Data sheet

Differential pressure controller (PN 16, 25, 40)

AFP(-9) / VFG 2(1) – return and flow mounting, adjustable setting

Description



The controller is a self-acting differential pressure controller primarily for use in district heating systems. The controller closes on rising differential pressure.

The controller has a control valve, an actuator with one control diaphragm and spring for differential pressure setting.

Further on two valve versions are available:
– VFG 2 with metallic sealing cone
– VFG 21 with soft sealing cone

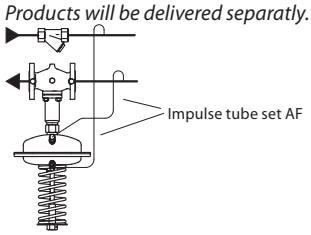
Main data:
- DN 15-250
- k_{VS} 4.0-400 m³/h
- PN 16, 25, 40
- Setting range:
  – AFP: 0.05-0.35 bar / 0.1-0.7 bar / 0.15-1.5 bar
  – AFP-9: 0.5-3 bar / 1-6 bar
- Temperature:
  – Circulation water / glycolic water up to 30 %: 2 … 150 / 200 °C
- Connections:
  – Flange

Ordering

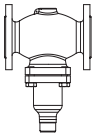
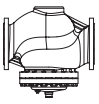
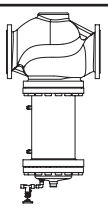
Example 1:
Differential pressure controller; return mounting; DN 15; k_{VS} 4.0; PN 16; metallic sealing; setting range 0.15-1.5 bar; T_{max} 150 °C; flange;

– 1× VFG 2 DN 15 valve
*Code no: **065B2388***
– 1× AFP actuator
*Code no: **003G1016***
– 2× Impulse tube set AF
*Code no: **003G1391***

Products will be delivered separatly.



VFG 2 Valves (metallic sealing cone)

Picture	DN (mm)	k_{VS} (m³/h)	Connections	$T_{max.}$ (°C)	Code No. PN 16	$T_{max.}$ (°C)	Code No. PN 25	Code No. PN 40
	15	4.0	Flanges acc. to EN 1092-1	150	**065B2388**	200 [1]	**065B2401**	**065B2411**
	20	6.3			**065B2389**		**065B2402**	**065B2412**
	25	8.0			**065B2390**		**065B2403**	**065B2413**
	32	16			**065B2391**		**065B2404**	**065B2414**
	40	20			**065B2392**		**065B2405**	**065B2415**
	50	32			**065B2393**		**065B2406**	**065B2416**
	65	50			**065B2394**		**065B2407**	**065B2417**
	80	80			**065B2395**		**065B2408**	**065B2418**
	100	125			**065B2396**		**065B2409**	**065B2419**
	125	160			**065B2397**		**065B2410**	**065B2420**
	150	280		150	**065B2398**	150	–	**065B2421**
	200	320			**065B2399**		–	**065B2422**
	250	400			**065B2400**		–	**065B2423**
	150	280		200 [1]	**065B2424**	200 [1]	–	**On request**
	200	320			**065B2425**		–	**On request**
	250	400			**065B2426**		–	**On request**

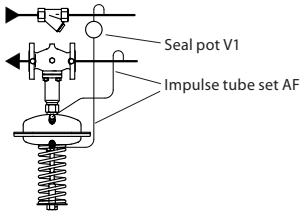
[1] *at temperatures above 150 °C only with seal pots (see Accessories)*

Ordering *(continued)*

Example 2:
Differential pressure controller; return mounting; DN 15; k_{VS} 4.0; PN 25; metallic sealing; setting range 0.15-1.5 bar; T_{max} 200 °C; flange;

– 1× VFG 2 DN 15 valve
Code no: ***065B2401***
– 1× AFP actuator
Code no: ***003G1016***
– 2× Impulse tube set AF
Code no: ***003G1391***
– 1× Seal pot V1
Code no: ***003G1392***

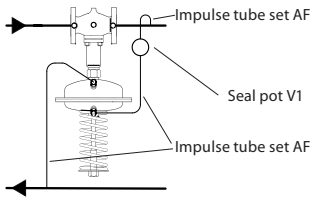
Products will be delivered separatly.



