ENGINEERING
TOMORROW

Data sheet

Differential pressure controller (PN 16, 25, 40)

AFP 2/VFG 22(221) – 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

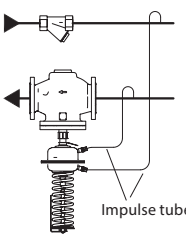
Main data:
- DN 65-250
- k_{VS} 60-800 m^3/h
- PN 16, 25, 40*
  ** PN 40 available in Q1-2019*
- Setting range:
  0.1-0.35 bar / 0.1-0.7 bar / 0.2-1.5 bar /
  / 1-2.5 bar / 1.5-4 bar / 1-3 bar / 1.5-5 bar
- Temperature:
  – Circulation water / glycolic water up to 30%:
  2 … 150°C
- Connections:
  – Flange

Ordering

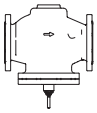
Example 1:
Differential pressure controller, return mounting, DN 65, k_{VS} 60, PN 16, metallic sealing, setting range 1.5-4 bar, T_{max} 150 °C, flange

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

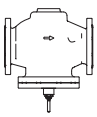
Products will be delivered separately.



VFG 22 Valve (metallic sealing cone)

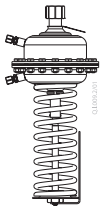
Picture	DN (mm)	k_{VS} (m^3/h)	Connections	$T_{max.}$ (°C)	Code No.		
					PN 16	PN 25	PN 40
	65	60	Flanges acc. to EN 1092-1	150	**065B5500**	**065B5507**	**065B5514**
	80	80			**065B5501**	**065B5508**	**065B5515**
	100	160			**065B5502**	**065B5509**	**065B5516**
	125	250			**065B5503**	**065B5510**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

VFG 221 Valve (soft sealing cone)

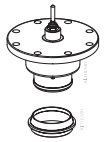
Picture	DN (mm)	k_{VS} (m^3/h)	Connections	$T_{max.}$ (°C)	Code No.		
					PN 16	PN 25	PN 40
	65	60	Flanges acc. to EN 1092-1	150	**065B5521**	**065B5528**	**065B5535**
	80	80			**065B5522**	**065B5529**	**065B5536**
	100	160			**065B5523**	**065B5530**	**065B5537**
	125	250			**065B5524**	**065B5531**	**065B5538**
	150	380			**065B5525**	**065B5532**	**065B5539**
	200	650			**065B5526**	**065B5533**	**065B5540**
	250	800			**065B5527**	**065B5534**	**065B5541**

Ordering *(continuous)*

AFP 2 Actuator

Picture	Actuator size (cm^2)		Δp setting range (bar)	for DN	Code No.	
					PN 16	PN 40
	80	red	1.5-5	65-125	**003G5604**	**003G5614**
	80	yellow	1-3		**003G5605**	**003G5615**
	160	black [1]	1.5-4	65-250	**003G5606**	**003G5616**
	160	red	1-2.5		**003G5607**	**003G5617**
	160	yellow	0.2-1.5	65-100	**003G5608**	**003G5618**
	320	red		125-250	**003G5609**	**003G5619**
	320	yellow	0.1-0.7	65-250	**003G5610**	**003G5620**
	640	yellow	0.1-0.35		**003G5611**	**003G5621**

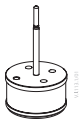
Accessories

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			G ¼	**003G1468**
	Shut off valve	For impulse tube Ø10			–	**003G1401**
	Static throttle valve					**065B2909**
	Dynamic throttle valve	For impulse tube Ø10 / connection to pressure actuator			G¼	**003G1771**
	Adapter	new AFP 2-old VFG			DN 15-125	**003G1780**
	Adapter	new AFP 2-old VFG			DN 150-250	**003G1781**
	Pressure control reduction set VFG/Q/U 22		**k_{vs}** (m^3/h)	**PN**	**For valve DN**	–	
			60	16/25	80		**003G1710**
			80		100		**003G1701**
			160		125		**003G1711**
			250		150		**003G1702**
			380		200		**003G1703**
			650		250		**003G1704**
	Pressure control reduction set VFG/Q/U 221		60		80		**003G1715**
			80		100		**003G1706**
			160		125		**003G1716**
			250		150		**003G1707**
			380		200		**003G1708**
			650		250		**003G1709**
	AMEi 6 **iSET** el. actuator 230 V [3]	Intelligent Δp actuator with **iSET** function					**082G4300**
	AMEi 6 **iSET** el. actuator 24 V [3]						**082G4301**
	AMEi 6 **iNET** el. actuator 230 V [3]	Intelligent Δp actuator with **iNET** function					**082G4302**
	AMEi 6 **iNET** el. actuator 24 V [3]						**082G4303**

