C) VFQ 22(1) : 2 ... 150 °C												
Connections			Flange												
Materials															
Valve body	PN 16		Grey cast iron EN-GJL-250 (GG-25)												
	PN 25		Ductile iron EN-GJS-400 (GGG-40.3)												
	PN 40		Cast steel GP240GH (GS-C 25)												
Valve seat			Stainless steel, mat. No. 1.4021												
Valve cone			Stainless steel, mat. No. 14404						Stainless steel, mat. No. 14021						
Sealing	VFQ 2		Metal												
	VFQ 22														
	VFQ 21		EPDM												
	VFQ 221														

[1] Δp_b – differential pressure over flow restrictor

[2] For flows smaller than $Q_{max} \rightarrow \Delta p_{min} = \left(\frac{Q}{k_{VS}}\right)^2 + \Delta p_b$

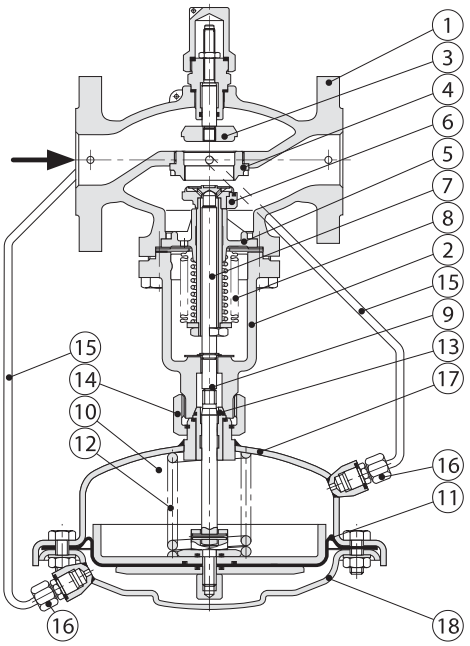
AFQ 2 Actuator

Actuator size	cm^2	160	320
Max. operating pressure	bar	16, 40	
Flow restrictor differential pressureΔpb		0.2 / 0.5	
For valve DN		15-125	150-250
Materials			
Actuator housing		Steel, mat. No. 10345 , zinc plated	
Control diaphragm		EPDM (Rolling; fibre enforced)	

Design

DN 15-50

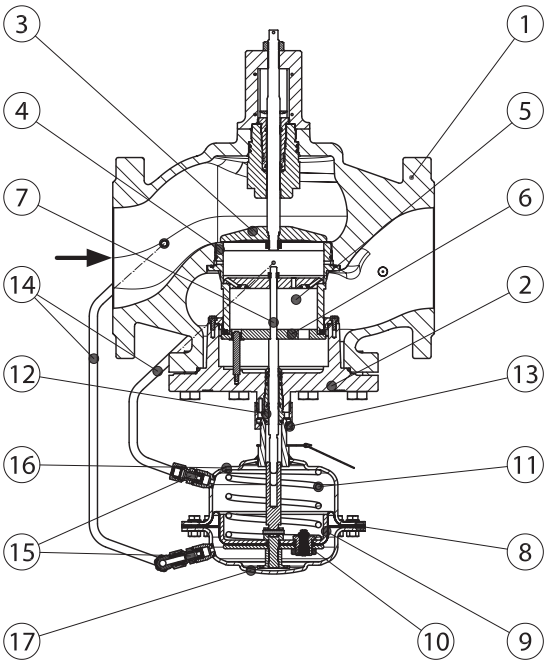
1. Valve body
2. Cover
3. Adjustable flow restrictor
4. Valve seat
5. Valve insert
6. Pressure relieved valve cone
7. Valve stem
8. Bellows for pressure relief of valve cone
9. Adapter - VFQ 2 - AFQ 2
10. Actuator
11. Control diaphragm for flow control
12. Built-in spring for flow control
13. Stuffing cone
14. Union nut
15. Impulse tube
16. Compression fitting for impulse tube
17. Upper casing of diaphragm
18. Lower casing of diaphragm
19. Valve body extension
20. Shut off valve for water filling
21. Closing plug



AFQ 2 / VFQ 2, DN 15-50

DN 65-250

1. Valve body
2. Cover
3. Adjustable flow restrictor
4. Valve seat
5. Valve insert
6. Pressure relieved valve cone
7. Valve stem
8. Actuator
9. Control diaphragm for differental pressure and flow control
10. Excess pressure safety valve
11. Built-in spring for differential pressure and flow control
12. Stuffing cone
13. Union nut
14. Impulse tube
15. Compression fitting for impulse tube
16. Upper casing of diaphragm
17. Lower casing of diaphragm



AFQ 2 VFQ 22(1), DN 65-250

Function

Flow volume causes pressure drop across the adjustable flow restrictor. Resulting pressures are being transferred through the impulse tubes 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 rate control. Control valve closes on rising differential pressure and opens on falling differential pressure to control max flow.