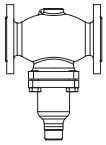
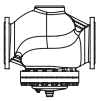
Example 3:
Differential pressure; flow mounting; DN 15; k_{VS} 4.0; PN 25; metallic sealing; setting range 0.15-1.5 bar; T_{max} 200 °C; flange;

– 1× VFG 2 DN 15 valve
Code no: ***065B2401***
– 1× AFP actuator
Code no: ***00G1016***
– 2× Impulse tube set AF
Code no: ***003G1391***
– 1× Seal pot V1
Code no: ***003G1392***

Products will be delivered separatly.

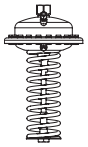


VFG 21 Valves (soft sealing cone)

Picture	DN (mm)	k_{VS} (m^3/h)	Connections	$T_{max.}$ (°C)	Code No. PN 16
	15	4.0	Flanges acc. to EN 1092-1	150	**065B2502**
	20	6.3			**065B2503**
	25	8.0			**065B2504**
	32	16			**065B2505**
	40	20			**065B2506**
	50	32			**065B2507**
	65	50			**065B2508**
	80	80			**065B2509**
	100	125			**065B2510**
	125	160			**065B2511**
	150	280		150	**065B2512**
	200	320			**065B2513**
	250	400			**065B2514**

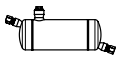
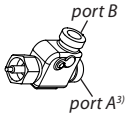
Note: *other valves available on special request.*

AFP / AFP-9 Actuators

Picture	Type	Δp setting range (bar)	for DN	Code No.
	AFP-9[1]	1-6	15-125	**003G1014**
		0.5-3		**003G1015**
	AFP	0.15-1.5	15-250	**003G1016**
		0.1-0.7		**003G1017**
		0.05-0.35		**003G1018**

[1] *actuator does not have excess pressure safety valve*

Accessories

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 ¼) – 2 × socket	–	**003G1391**
	Seal pot V1[1]	Capacity 1 liter; with compression fittings for imp. tube Ø10	–	**003G1392**
	Seal pot V2[1]	Capacity 3 liter; with compression fittings for imp. tube Ø10, for actuator size 630 cm^2	–	**003G1403**
	Compression fitting[2]	For impulse tube Ø10 connections to controller	G ¼	**003G1468**
 *port B* *port A[3]*	Combination piece KF3	For combination with pressure actuators. Electrical actuator connected on side (port B) only for ON/OFF function.	G 1¼ / 2× G 1¼	**003G1441**
	Combination piece KF2	For combination with thermostat - side connection to port B		**003G1440**
	Shut off valve	For impulse tube Ø10	–	**003G1401**
	Throttle valve			**065B2909**

[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*

Ordering *(continuous)*

Service kits

Picture	Type designation	DN (mm)	k_{VS} (m^3/h)	Code No. for VFG 2	Code No. for VFG 21
	Valve insert	15	4.0	**065B2796**	**065B2790**
		20	6.3	**065B2797**	**065B2791**
		25	8	**065B2798**	**065B2792**
		32	16		
		40	20	**065B2799**	**065B2793**
		50	32		
		65	50	**065B2800**	**065B2794**
		80	80		
		100	125	**065B2801**	**065B2795**
		125	160		
		150	280	**065B2964**	**065B2966**
		250	400	**065B2965**	–
	Stuffing cone (with EPDM O-rings)			**003G1464**	

