

Data sheet

Differential pressure controller

AFP 2 / VFG 22(1) – return and flow mounting, adjustable setting

Description



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The controller is a self-acting differential pressure controller primarily for use in district heating systems. Direct operated, reliable and high precise 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 22 with metallic sealing cone
- VFG 221 with soft sealing cone

Together with Danfoss intelligent electrical actuator AMEi 6 intelligent optimization functions are available:

- iSET-intelligent substation efficiency optimization
- iNET-intelligent network balancing

Main data:

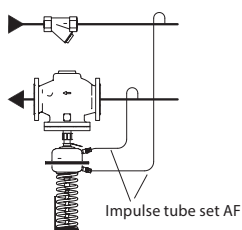
- DN 65-250
- k_{vs} 60-800 m³/h
- PN 16, 25, 40
- Setting range:
0.1-0.35 bar / 0.1-1 bar / 0.5-1.5 bar /
1-2.5 bar / 1.5-4 bar / 1-3 bar / 1.5-5 bar
- Temperature:
– Circulation water / glycolic water up to 30%:
2 ... 150°C
- Connections:
– Flange

Ordering

Example 1:
Differential pressure controller,
return mounting, DN 65, k_{vs} 60,
PN 16, metallic sealing, setting
range 1.5-4 bar, T_{max} 150 °C, flange

- 1x VFG 22 DN 65 valve
Code no: **065B5500**
- 1x AFP 2 actuator
Code no: **003G5606**
- 2x Impulse tube set AF
Code no: **003G1391**

Products will be delivered
separately.

**VFG 22 Valve (metallic sealing cone)**

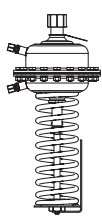
Picture	DN (mm)	k_{vs} (m ³ /h)	Connections	T_{max} (°C)	Code No.		
					PN 16	PN 25	PN 40
	65	60	Flanges acc. to EN 1092-1	150	065B5500	065B5507	065B5514
	80	80			065B5501	065B5508	065B5515
	100	160			065B5502	065B5509	065B5516
	125	250			065B5503	065B5510	065B5517
	150	380			065B5504	065B5511	065B5518
	200	650			065B5505	065B5512	065B5519
	250	800			065B5506	065B5513	065B5520

VFG 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	065B5521	065B5528	065B5535
	80	80			065B5522	065B5529	065B5536
	100	160			065B5523	065B5530	065B5537
	125	250			065B5524	065B5531	065B5538
	150	380			065B5525	065B5532	065B5539
	200	650			065B5526	065B5533	065B5540
	250	800			065B5527	065B5534	065B5541

Ordering (continuous)

AFP 2 Actuator

Picture	Setting range (bar)	Possible combinations with DN							Actuator size (cm ²)	Spring colour	Code No.	
		65	80	100	125	150	200	250			PN 16	PN 40
	1.5-5	✓	✓	✓	✓	-	-	-	80	red	003G5604	003G5614
	1-3	✓	✓	✓	✓	-	-	-	80	yellow	003G5605	003G5615
	1.5-4	✓	✓	✓	✓	✓	✓	✓	160	black ¹⁾	003G5606	003G5616
	1-2.5	✓	✓	✓	✓	✓	✓	✓	160	red	003G5607	003G5617
	0.5-1.5	✓	✓	✓	✓	-	-	-	160	yellow	003G5608	003G5618
	0.4-1.5	✓	✓	✓	✓	✓	✓	✓	320	red	003G5609	003G5619
	0.1-1	✓	✓	✓	✓	-	-	-	160	blue	003G5612	003G5622
	0.1-1	✓	✓	✓	✓	✓	✓	✓	320	orange	003G5610	003G5620
	0.1-0.35	✓	✓	✓	✓	✓	✓	✓	640	yellow	003G5611	003G5621

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
	Compression fitting ²⁾	For impulse tube Ø10 connections to controller	G¼	003G1468
	Shut off valve	For impulse tube Ø10	–	003G1401
	Static throttle valve			065B2909
	Adapter	For combination of new Virtus pressure actuators AFx 2, with old generation of valves VFx 2 (DN15-250)	–	003G1780
	AMEi 6 iSET el. actuator 230 V	Intelligent Δp actuator with iSET function	–	082G4300
	AMEi 6 iSET el. actuator 24 V			082G4301
	AMEi 6 iNET el. actuator 230 V	Intelligent Δp actuator with iNET function		082G4302
	AMEi 6 iNET el. actuator 24 V			082G4303