Settings

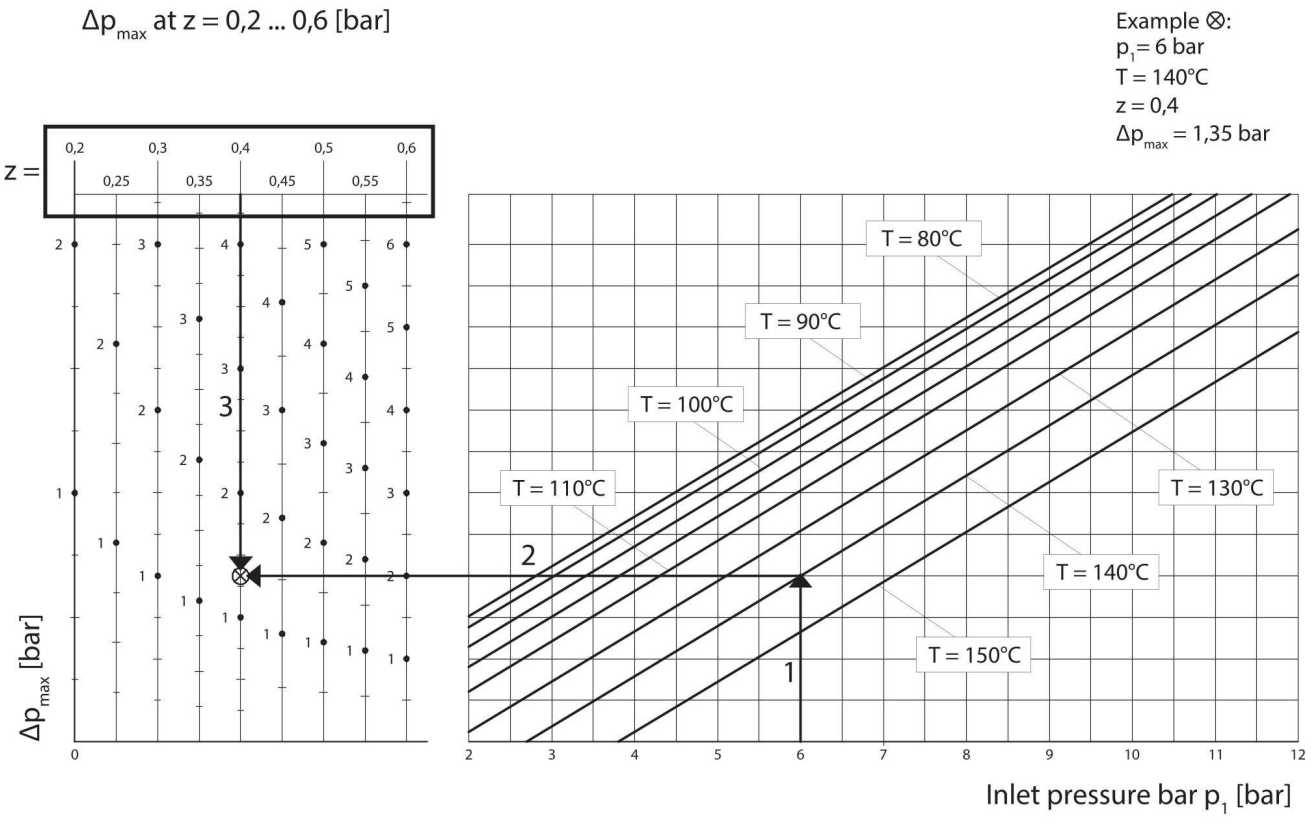
Flow setting

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. Flow should not be limited to less than 20% of maximum valve capacity.