[1] Combination with AMEi 6 not possible
[2] Consist of a nipple, compression ring and nut
[3] Available in Q4 2018

Ordering *(continuous)*

Service kits

Picture	Type	k_{vs} (m^3/h)	PN	DN	Code no.
	Pressure control insert VFG/Q/U 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/U 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/U 221			65-125	**003G1730**
				150-250	**003G1731**

Technical data

Valve

Nominal diameter		**DN**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
k_{vs} value		m^3/h	60	80	160	250	380	650	800
Cavitation factor z			0.5	0.45	0.4	0.35	0.3	0.2	0.2
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(221)	°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. 1.4305						
Sealing	VFG 22		Metal						
	VFG 221		EPDM						

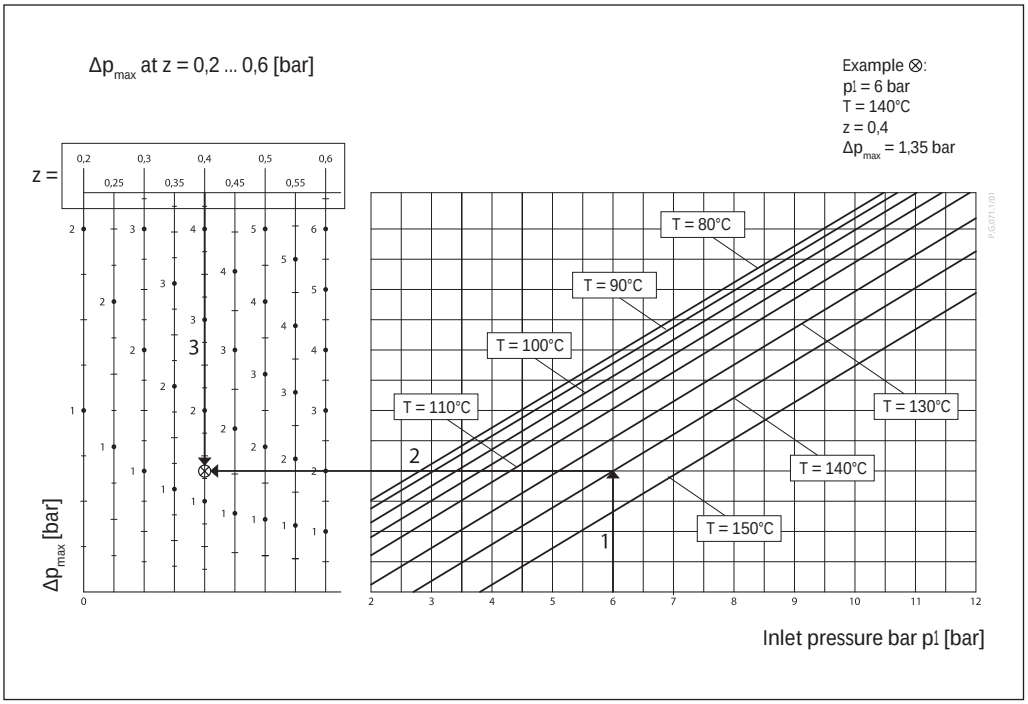
AFP 2 Actuator

Actuator size	cm^2	80		160			320		640
Max. operating pressure	bar	40							
Diff. pressure setting ranges and spring colours	bar	red	yellow	black [1]	red	yellow	red	yellow	yellow
		1.5-5	1-3	1.5-4	1-2.5	0.2-1.5		0.1-0.7	0.1-0.35
For valve DN		65-125		65-250		65-100	125-250	65-250	
Materials									
Actuator housing		Steel, mat. No. 1.0345, zinc plated							
Control diaphragm		EPDM							