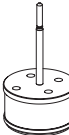
¹⁾ Combination with AMEi 6 not possible

²⁾ Consist of a nipple, compression ring and nut

³⁾ Available in 2022

Service kits

Service kits

Picture	Type	k_{vs} (m ³ /h)	PN	DN	Code No.
	Pressure control insert VFG/Q/22	60	16/25/40	65	003G1800
		80		80	003G1801
		160		100	003G1802
		250		125	003G1803
		380		150	003G1804
		650		200	003G1805
		800		250	003G1806
	Pressure control insert VFG/Q/221	60		65	003G1807
		80		80	003G1808
		160		100	003G1809
		250		125	003G1810
		380		150	003G1811
		650		200	003G1812
		800		250	003G1813
	Pressure stuffing box VFG/Q/221			65-125	003G1730
				150-250	003G1731

Technical data

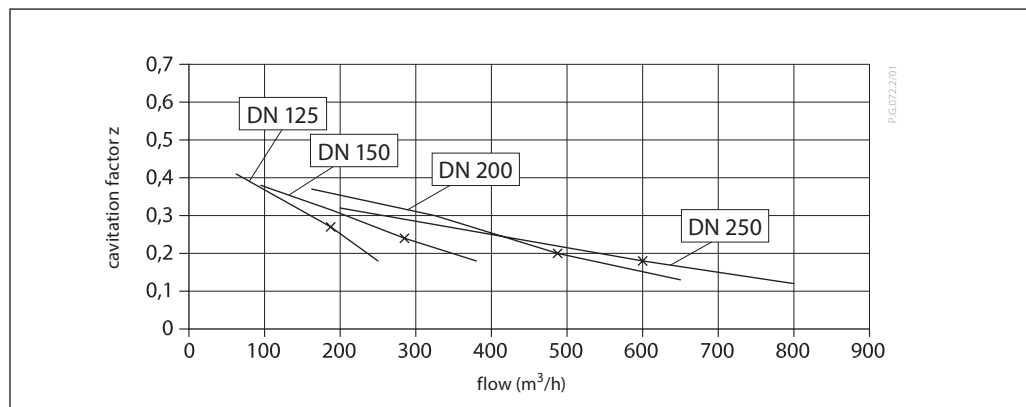
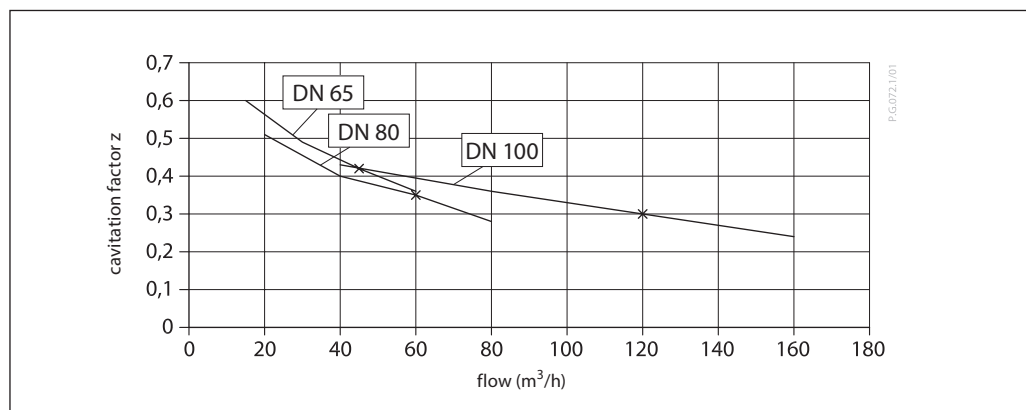
Valve

Nominal diameter		DN	65	80	100	125	150	200	250
k _{vs} value		m³/h	60	80	160	250	380	650	800
Leakage acc. to standard IEC 534 (% of k _{vs})	VFG 22	≤ 0.03					≤ 0.05		
	VFG 221	≤ 0.01							
Nominal pressure		PN	16, 25, 40						
Max. differential pressure	PN 16	bar	16	15			12	10	
	PN 25, 40		20						
Pressure relieve system		Chamber relieved							
Media		Circulation water / glycolic water up to 30%							
Media pH		Min. 7, max. 10							
Media temperature	VFG 22(1)	°C	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							
Valve cone		Stainless steel, mat. No. 1.4021							
Sealing	VFG 22	Metal							
	VFG 221	EPDM							

