ENGINEERING
TOMORROW

Data sheet

Pressure independent control valve with integrated flow limiter
AFQMP 2 - return and flow mounting, adjustable setting

Description

virtus.danfoss.com

AFQMP 2 is a self-acting flow controller with integrated control valve and with pressure actuator with adjustable spring, developed for the use in district heating / cooling systems. The controller prevents flow to exceed set max flow. Pressure actuator with adjustable spring enables adjustment of differential pressure over the control cone from 0.1 to 1 bar. Increased flows can be provided. In a combination with electrical actuators AMV(E) and ECL electronic controllers the flow and temperature can be controlled to achieve highest energy savings.

AFQMP 2 has a control valve with adjustable flow limiter, connection neck for electrical actuator and a pressure actuator with one control diaphragm.

Controllers are used together with Danfoss electrical actuators:

- AFQMP 2 PN 16/25/40 DN 65-250
  - AMV(E) 655 without spring return function and with manual operation;
  - AMV(E) 658 SD [2]) spring return function and manual operation;
  - AMV(E) 659 SD [1]) spring return function;
  - AMV(E) 55
- AFQMP 2 PN 16/25/40 DN 65-125
  - AMV(E) 56

[1]) *DIN approved (according to EN 14597)*
[2]) *not DIN approved*

Together with Danfoss intelligent electrical actuator AMEi 6 intelligent optimization functions are available:
· iSET-intelligent substation efficiency optimization
· iNET-intelligent pump optimization

Main data:

- DN 65-250
- k_{VS} 60-800 m^3/h
- Flow range 4.2-630 m^3/h
- PN 16, 25, 40
- Differential pressure over the flow control cone Δp_{CV}:
  0.1-1 bar (adjustable by the spring)
- Temperature:
- Circulation water / glycolic water up to 30 %:
  2 … 150°C
- Connections: Flange
- AFQMP 2 combined with AMV(E) 659 SD have been DIN approved according to EN 14597.

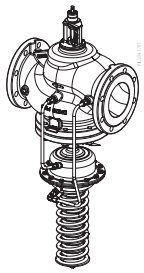
Ordering

Example:
Flow controller with integrated control valve for flow rate, DN 65, k_{VS} 60, PN 16, T_{max} 150 °C, flange

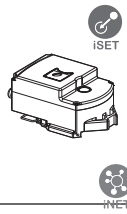
- *1× AFQMP 2 DN 65 controller Code No.:* ***003G5560***

The controller will be delivered completely assembled, inclusive impulse tubes between valve and actuator. Electrical actuator AMV(E) must be ordered separately.

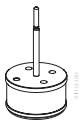
AFQMP 2 Controller

Picture	DN	Q_{max} Δp_{CV}= 0.1-1 bar	PN	Connection	Code No.
	65	27-61	16	Flange EN 1092-1	**003G5560**
	80	40-100			**003G5561**
	100	60-138			**003G5562**
	125	100-230			**003G5563**
	150	130-290			**003G5564**
	200	180-450			**003G5565**
	250	280-630			**003G5566**
	65	27-61	25		**003G5570**
	80	40-100			**003G5571**
	100	60-138			**003G5572**
	125	100-230			**003G5573**
	150	130-290			**003G5574**
	200	180-450			**003G5575**
	250	280-630			**003G5576**
	65	27-61	40		**003G5580**
	80	40-100			**003G5581**
	100	60-138			**003G5582**
	125	100-230			**003G5583**
	150	130-290			**003G5584**
	200	180-450			**003G5585**
	250	280-630			**003G5586**

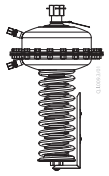
Accessories

Picture	Type designation	Description	Code No.
	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**