Technical data

Valve

Nominal diameter		**DN**	**15**	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
k_{VS} value		m^3/h	4.0	6.3	8.0	16	20	32	50	80	125	160	280	320	400
Cavitation factor z			0.6	0.6	0.6	0.55	0.55	0.5	0.5	0.45	0.4	0.35	0.3	0.2	0.2
Leakage acc. to standard IEC 534 (% of k_{VS})	VFG 2		≤ 0.03										≤ 0.05		
	VFG 21		≤ 0.01												
Nominal pressure		PN	16, 25, 40												
Max. differential pressure	PN 16	bar	16								15		12	10	
	PN 25, 40		20												
Media			Circulation water / glycolic water up to 30 %												
Media pH			Min. 7, max. 10												
Media temperature	VFG 2	°C	2 … 150 / 2 … 200 [1]										2 … 150 (200 [2])		
	VFG 21		2 … 150												
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										Stainless steel, mat. No. 1.4313		
Valve cone			Stainless steel, mat. No. 1.4404										Stainless steel, mat. No. 1.4021		
Sealing	VFG 2		Metal												
	VFG 21		EPDM												
Pressure relieve system			Bellows (Stainless steel, mat. No. 1.4571)										Diaphragm (EPDM)		

[1] *at temperatures above 150 °C only with seal pots (see Accessories)*
[2] *on request*

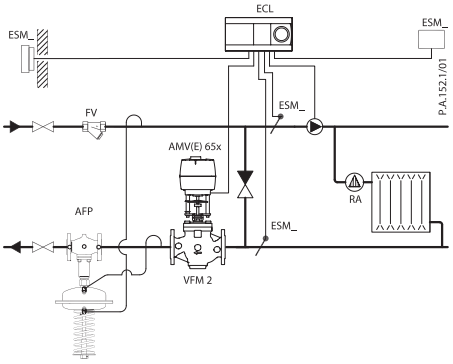
Actuators

Type		**AFP-9**[1]		**AFP**		
Actuator size	cm^2	80		250		630
Max. operating pressure	bar	25		25		16
Diff. pressure setting ranges and spring colours	bar	red	yellow	red	yellow	yellow
		1-6	0.5-3	0.15-1.5	0.1-0.7	0.05-0.35
Materials						
Actuator housing		Steel, mat. No. 1.0338, zinc plated				
Control diaphragm		EPDM (Rolling; fibre enforced)				

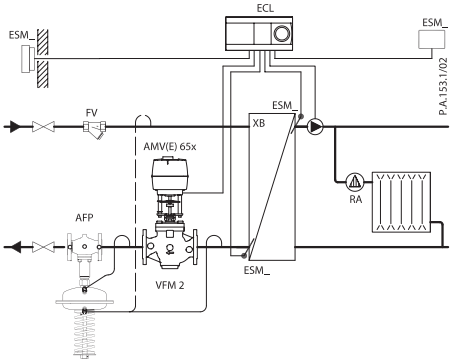
[1] *Actuator does not have excess pressure safety valve*