AFP 2 Actuator

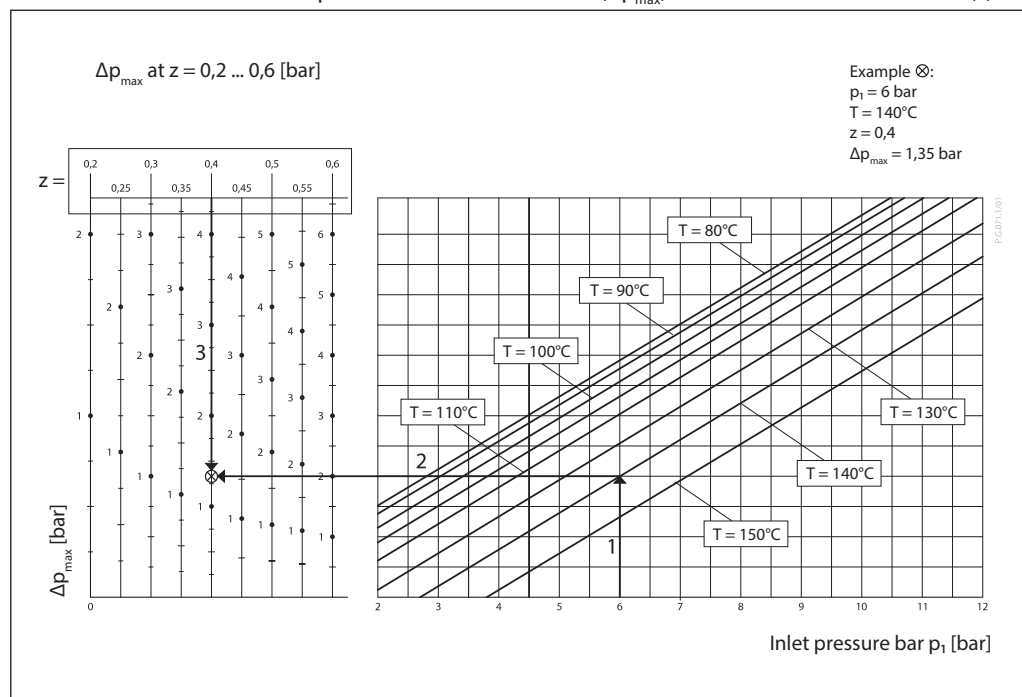
Actuator size	cm²	80		160				320		640
Max. operating pressure	bar	16, 40								
Diff. pressure setting ranges and spring colours	bar	red	yellow	black ¹⁾	red	yellow	blue	red	orange	yellow
		1.5-5	1-3	1.5-4	1-2.5	0.5-1.5	0.1-1	0.4-1.5	0.1-1	0.1-0.35
For valve DN		65-125		65-250		65-125	65-125	65-250	65-250	
Materials										
Actuator housing		Steel, mat. No. 1.0345, zinc plated								
Control diaphragm		EPDM								

¹⁾ Combination with AMEi 6 not possible



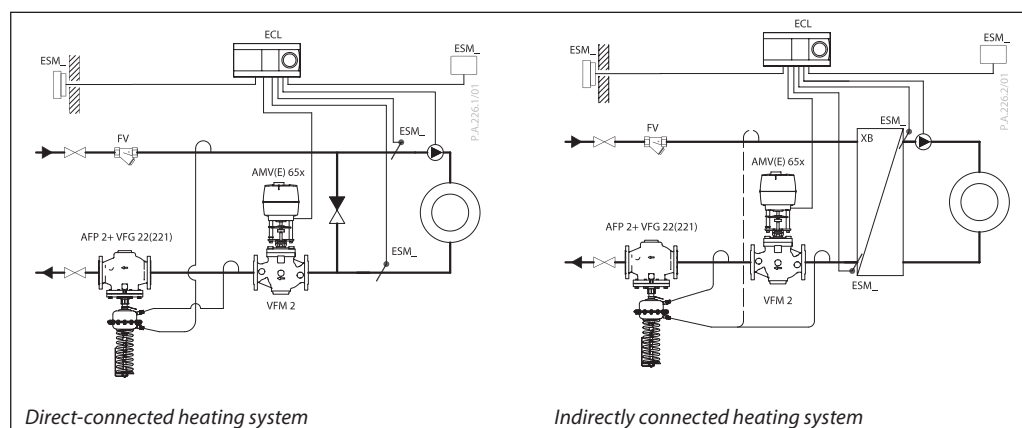
Operating area

Maximum allowed differential pressure over the controller ($\Delta p_{\max}$) at different cavitation factors (z)