Service kits

Picture	Type	k_{VS} (m^3/h)	PN	DN	Code No.
	Pressure control insert VFG/Q 221	60	16/25/40	65	**003G1807**
		80		80	**003G1808**
		160		100	**003G1809**
		250		125	**003G1810**
		380		150	**003G1811**
		650		200	**003G1812**
		800		250	**003G1813**
	Flow stuffing box VFG/Q 22(1)			65-125	**003G1720**
				150-250	**003G1721**
	Pressure stuffing box VFG/ Q 22(1)			65-125	**003G1730**
				150-250	**003G1731**

AFQMP 2 Actuator

Picture	Actuator size (cm^2)		Δp setting range (bar)	for DN	Code No.	
					PN 16	PN 40
	160	blue	0.1-1	65-125	**003G5612**	**003G5622**
	320	orange		150-250	**003G5610**	**003G5620**

Technical data

AFQMP 2 valve

Nominal diameter			**DN**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
k_{VS} value			m^3/h	60	80	160	250	380	650	800
Range of max. flow settings	Q_{max}	Δp_{CV} [1] = 0.1 bar	m^3/h	27	40	60	100	130	180	280
		Δp_{CV} [1] = 1 bar		61	100	138	230	290	450	630
Stroke			mm	12	19		23		28	32
Control valve authority				1 (100 %) in the range of flow setting						
Control characteristic				linear-split						
Cavitation factor z				0.65	0.55	0.4	0.4	0.4	0.4	0.3
Leakage acc. to standard IEC 534			% of k_{VS}	≤ 0.01						
Nominal pressure			PN	16, 25, 40						
Min. differential pressure			bar	see remark [2]						
Max. differential pressure PN 16				16	16	15	15	12	10	10
Max. differential pressure PN 25/40				20	20					
Pressure relievement system				Chamber relieved						
Media				Circulation water / Glycolic water up to 30 %						
Media pH				Min.7, max.10						
Media temperature			°C	2 … 150						
Connections				Flange						
Materials										
Valve body			PN 16	Grey cast iron EN-GJL-250 (GG-25)						
			PN 25	Ductile iron EN-GJS-400-18-LT (GGG-40.3)						
			PN 40	Cast steel GP240GH (GS-C 25)						
Valve seat DP, CV				Stainless steel, mat. No. 1.4021						
Valve cone DP, CV				Stainless steel, mat. No. 1.4021						
Sealing DP, CV				EPDM						

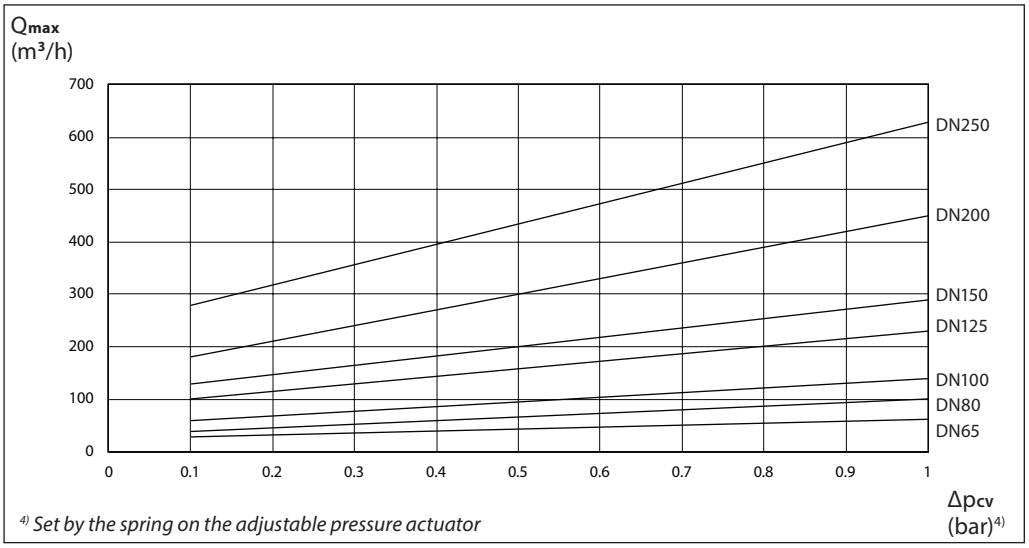
[1] *DP-diff. pressure over the pressure control cone, CV-diff. pressure over the flow control cone, Δp_{AFQMP} - diff. pressure over AFQMP 2 valve*