Pressure and temperature data

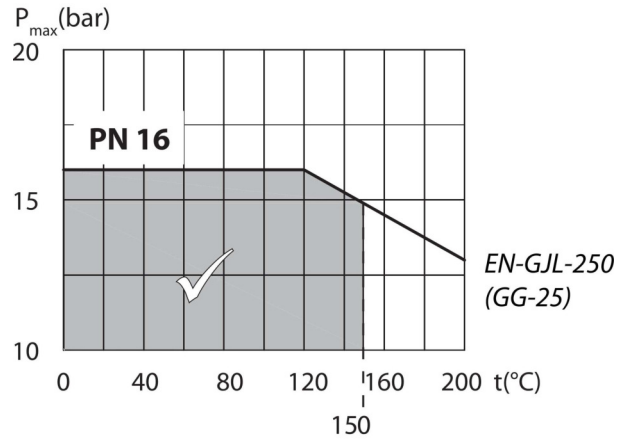
Operating area

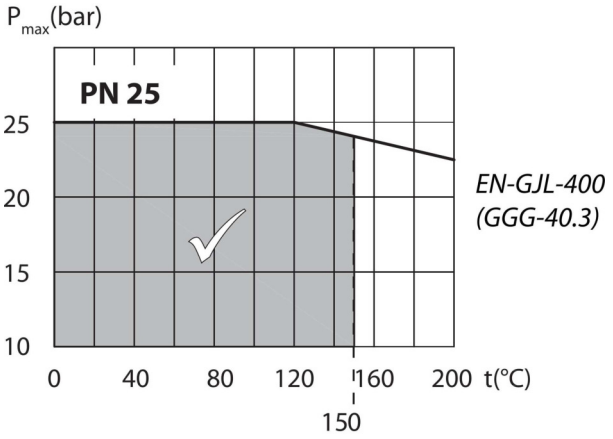
Maximum allowed differential pressure over the controller (Δp_{max}) at different cavitation factors (z)



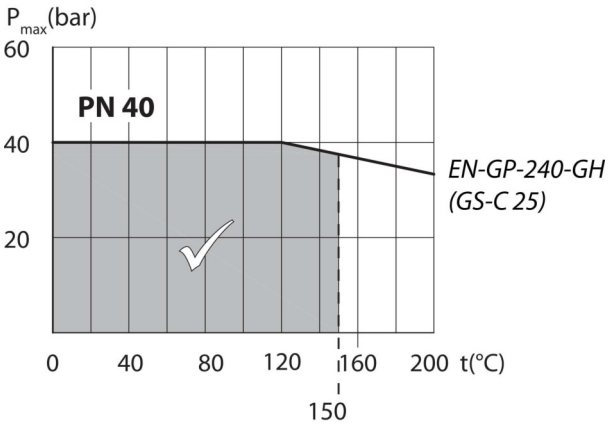
Pressure temperature diagram

Working area is below P-T line and it ends at T_{max} for each valve





Maximum allowed operating pressure as a function of media temperature (according to EN 1092-2)



Maximum allowed operating pressure as a function of media temperature (according to EN 1092-1)

Sizing

Directly connected heating system

Example 1

Motorised control valve (MCV) for mixing circuit in direct-connected heating system requires differential pressure of 0.5 bar (50 kPa) and flow less than 25.000 l/h.

Given data:

Q_{max} = 25 m^3/h (25.000 l/h)

Δp_{min} = 1 bar (100 kPa)

$\Delta p_{circuit}$ [1)] = 0.1 bar (10 kPa)

Δp_{MCV} = 0.5 bar (50 kPa) selected

Δpb [2)] = 0.2 bar (20 kPa)

Remark:

[1)] $\Delta p_{circucit}$ corresponds to the required pump pressure in the heating circuit and is not to be considered when sizing the AFQ 2.

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

The total (avaliable) pressure loss across the controller is:

$\Delta p_{AFQ.\,A} = \Delta p_{min} - \Delta p_{MCV} = 1 - 0.5$

$\Delta p_{AFQ.\,A}$ = 0.5 bar (50 kPa)

Possible pipe pressure losses in tubes, shut- off fittings, heatmeters, etc. are not included. The min. required differential pressure across the selected controller is calculated from the formula:

k_v value is calculated according to formula:

$$\Delta p_{AFQ,min} = \left(\frac{Q_{max}}{k_{vs}}\right)^2 + \Delta p_b = \left(\frac{25}{60}\right)^2 + 0.2$$