Application principles

– Return mounting

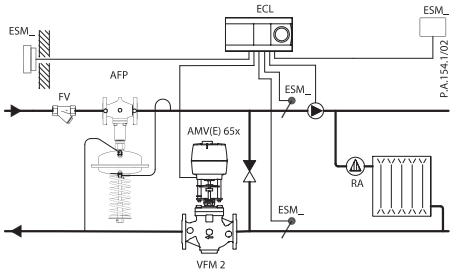


Direct-connected heating system

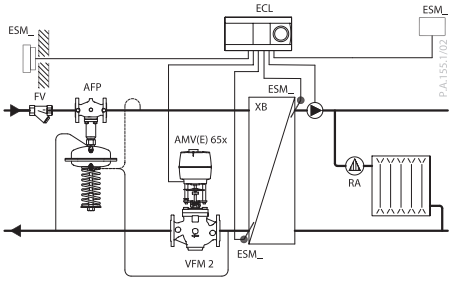


Indirectly connected heating system

– Flow mounting



Direct-connected heating system



Indirectly connected heating system

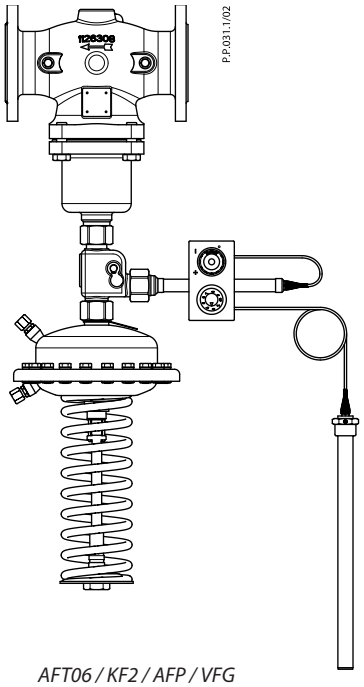
Combinations

Example
Differential pressure and temperature controller AFP / AFT06 / VFG 2; DN 15; PN 16; k_{VS} 4.0; $T_{max.}$ 150 °C; 0.15-1.5 bar; range 20 … 90 °C;

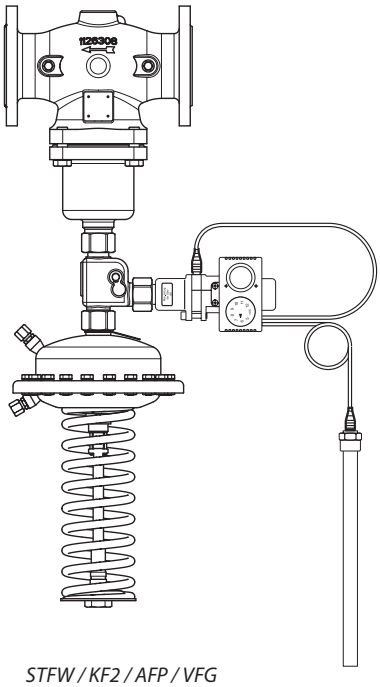
– 1× VFG 2 DN 15 valve
Code no: ***065B2388***
– 1× AFP actuator
Code no: ***003G1016***
– 1× AFT06 thermostat
Code no: ***065-4391***
– 1× Combination piece KF2
Code no: ***003G1398***
– 2× Impulse tube set AF
Code no: ***003G1391***

Parts will be delivered separately.

Note:
For AFT 06 and STFW thermostats data see relevant data sheets



AFT06 / KF2 / AFP / VFG



STFW / KF2 / AFP / VFG

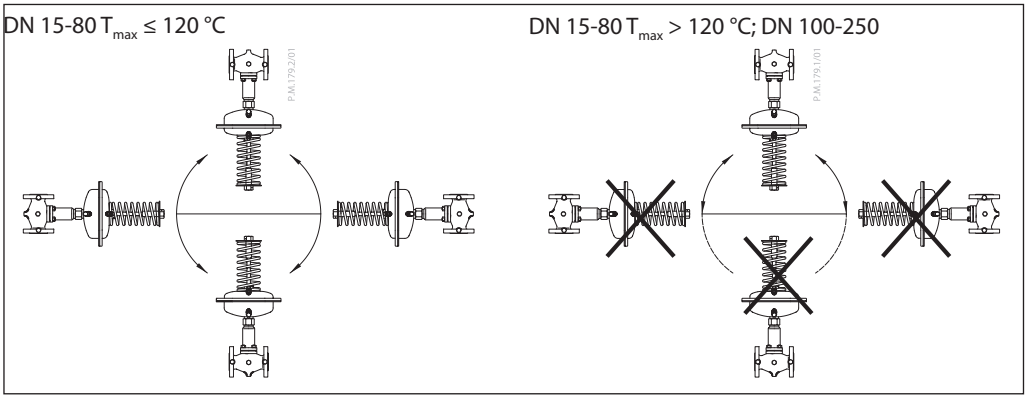
Installation position

DN 15-80 T_{max} ≤ 120 °C

The controllers can be installed in any position.