[2] *Required differential pressure for desired flow Q ->* $\Delta p_{AFQMP} = \left(\frac{Q}{k_{VS}}\right)^2 + \Delta p_{CV}$ *, Δp_{CV} can be set between 0.1 - 1 bar*

AFQMP 2 actuator

For valve	DN	65	80	100	125	150	200	250
Actuator size	cm^2	160				320		
Max. operational pressure	bar	16 or 40						
Differential pressure over the flow control cone Δp_{CV}		0.1-1 (adjustable)						
Materials								
Housing		Steel, mat. No. 1.0345, zinc plated						
Diaphragm		EPDM (Rolling; fibre enforced)						
Impulse tube		Stainless steel tube Ø10 × 0.8 mm						

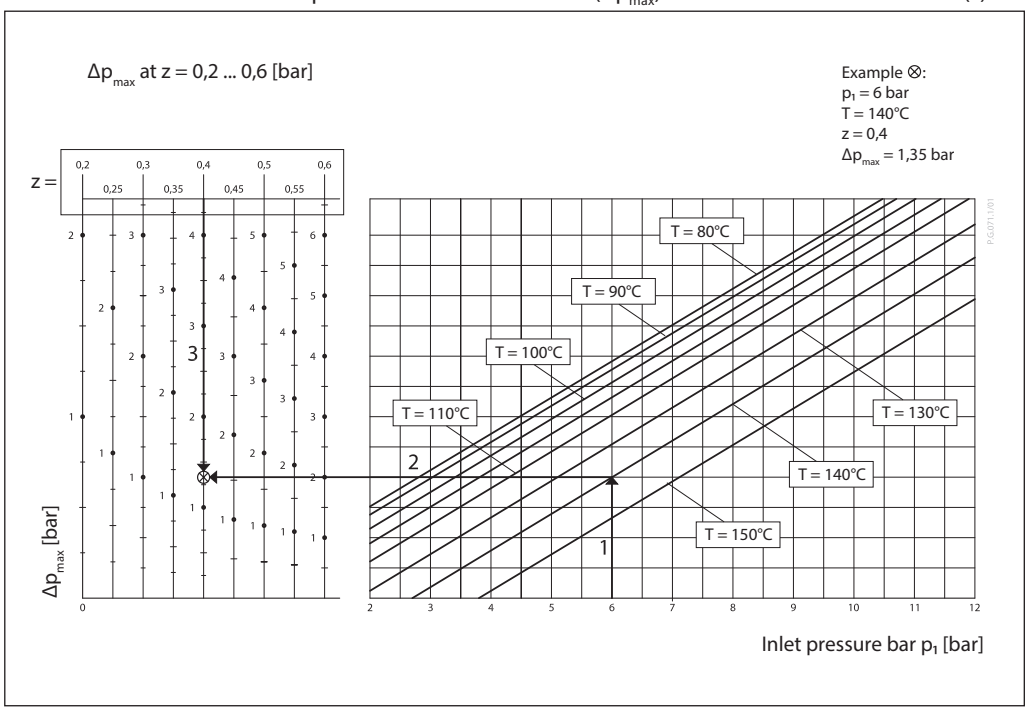
Range of max. flow settings



4) Set by the spring on the adjustable pressure actuator