$\Delta p_{AFQ,min}$=0,37

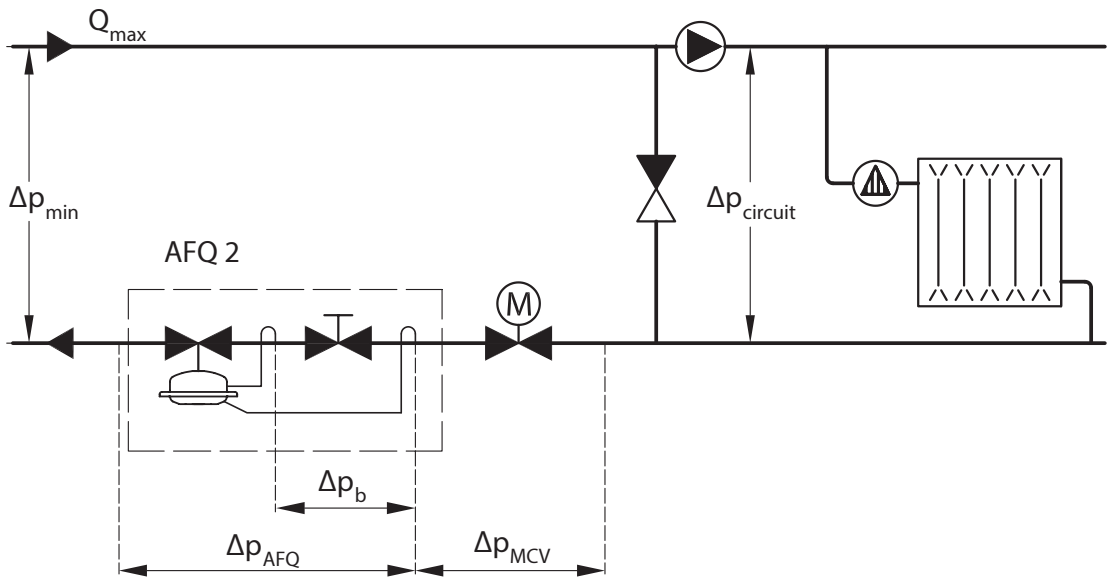
$\Delta p_{AFQ.\,A} > \Delta p_{AFQ,min}$

0,5 > 0,37

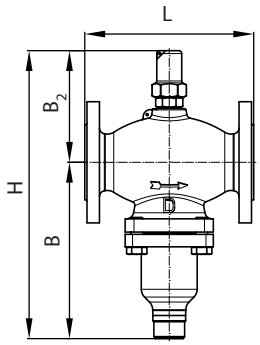
k_v = 45.6 m^3/h

Solution:

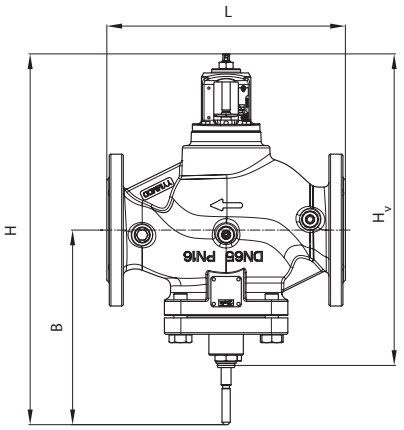
The example selects AFQ 2 DN 65, k_{VS} value 60, flow setting range 5.6-28 m^3/h.



Dimensions



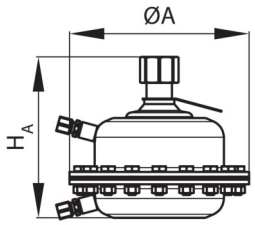
VFQ 2 DN 15-50



VFQ 22(1) DN 65-250

VFQ 2, VFQ 22, VFQ 221 Valves

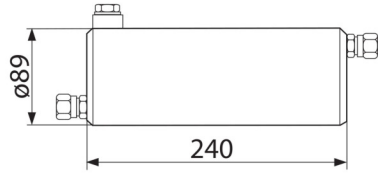
DN	L	B	B_2	H	H_v	Weight		
						PN16	PN25	PN40
15	130	213	124	337	-	8	8	8
20	150	213	124	337	-	9	9	9
25	160	239	135	374	-	10.5	10.5	10.5
32	180	239	135	374	-	12.5	12.5	12.5
40	200	241	152	393	-	15.5	15.5	15.5
50	230	241	152	393	-	18.5	18.5	18.5
65	290	237	-	473	396	28	29	31
80	310	237	-	473	396	33	34	36
100	350	272	-	547	472	52	53	57
125	400	268	-	582	514	71	72	79
150	480	326	-	670	610	123	126	135
200	600	361	-	773	713	230	236	286
250	730	419	-	843	783	382	392	441



