

## Data sheet

# Pressure independent control valve with integrated flow limiter AFQM 2 - return and flow mounting

## Description



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AFQM 2 is a self-acting flow controller with integrated control valve developed for the use in district heating / cooling systems. The controller prevents flow to exceed set max flow. In a combination with electrical actuators AMV(E) and ECL electronic controllers the flow and temperature can be controlled to achieve highest energy savings.

AFQM 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:

- AFQM 2 DN 65-250
  - AMV(E) 655 without spring return function and with manual operation;
  - AMV(E) 658 SD<sup>2)</sup> spring return function and manual operation;
  - AMV(E) 659 SD<sup>1)</sup> spring return function;
  - AMV(E) 55
- AFQM 2 DN 65-125
  - AMV(E) 56

<sup>1)</sup> DIN approved (according to EN 14597)

<sup>2)</sup> not DIN approved

**Main data:**

- DN 65-250
- $k_{vs}$  60-800 m<sup>3</sup>/h
- Flow range 3.0-500 m<sup>3</sup>/h
- PN 16, 25, 40
- Differential pressure over the flow control cone  $\Delta p_{MCV}$ :
  - 0.2 bar (standard version) or
  - 0.5 bar (high flow version)
- Temperature:
  - Circulation water / glycolic water up to 30 %: 2 ... 150°C
- Connections: Flange

Ordering

Example:  
Flow controller with integrated control valve for flow rate, DN 65,  $k_{vs}$  60, PN 16, flow restrictor  $\Delta p_{MCV}$  0.2 bar,  $T_{max}$  150 °C, flange

- 1x AFQM 2 DN 65 controller  
Code No.: **003G5500**

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

AFQM 2 Controller

Picture	DN	$Q_{max}$		PN	Connection	Code No.	
		$\Delta p_{MCV}=0.2$ bar	$\Delta p_{MCV}=0.5$ bar			$\Delta p_{MCV}=0.2$ bar	$\Delta p_{MCV}=0.5$ bar
	65	28	42	16	Flange EN 1092-1	<b>003G5500</b>	<b>003G5501</b>
	80	40	60			<b>003G5502</b>	<b>003G5503</b>
	100	63	95			<b>003G5504</b>	<b>003G5505</b>
	125	100	150			<b>003G5506</b>	<b>003G5507</b>
	150	160	240			<b>003G5508</b>	<b>003G5509</b>
	200	270	340			<b>003G5510</b>	<b>003G5511</b>
	250	360	500	25		<b>003G5512</b>	<b>003G5513</b>
	65	28	42			<b>003G5514</b>	<b>003G5515</b>
	80	40	60			<b>003G5516</b>	<b>003G5517</b>
	100	63	95			<b>003G5518</b>	<b>003G5519</b>
	125	100	150			<b>003G5520</b>	<b>003G5521</b>
	150	160	240			<b>003G5522</b>	<b>003G5523</b>
	200	270	340	40		<b>003G5524</b>	<b>003G5525</b>
	250	360	500			<b>003G5526</b>	<b>003G5527</b>
	65	28	42			<b>003G5528</b>	<b>003G5529</b>
	80	40	60			<b>003G5530</b>	<b>003G5531</b>
	100	63	95			<b>003G5532</b>	<b>003G5533</b>
	125	100	150			<b>003G5534</b>	<b>003G5535</b>
	150	160	240	250	<b>003G5536</b>	<b>003G5537</b>	
	200	270	340		<b>003G5538</b>	<b>003G5539</b>	
250	360	500	<b>003G5540</b>		<b>003G5541</b>		

Service kits

Picture	Type	$k_{vs}$ (m <sup>3</sup> /h)	PN	DN	Code No.
	Pressure control insert VFG/Q 221	60	16/25/40	65	<b>003G1807</b>
		80		80	<b>003G1808</b>
		160		100	<b>003G1809</b>
		250		125	<b>003G1810</b>
		380		150	<b>003G1811</b>
		650		200	<b>003G1812</b>
		800		250	<b>003G1813</b>
	Flow stuffing box VFG/Q 22			65-125	<b>003G1720</b>
				100-125	<b>003G1721</b>
				150-250	<b>003G1722</b>
	Pressure stuffing box VFG/Q 22(1)			65-125	<b>003G1730</b>
				150-200	<b>003G1731</b>
				250	<b>003G1732</b>

Picture	Type	PN	$\Delta p_{MCV}$ (bar)	Actuator size (cm <sup>2</sup> )	Code No.
	Pressure actuator	16	0.2	160	<b>003G5600</b>
			0.5		<b>003G5601</b>
			0.2	320	<b>003G5596</b>
			0.5		<b>003G5597</b>
		40	0.2	160	<b>003G5602</b>
			0.5		<b>003G5603</b>
			0.2	320	<b>003G5598</b>
			0.5		<b>003G5599</b>