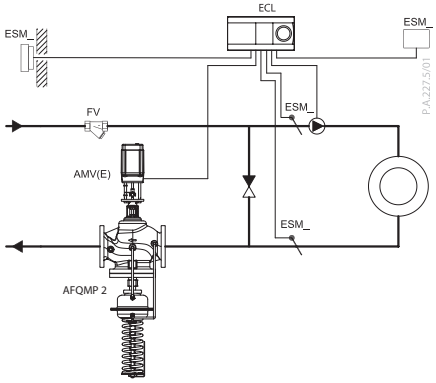
Operating area

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

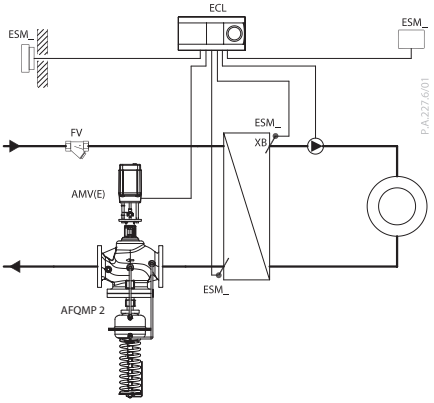


Application principles

- Return mounting

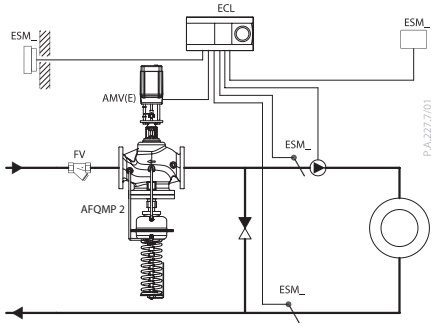


Direct-connected heating system

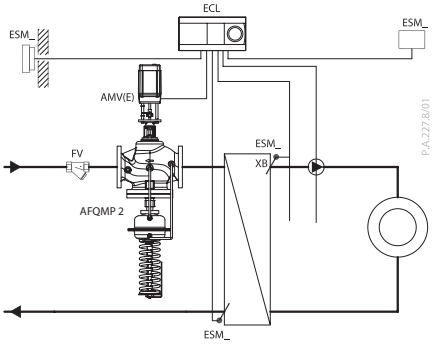


Indirectly connected heating system

- Flow mounting

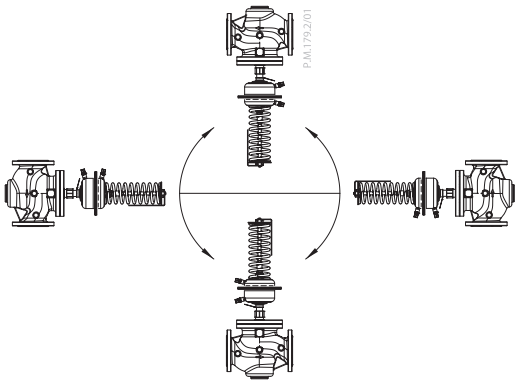


Direct-connected heating system



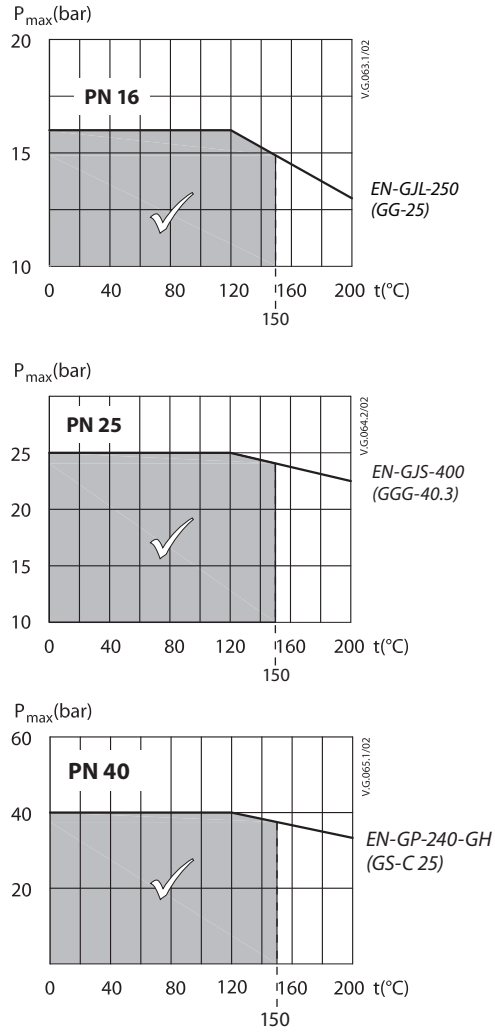
Indirectly connected heating system

Installation positions



Note!
Installation positions for electrical actuators AMV(E) have to be observed as well. Please see relevant Data sheet.