[1] *Combination with AMEi 6 not possible*

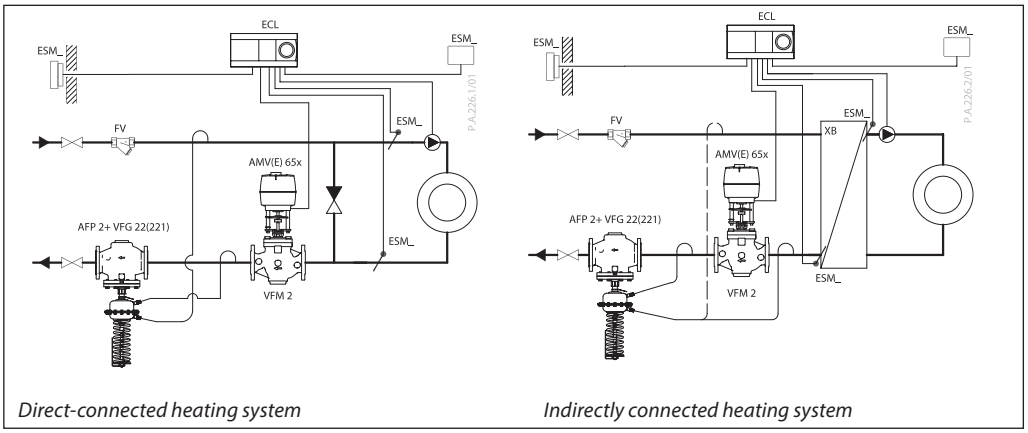
Operating area

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



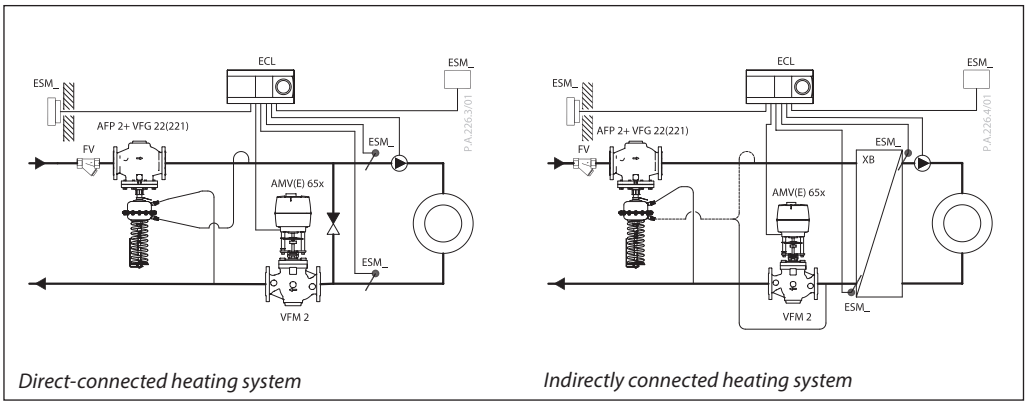
Application principles

– Return mounting



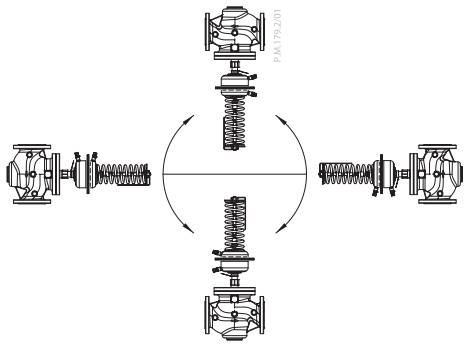
Direct-connected heating system *Indirectly connected heating system*