Picture	Type	For controller	for valve DN (mm)	PN (bar)	Code No.
	Impulse tubes	AFQ 2	65	40	<b>003G1843</b>
			80		<b>003G1850</b>
			100		<b>003G1851</b>
			125		<b>003G1852</b>
			150		<b>003G1853</b>
			200		<b>003G1854</b>
			250		<b>003G1855</b>

Technical data

AFQM 2 valve

Nominal diameter		DN	65	80	100	125	150	200	250	
k <sub>VS</sub> value		m <sup>3</sup> /h	60	80	160	250	380	650	800	
Range of flow setting	Δp <sub>MCV</sub> <sup>1)</sup> = 0.2 bar	Q <sub>min</sub>	m <sup>3</sup> /h	3	4	8	12	19	27	36
		Q <sub>max</sub>	m <sup>3</sup> /h	28	40	63	100	160	270	360
		Δp <sub>AFQM</sub> <sup>2)</sup>	bar	0.45		0.4		0.45		
	Δp <sub>MCV</sub> <sup>1)</sup> = 0.5 bar	Q <sub>min</sub>	m <sup>3</sup> /h	4	6	11	18	24	31	45
		Q <sub>max</sub>	m <sup>3</sup> /h	42	60	95	150	240	340	500
		Δp <sub>AFQM</sub> <sup>2)</sup>	bar	1.0		0.9		0.8		
Stroke		mm	12	19		23		28	32	
Control valve authority		1 (100 %) in the range of flow setting								
Control characteristic		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 <sub>VS</sub>	≤ 0.01							
Nominal pressure		PN	16, 25, 40							
Min. differential pressure			see remark <sup>3)</sup>							
Max. differential pressure PN 16		bar	16	16	15	15	12	10	10	
Max. differential pressure PN 25/40			20	20						
Pressure relief system		Chamber relieved								
Media		Circulation water / Glycolic water up to 30 %								
Media pH		Min.7, max.10								
Media temperature		°C	2 ... 150							
Connections		Flange								
<b>Materials</b>										
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								

**Note:**

DP-diff. pressure over the pressure control cone, CV-diff. pressure over the flow control cone

<sup>1)</sup> Δp<sub>MCV</sub> - differential pressure over flow restrictor

<sup>2)</sup> Δp<sub>AFQM</sub> - diff. pressure required for Q<sub>max</sub>

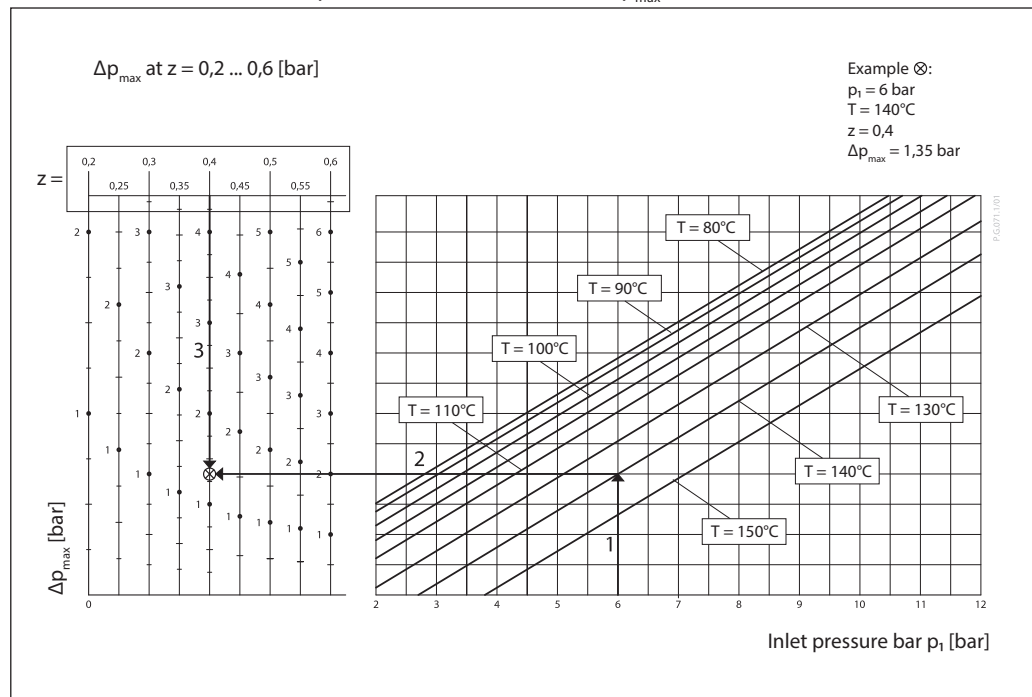
<sup>3)</sup> For flows smaller than Q<sub>max</sub> -> Δp<sub>AFQM</sub> =  $\left(\frac{Q}{k_{VS}}\right)^2 + \Delta p_{MCV}$