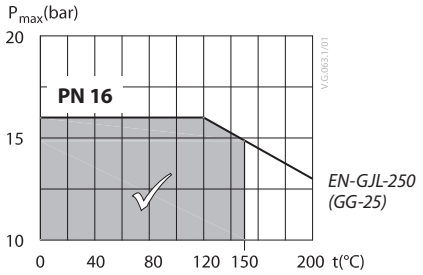
DN 15-80 T_{max} > 120 °C; DN 100-250

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

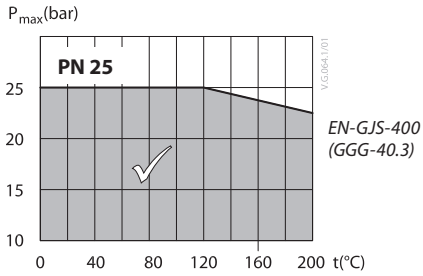


Pressure temperature diagram

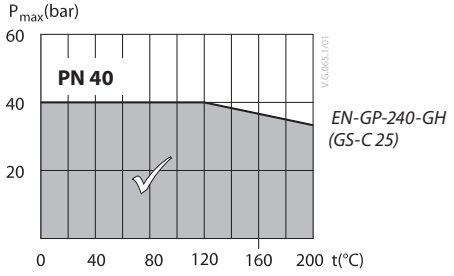
Working area is below P-T line and it ends at Tmax for each valve



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 1092-2)



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 0.3 bar (30 kPa).

Given data:
Q_{max} = 2.2 m³/h (1200 l/h)
Δp_{min} = 0.7 bar (70 kPa)
*$\Delta p_{circuit}$ = 0.1 bar (10 kPa)
Δp_{MCV} = 0.3 bar (30 kPa) selected

*Remark
$\Delta p_{circuit}$ corresponds to the required pump pressure in the heating circuit and is not to be considered when sizing the AFP.

The differential pressure set value is:
$\Delta p_{set\ value} = \Delta p_{MCV}$
$\Delta p_{set\ value}$ = 0.3 bar (30 kPa)

The total pressure loss across the controller is:
$\Delta p_{AFP} = \Delta p_{min} - \Delta p_{MCV} = 0.7 - 0.3$
Δp_{AFP} = 0.4 bar (40 kPa)

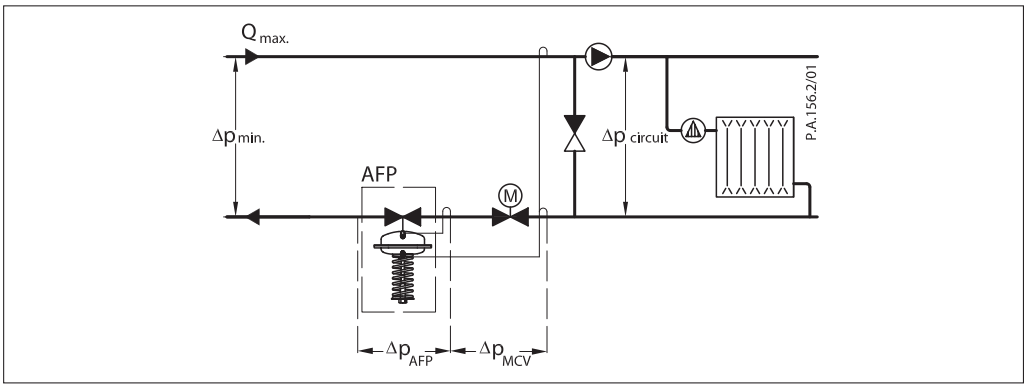
Possible pipe pressure losses in tubes, shut-off fittings, heatmeters, etc. are not included.