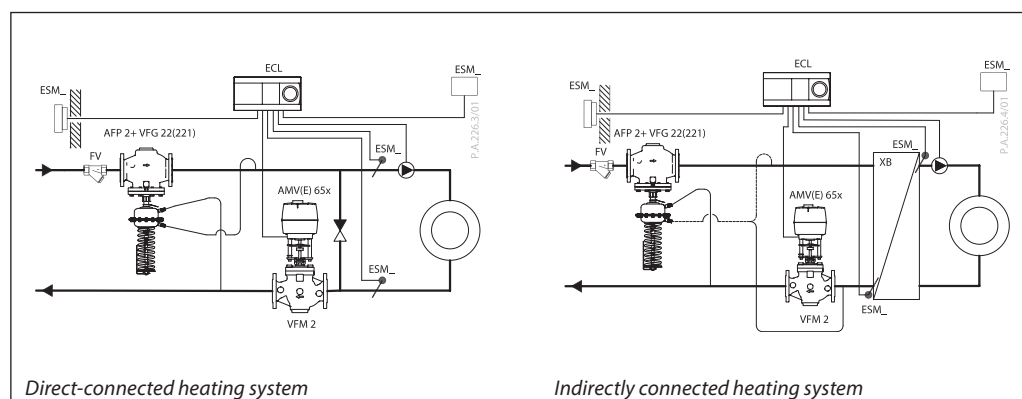


Application principles

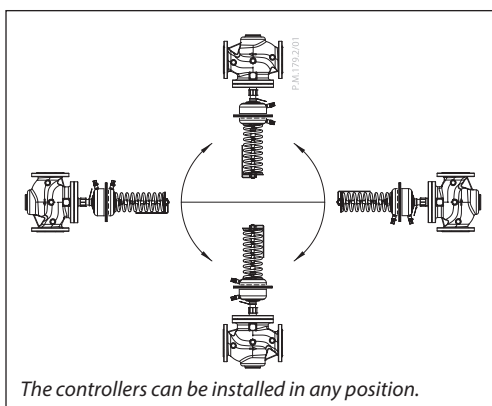
– Return mounting



– Flow mounting

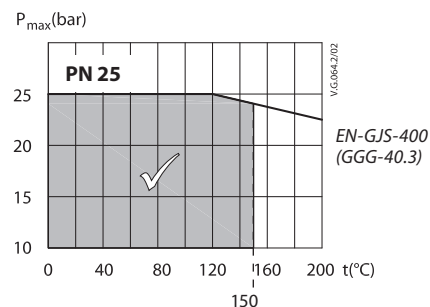
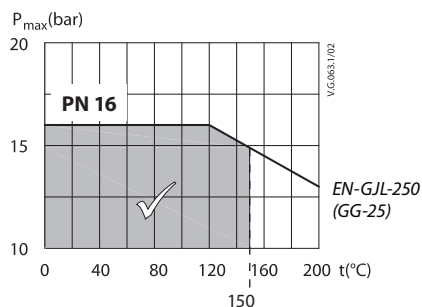


Installation position

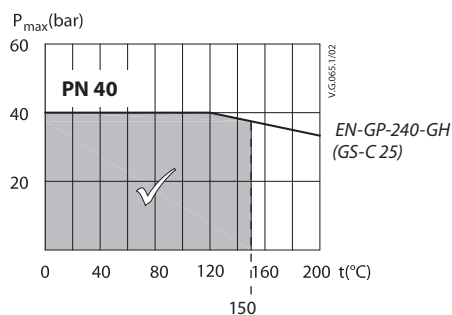


Pressure temperature diagram

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

Example:

The application demands a maximal flow of 25 m³/h and has a motorized control valve (MCV) that needs a control of a pressure drop 0.4 bar. The minimal differential pressure available over MCV and AFP is 0.7 bar.