AFQM 2 actuator

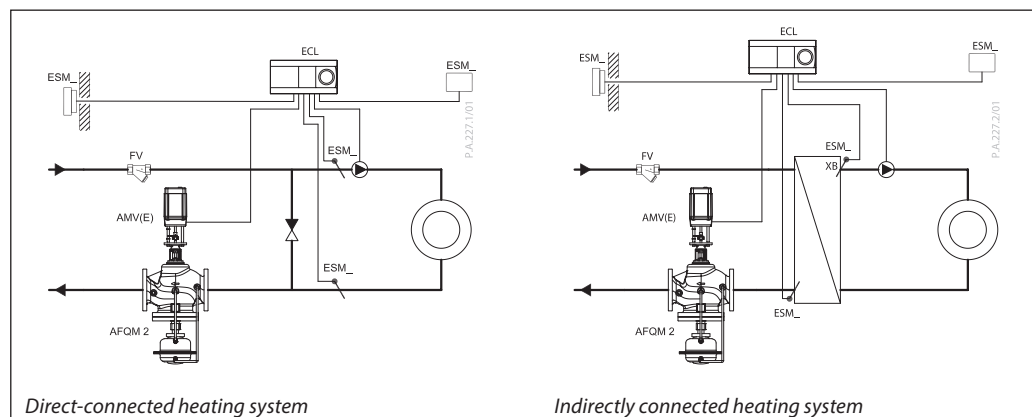
For valve	DN	65	80	100	125	150	200	250	
Actuator size	cm <sup>2</sup>	160				320			
Max. operational pressure	bar	16 or 40							
Differential pressure over the flow control cone Δp <sub>MCV</sub>		0.2 or 0.5							
<b>Materials</b>									
Housing	Steel, mat. No. 1.0345, zinc plated								
Diaphragm	EPDM (Rolling; fibre enforced)								
Impulse tube	Stainless steel tube Ø10 × 0.8 mm								

Operating area

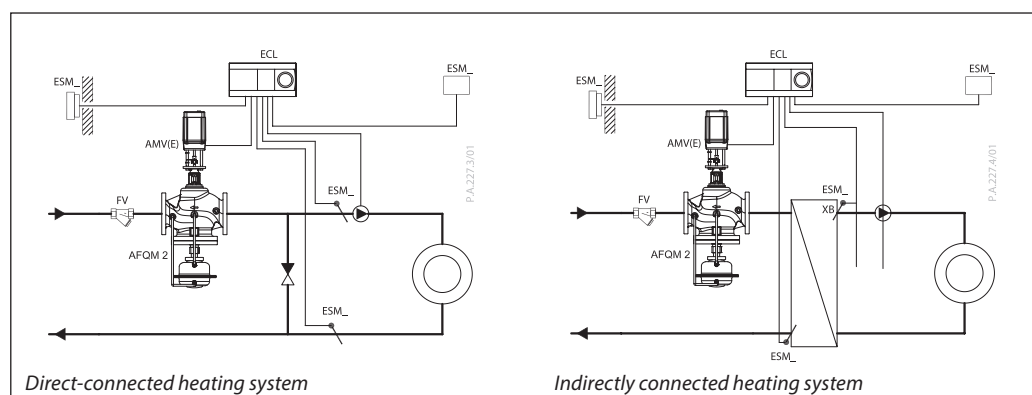
Maximum allowed differential pressure over the controller ( $\Delta p_{max}$ ) at different cavitation factors ( $z$ )



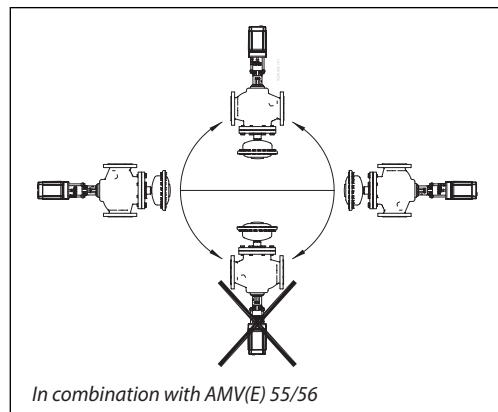
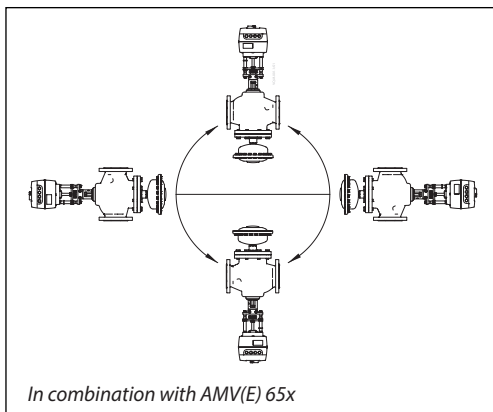
Application principles  
 - Return mounting