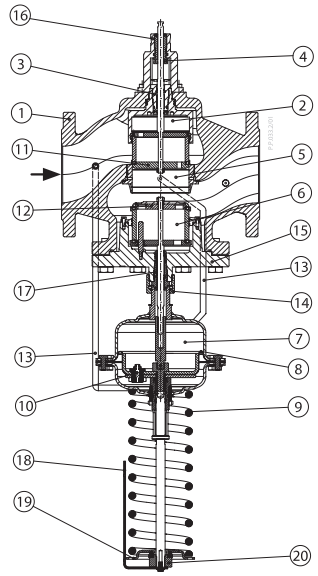
Pressure temperature diagram



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

Design

1. Valve body
2. Flow control insert
3. Flow stuffing box
4. Max. flow limitation nut
5. Valve seat
6. Pressure control insert
7. Pressure actuator
8. Pressure actuator diaphragm
9. Pressure actuator spring
10. Diaphragm excess pressure safety valve
11. Flow control cone (CV)
12. Pressure control cone (DP)
13. Impulse tube
14. Union nut
15. Cover
16. Connection for electrical actuator
17. Pressure stuffing box
18. Setting scale
19. Setting indicator
20. Differential pressure setting nut

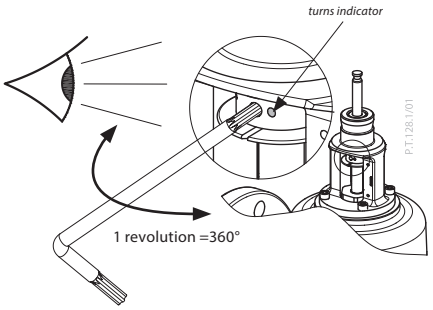


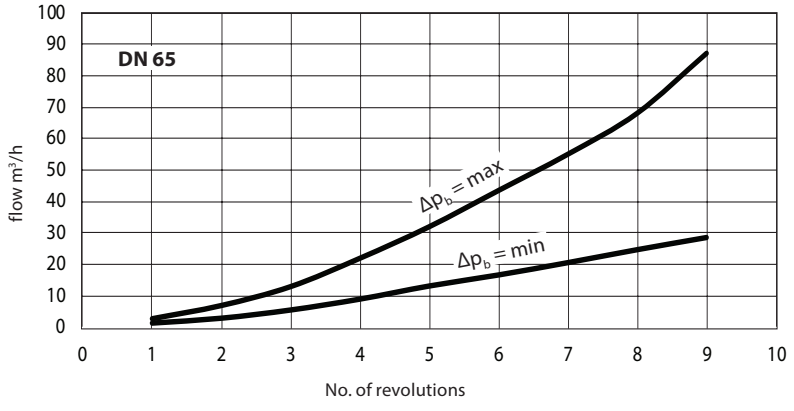
Settings

Flow setting
Flow limitation is being done by the adjustment of the max. flow limitation nut. The adjustment can be performed on the basis of flow limiting diagram (see relevant instructions) and/or by the means of heat meter. Flow limiting curves in diagrams represent informational values, for more accurate flow limitation setting use flow/ heat meter.