– Flow mounting



Direct-connected heating system *Indirectly connected heating system*

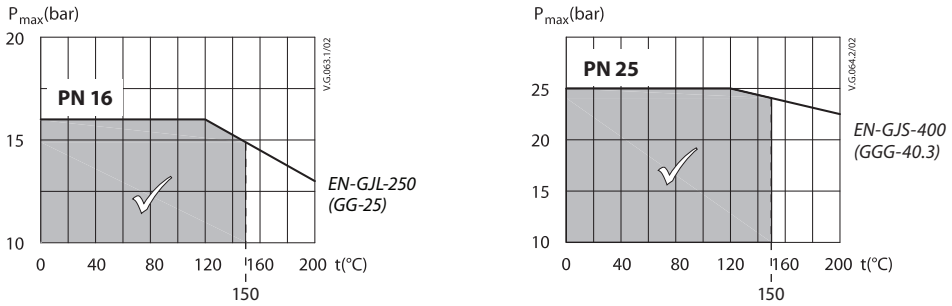
Installation position



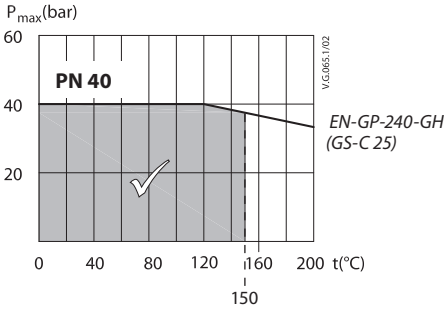
The controllers can be installed in any position.

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 m³/h
Δp_{min} = 0.7 bar
Δp_{MCV} = 0.4 bar

The total pressure across the controller is:

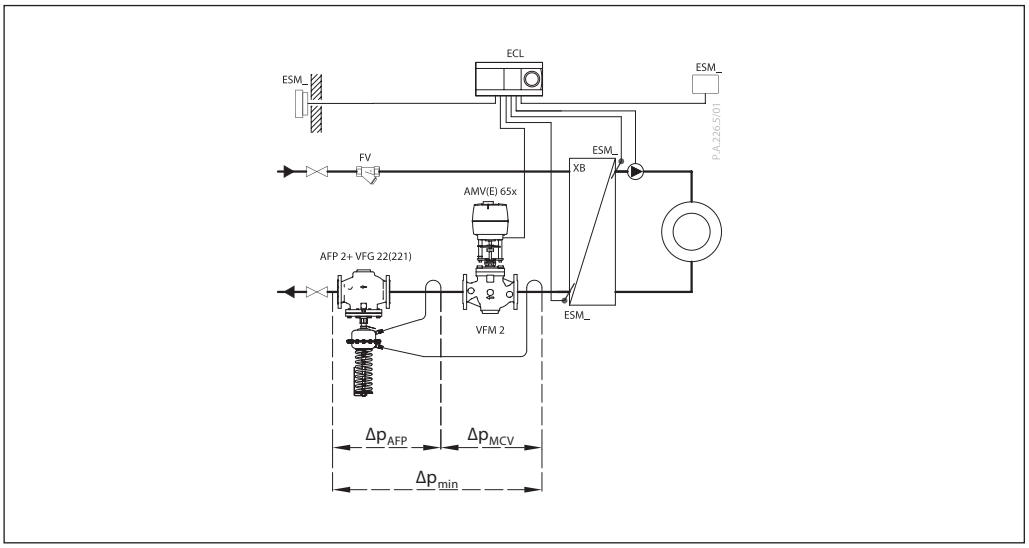
$$\Delta p_{AFP} = \Delta p_{min} - \Delta p_{MCV} = 0.7 - 0.4 = 0.3\,\text{bar}(30\,\text{kPa})$$

Calculate the k_v value:

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

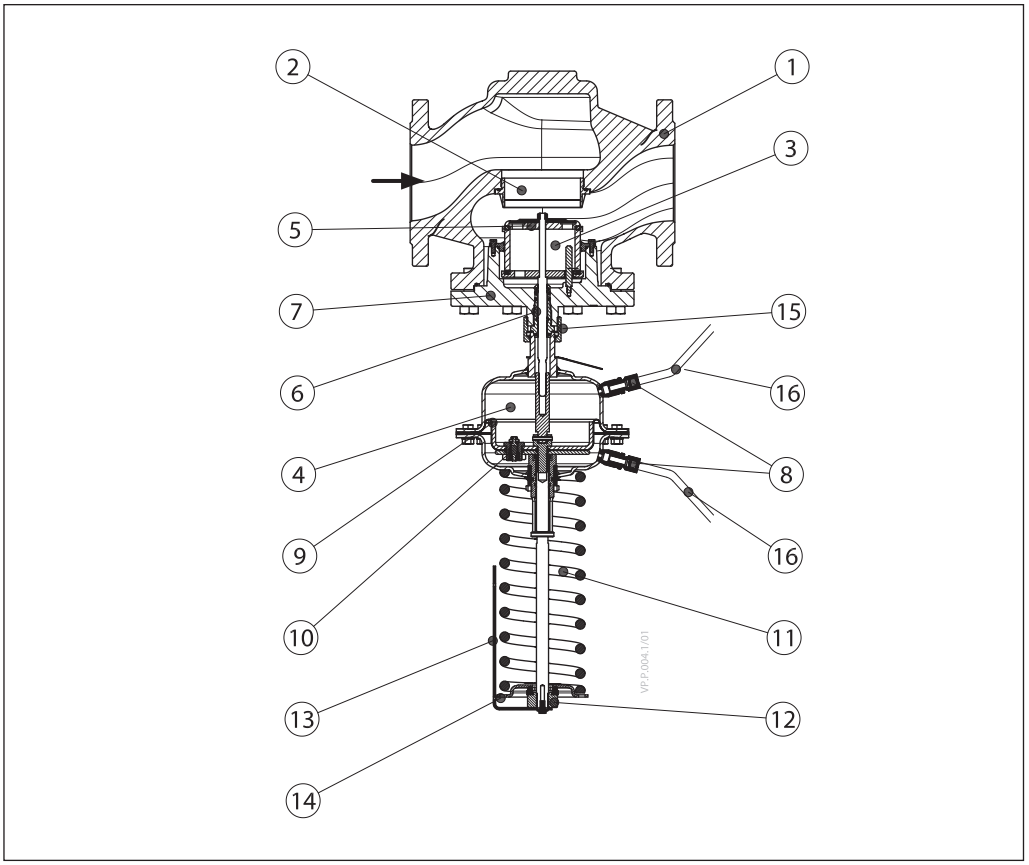
The first bigger k_{VS} to 45.6 m³/h is 60 m³/h and gives VFG DN 65.
The available setting range to control 0.4 bar is 0.1-0.7 bar and is available for DN 65.

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.

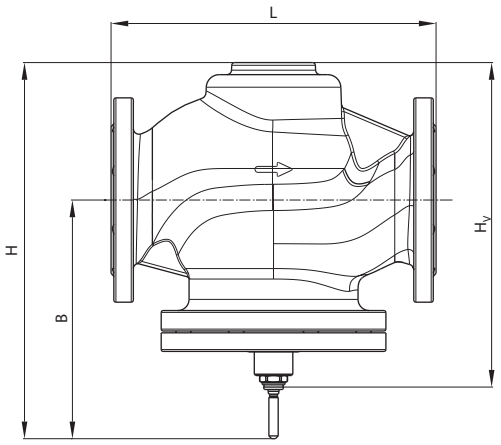
The pressure actuator diaphragm is equipped with excess pressure safety valve to protect diaphragm from the damages caused by too high differential pressure.

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(221) (PN 16, 25, 40)**

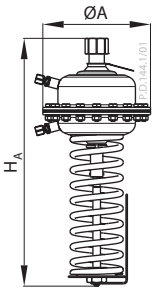
Dimensions



VFG 22(1) DN 65-250

VFG 22, VFG 221 Valves

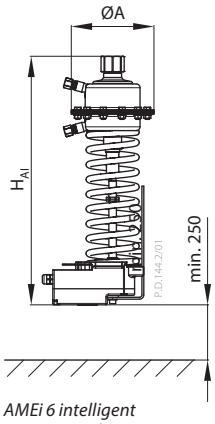
DN	L	B	H	H_V	Weight		
					PN 16	PN 25	PN 40
	mm				kg		
65	290	220	345	285	24	25	26
80	310	220	345	285	29	30	32
100	350	260	405	345	47	48	50
125	400	260	425	365	60	62	60
150	480	325	515	455	105	108	130
200	600	360	605	545	204	210	260
250	730	420	675	615	343	353	375



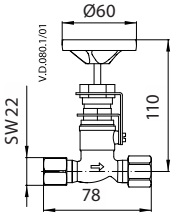
AFP 2 Actuator

Size	ØA	H_A	H_{AI}	Weight (kg)	
(cm^2)	mm			AFP 2	AFP 2 + AMEi 6
80	175	485	602	10	12.5
160	228	505	622	13.5	16
320	295	505	622	20.5	23
630	300	630	747	36	38.5

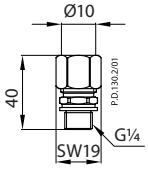
Total installation height of the controller (VFG 22(1) valve + AFP 2 pressure actuator) is sum of H_V and H_A (H_{AI})



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



Shut off valve



Compression fitting