Given Data:

$Q_{\max} = 25 \text{ m}^3/\text{h}$
 $\Delta p_{\min} = 0.7 \text{ bar}$
 $\Delta p_{\text{MCV}} = 0.4 \text{ bar}$

The total pressure across the controller is:

$$\Delta p_{\text{AFP}} = \Delta p_{\min} - \Delta p_{\text{MCV}} = 0.7 - 0.4 = 0.3 \text{ bar (30 kPa)}$$

Calculate the k_v value:

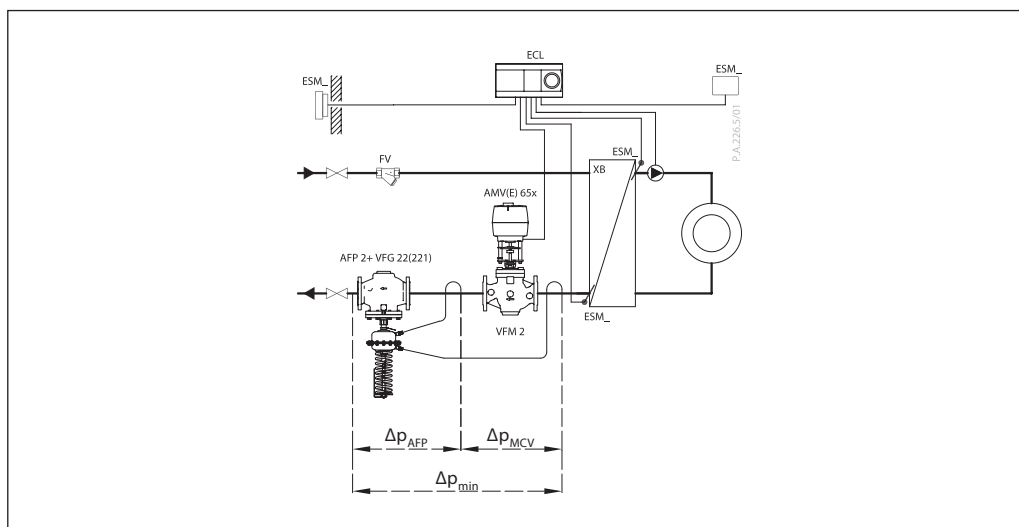
$$k_v = \frac{Q_{\max}}{\sqrt{\Delta p_{\text{AFP}}}} = \frac{25}{\sqrt{0.3}} = 45.6 \text{ m}^3/\text{h}$$

The first bigger k_{vs} to 45.6 m³/h is 60 m³/h and gives VFG DN 65.

The available setting range to control 0.4 bar is 0.1-0.7 bar and is available for DN 65.

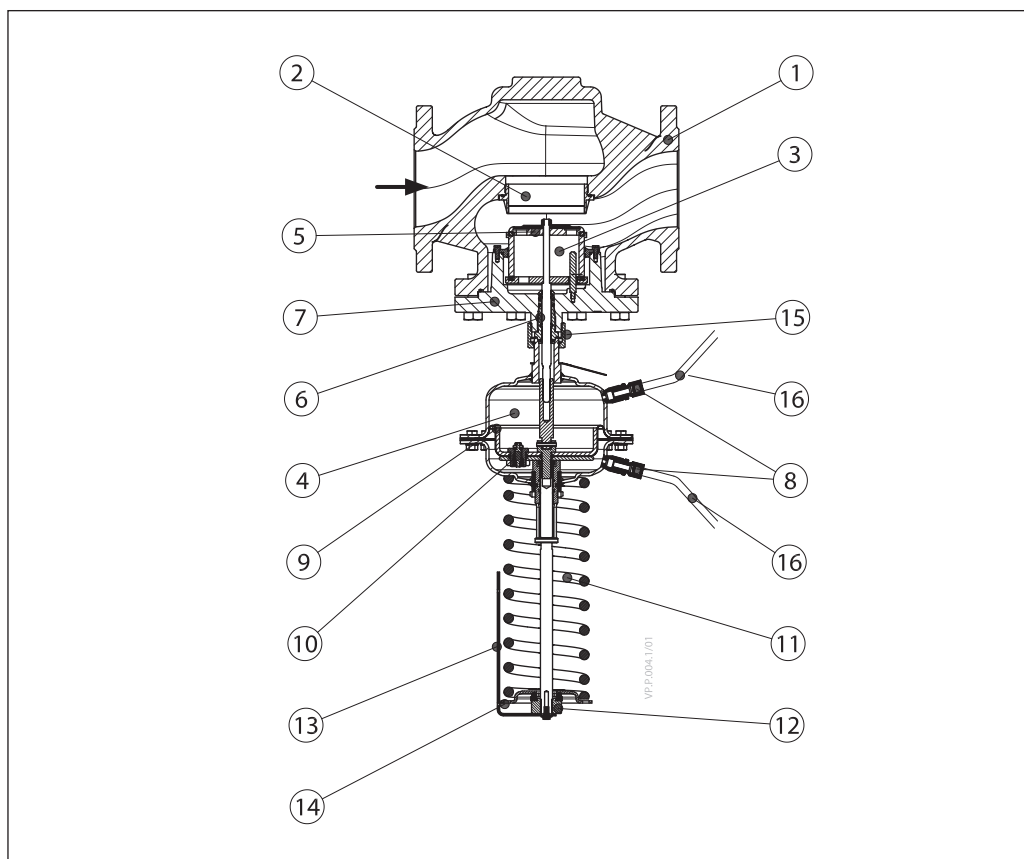
Solution:

AFP 2 0.1-0.7
VFG 22 (221) DN 65 $k_{vs} 60$



Design

1. Valve body
2. Valve seat
3. Pressure control insert
4. Pressure actuator
5. Pressure control cone
6. Pressure stuffing box
7. Cover
8. Impulse tube connection
9. Diaphragm
10. Diaphragm excess pressure safety valve
11. Differential pressure setting spring
12. Differential pressure setting nut
13. Setting scale
14. Setting indicator
15. Union nut
16. Impulse tube



Function

The differential pressure control is achieved by maintaining a constant differential pressure over the control valve/application.

The differential pressure over the control valve is lead to the pressure actuator diaphragm through the impulse tubes.

The opening/closing of the pressure control cone is performed by changing differential pressure over the diaphragm.

When differential pressure over the control valve:

- a) rises, the pressure control cone takes over the exceeded differential pressure by closing, until set differential pressure over the control valve/application is reached.
- b) drops, the pressure control cone compensates the missing differential pressure by opening, until set differential pressure over the control valve/application is reached.

The pressure actuator diaphragm is equipped with excess pressure safety valve to protect diaphragm from the damages caused by too high differential pressure.

Settings

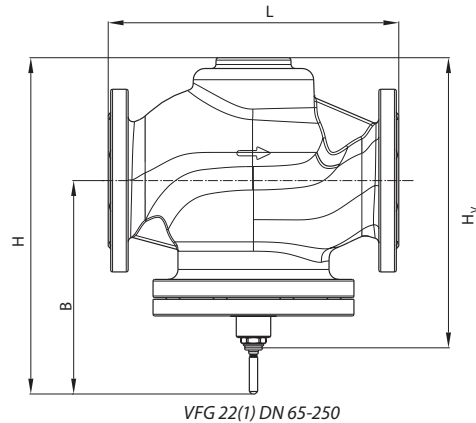
Differential pressure setting

Differential pressure setting is being done by the adjustment of the setting spring for diff. pressure control. This is done by rotating the differential pressure setting nut. Set differential pressure should be checked by observing the pressure indicators.

Data sheet

Differential pressure controller AFP 2 / VFG 22(1)

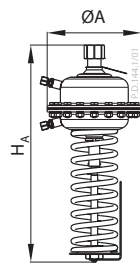
Dimensions



VFG 22, VFG 221 Valves

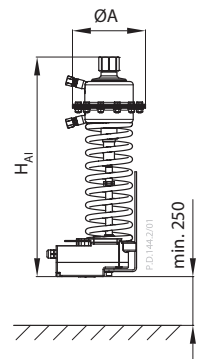
DN	L	B	H	H _v	Weight		
					PN 16	PN 25	PN 40
	mm				kg		
65	290	245	370	285	24	24	27
80	310	240	365	290	29	29	32
100	350	275	425	350	47	48	53
125	400	270	435	370	60	60	68
150	480	330	520	460	105	106	121
200	600	365	610	550	204	206	235
250	730	420	680	620	343	350	404

AFP 2 Actuator

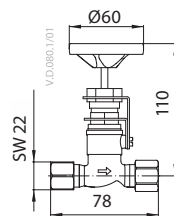


Size	ØA	H _A	H _{Ai}	Weight [kg]			
(cm ²)			mm	AFP 2 PN 16	AFP 2 PN 16 + AMEi 6	AFP 2 PN 40	AFP 2 PN 40 + AMEi 6
80	175	490	590	9	11.5	16	18.5
160	230	510	610	11.5	14	23.5	26
320	300	510	610	15	17.5	35.5	38
640	300	630	730	38	40.5	58	60.5

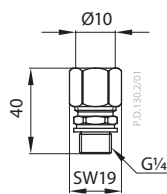
Total installation height of the controller (VFG 22(1) valve + AFP 2 pressure actuator) is sum of H_v and H_A (H_{Ai})



AMEi 6 intelligent actuator with iSET/iNET functionality should be ordered separately



Shut off valve



Compression fitting

Danfoss A/S

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