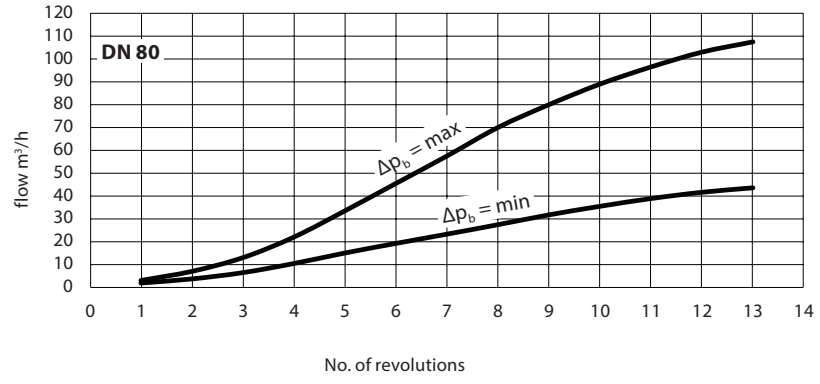
Differential pressure setting
Differential pressure setting is being done by the adjustment of the setting spring for diff. pressure control. This is done by rotating the differential pressure setting nut. Set differential pressure should be checked by observing the pressure indicators.

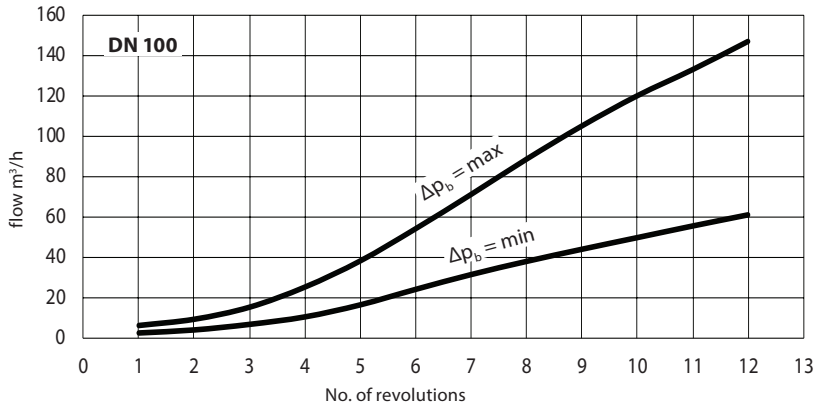
Flow limiting

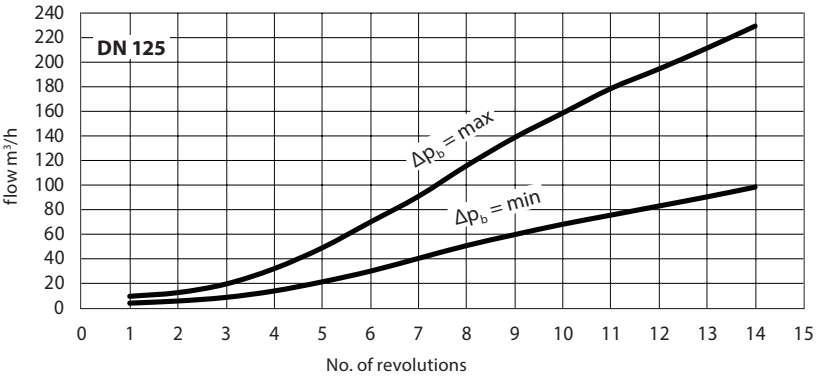


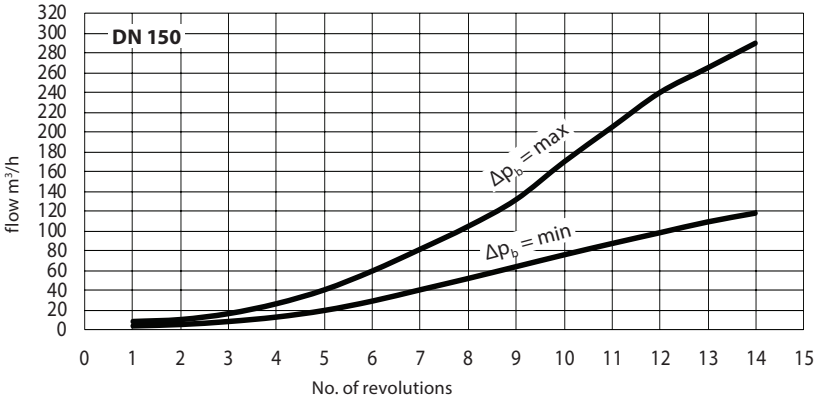


Flow limiting *(continuous)*

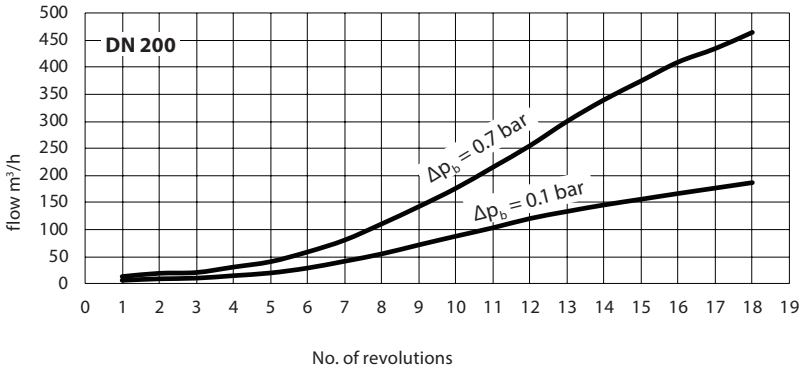


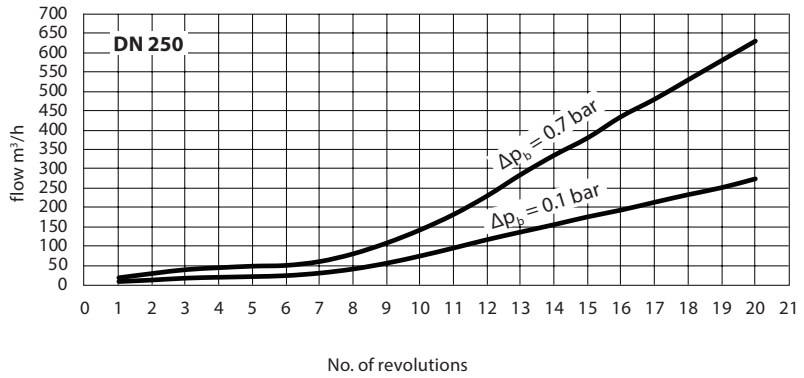






Flow limiting *(continuous)*





Function

Flow control

Flow control cone adjusts the flow by opening and closing. This action is provided by an electric actuator. The max flow is limited by limiting the maximal opening of the flow control cone. This is done by rotating the flow limitation nut. The pressure independent flow control is achieved by maintaining a constant differential pressure over the flow control cone.