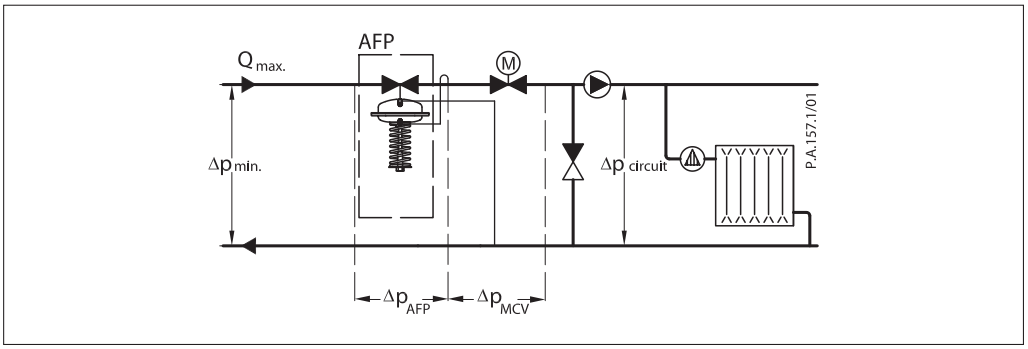
k_v value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AFP}}} = \frac{2{,}2}{\sqrt{0{,}4}}$$

k_v = 3.5 m³/h

Solution:
The example selects AFP DN 15, k_{VS} value 4.0, with differential pressure setting range 0.15-1.5 bar.





Sizing *(continuous)*

– *Indirectly connected heating system*

Example 2
Motorised control valve (MCV) for indirectly connected heating system requires differential pressure of 0.5 (50 kPa) bar.

Given data:
Q_{max} = 2.4 m³/h (1250 l/h)
Δp_{min} = 1.0 bar (100 kPa)
$\Delta p_{exchanger}$ = 0.05 bar (5 kPa)
Δp_{MCV} = 0.4 bar (40 kPa) selected

The differential pressure set value is:
$\Delta p_{set\ value} = \Delta p_{exchanger} + \Delta p_{MCV} = 0.05 + 0.4$
$\Delta p_{set\ value} = 0.45$ bar (45 kPa)

The total pressure loss across the controller is:
$\Delta p_{AFP} = \Delta p_{min} - \Delta p_{exchanger} - \Delta p_{MCV} = 1.0 - 0.05 - 0.4$
$\Delta p_{AFP} = 0.55$ bar (55 kPa)

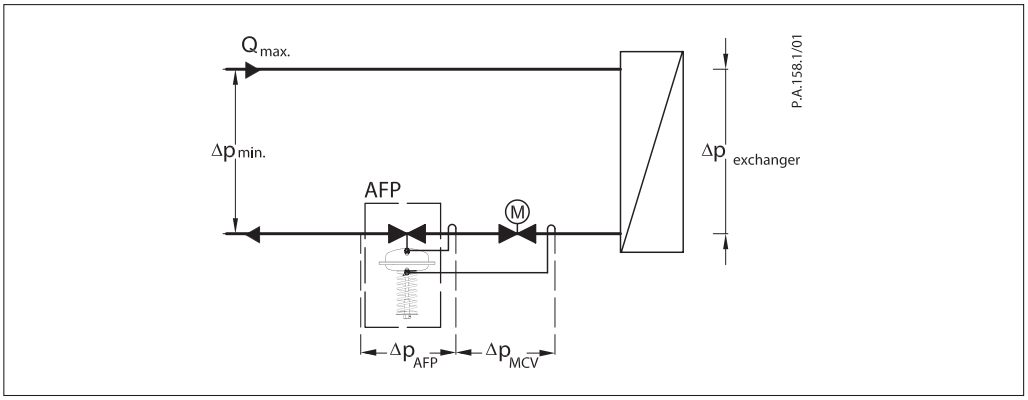
Possible pipe pressure losses in tubes, shut-off fittings, heatmeters, etc. are not included.