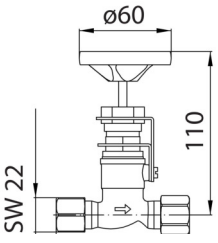
AFQ 2 Actuator

Size	ØA	H_A	Weight	
			PN 16	PN 40
cm^2	mm		kg	
160	230	200	8	10
320	300	200	13	19

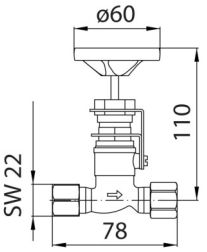
Total installation height of the controller (VFQ 22(1) valve + AFQ 2 pressure actuator) is sum of H_V and H_A



Seal pot V1



Compression fitting

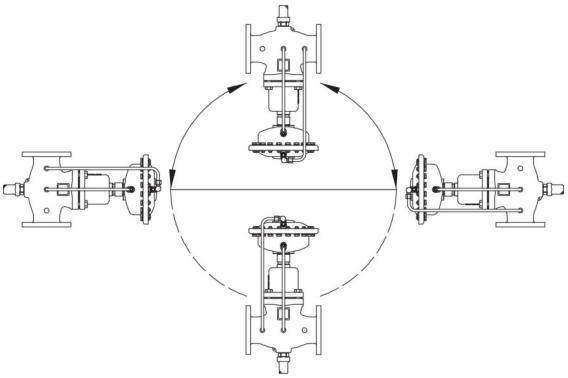


Shut off valve

Installation

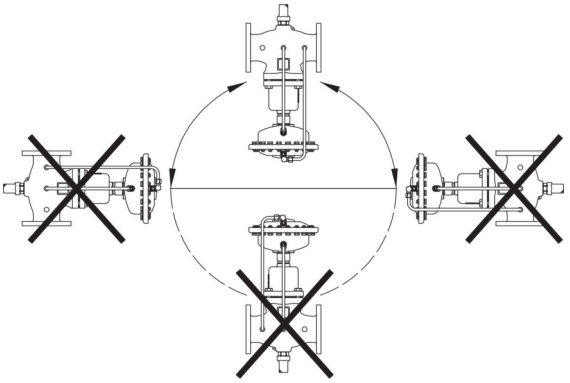
Installation position

DN 15-50
Tmax ≤ 120°C



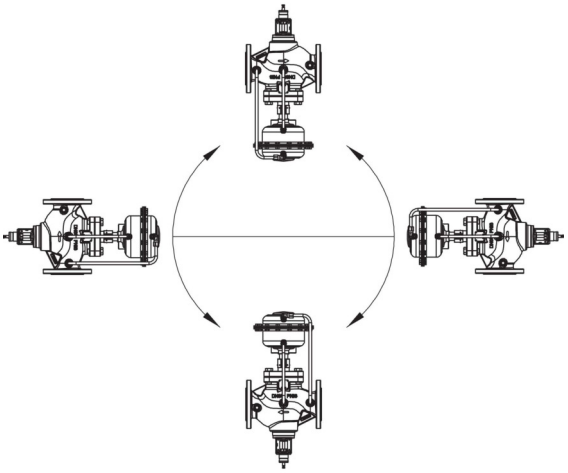
The controllers can be installed in any position

DN 15-50
Tmax > 120°C



The controllers can be installed in horizontal pipes only, with a pressure actuator oriented downwards.

DN 65-250



The controllers can be installed in any position

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 7100841.13.12.02339	EAC - Eurasian Customs Union	MD
Export Control Declaration	Pressure flow controllers	Danfoss	
UA Declaration	Danfoss UA 10.01.23 Heat Control Valves	Danfoss	
EU Declaration	Danfoss EU 230530EN0858104.06	Danfoss	PED, Pressure
EU Declaration	Danfoss EU 230612EN0854103.05	Danfoss	PED, Pressure
Export Control Declaration	Actuators pressure flow and temperature	Danfoss	
Pressure Safety Certificate	CE-0062-PED-H-DAF 002-24-DNK-rev-A	BV - Bureau Veritas	PED, Pressure

Contact details

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