The differential pressure over the flow control cone is lead to the pressure actuator diaphragm through the impulse tubes. It is factory preset.

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

When differential pressure over the flow control cone:

a) rises, the pressure control cone takes over the exceeded differential pressure by closing, until set differential pressure over the flow control cone is reached.

b) drops, the pressure control cone compensates the missing differential pressure by opening, until set differential pressure over the flow control cone is reached.

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

Differential pressure control

Is achieved by maintaining a constant differential pressure over the control valve.

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:

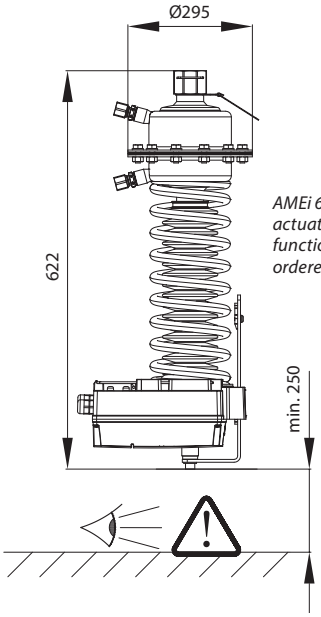
a) rises, the pressure control cone takes over the exceeded differential pressure by closing, until set differential pressure over the control valve/ application is reached.