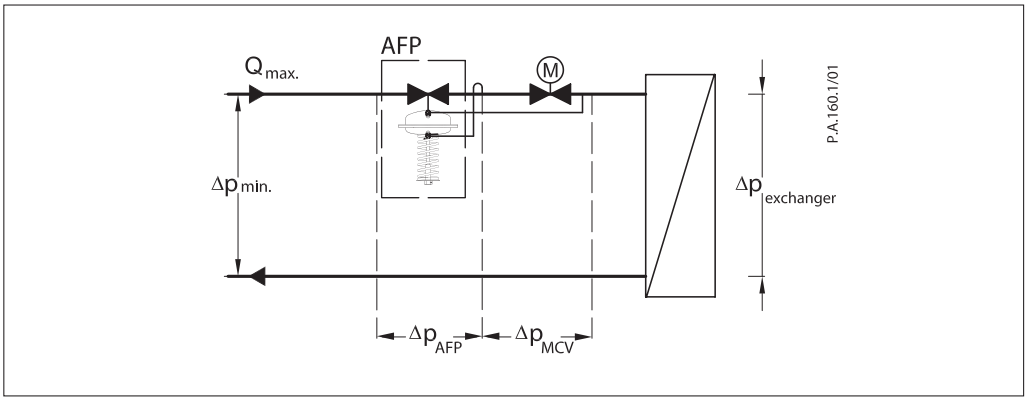
k_v value is calculated according to formula:

$$k_v = \frac{Q_{max}}{\sqrt{\Delta p_{AFP}}} = \frac{2{,}4}{\sqrt{0{,}55}}$$

k_v = 3.2 m³/h

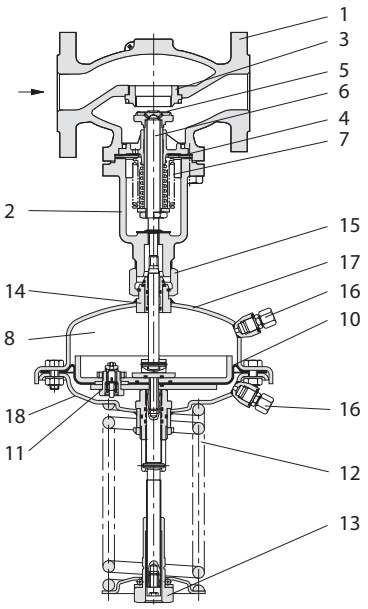
Solution:
The example selects AFP DN 15, k_{VS} value 4.0, with differential pressure setting range 0.15-1.5 bar.



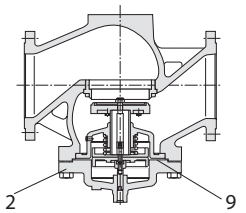


Design

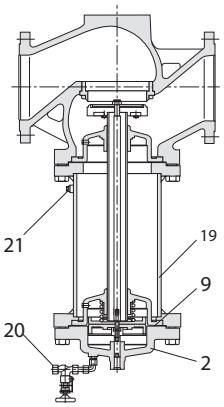
1. Valve body
2. Cover
3. Valve seat
4. Valve insert
5. Pressure relieved valve cone
6. Valve stem
7. Bellows for pressure relief of valve cone
8. Actuator
9. Diaphragm for pressure relief of valve cone
10. Control diaphragm for differential pressure control
11. Excess pressure safety valve
12. Setting spring for diff. pressure control
13. Adjuster for diff. pressure setting, prepared for sealing
14. Stuffing cone
15. Union nut
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



AFP / VFG 2 DN 15-125



VFG 2 DN 150-250, T_{max} 150 °C



VFG 2 DN 150-250, T_{max} 200 °C

Function

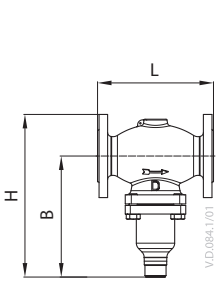
Pressure changes from flow and return pipes are being transferred through the impulse tubes to the actuator chambers and act on control diaphragm for diff. pressure control. The diff. pressure is controlled by means of setting spring for diff. pressure control. Control valve closes on rising differential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

Controller is equipped with excess pressure safety valve (not AFP-9), which protects control diaphragm for diff. pressure control from too high differential pressure.