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.

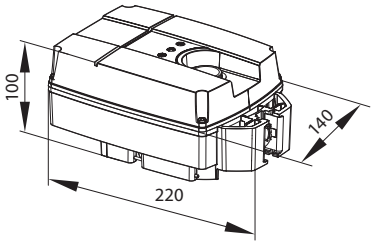
Dimensions

AFQMP 2 pressure actuator

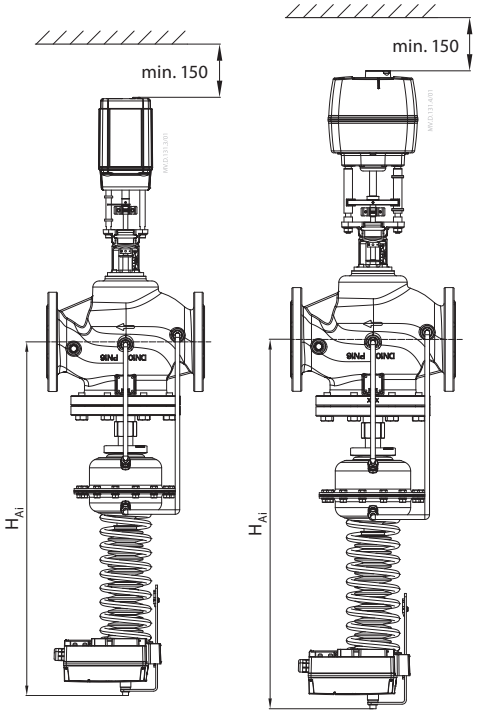


AMEi 6 intelligent actuator with iSET/iNET functionality should be ordered separately

AMEi 6 iSET/iNET electric actuator

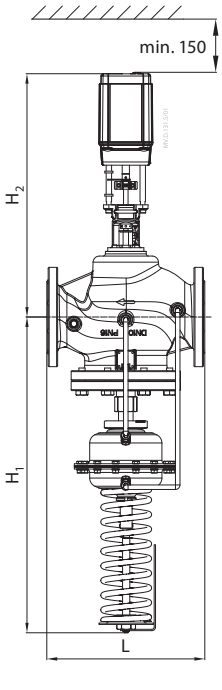


DN	L	H_1	H_2	H_3	H_{AI}	**Valve weight** (kg)		
	mm					PN 16	PN 25	PN 40
65	290	670	520	545	770	39	51	54
80	310	670	520	545		44	56	59
100	350	705	545	575	805	63	76	81
125	400	710	580	610	810	82	94	102
150	480	775	610	635	875	138	159	174
200	600	810	665	695	910	245	267	295
250	730	870	680	705	970	397	424	478

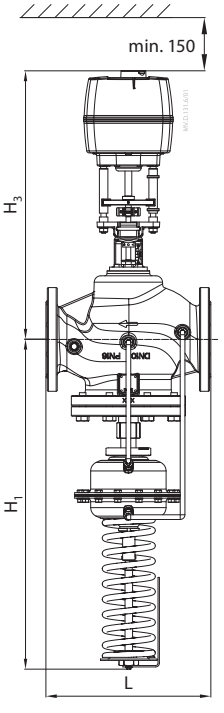


AMV(E) 55, 56/ AMEi 6 iSET/iNET AFQMP 2 DN 65-125

AMV(E) 65X/ AMEi 6 iSET/ iNET AFQMP 2 DN 65-250



AMV(E) 55, 56/AFQMP 2 DN 65-125



AMV(E) 65X/AFQMP 2 DN 65-250

Danfoss A/S
Climate Solutions • danfoss.com • +45 7488 2222