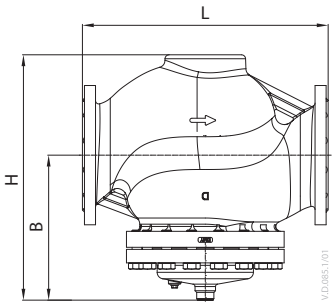
Settings

Differential pressure setting
Differential pressure setting is being done by the adjustment of the setting spring for diff. pressure control. The adjustment can be done by means of spring for diff. pressure setting and/or pressure indicators.

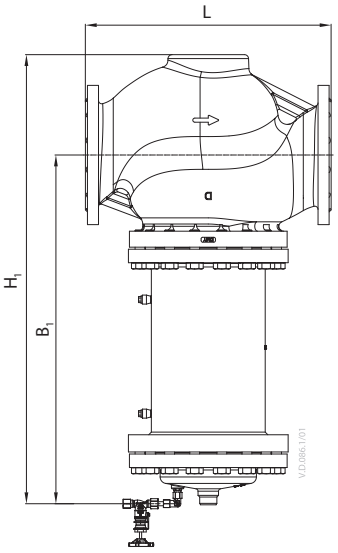
Dimensions



VFG DN 15-125



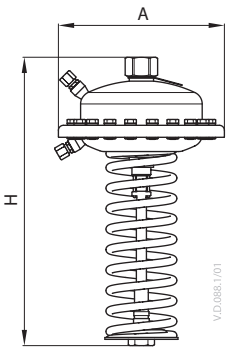
VFG DN 150-250

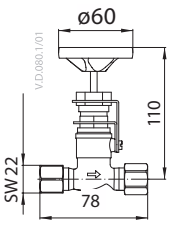


VFG DN 150-250
with valve body extension up to 200 °C

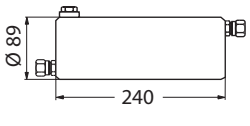
VFG 2, VFG 21 Valves

DN			15	20	25	32	40	50	65	80	100	125	150	200	250
L		mm	130	150	160	180	200	230	290	310	350	400	480	600	730
B		mm	213	213	239	239	241	241	276	276	381	381	326	354	401
H		mm	267	267	304	304	323	323	370	370	505	505	505	591	661
Weight	PN 16 / 25	kg	7.5	8.5	10	12	15	18	27.5	30	58	68	115	185	323
	PN 40	kg							30	32.5	60.5	69	141	253	333
B_1		mm											620	852	1199
H_1		mm											799	1089	1459
Weight (valve with body extension)	PN 16 / 25	kg											154	301	469
	PN 40	kg											179	336	505

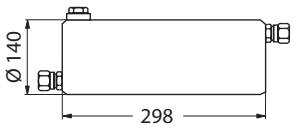




Shut off valve



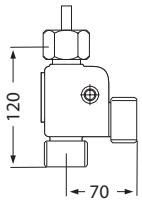
Seal pot V1



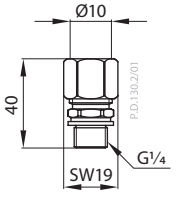
Seal pot V2

AFP Actuator

Actuator size	cm²	80	250	630
A	mm	172	263	380
H	mm	430	470	520
Weight	kg	7.5	13	28



Comb. piece KF2, KF3



Compression fitting