- Flow mounting



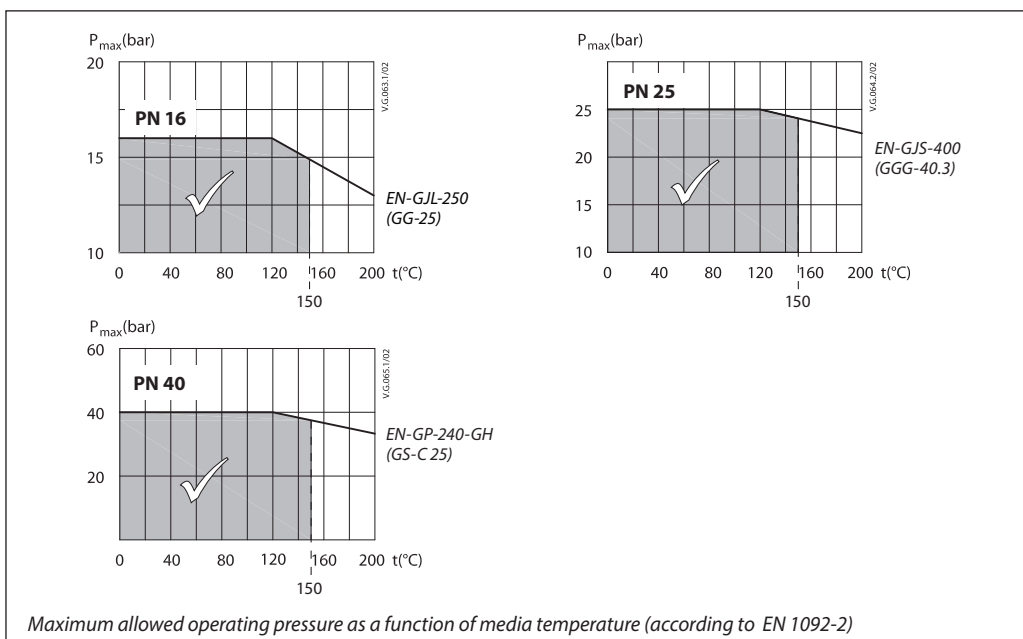
Installation positions



Note!

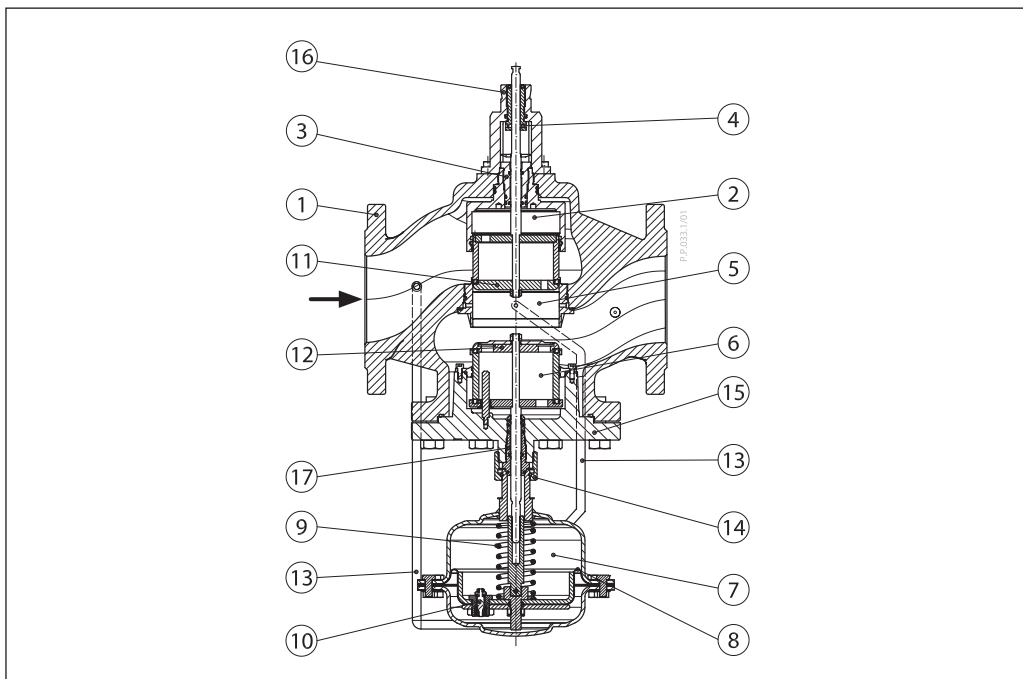
Installation positions for electrical actuators AMV(E) have to be observed as well. Please see relevant Data sheet.

Pressure temperature diagram



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



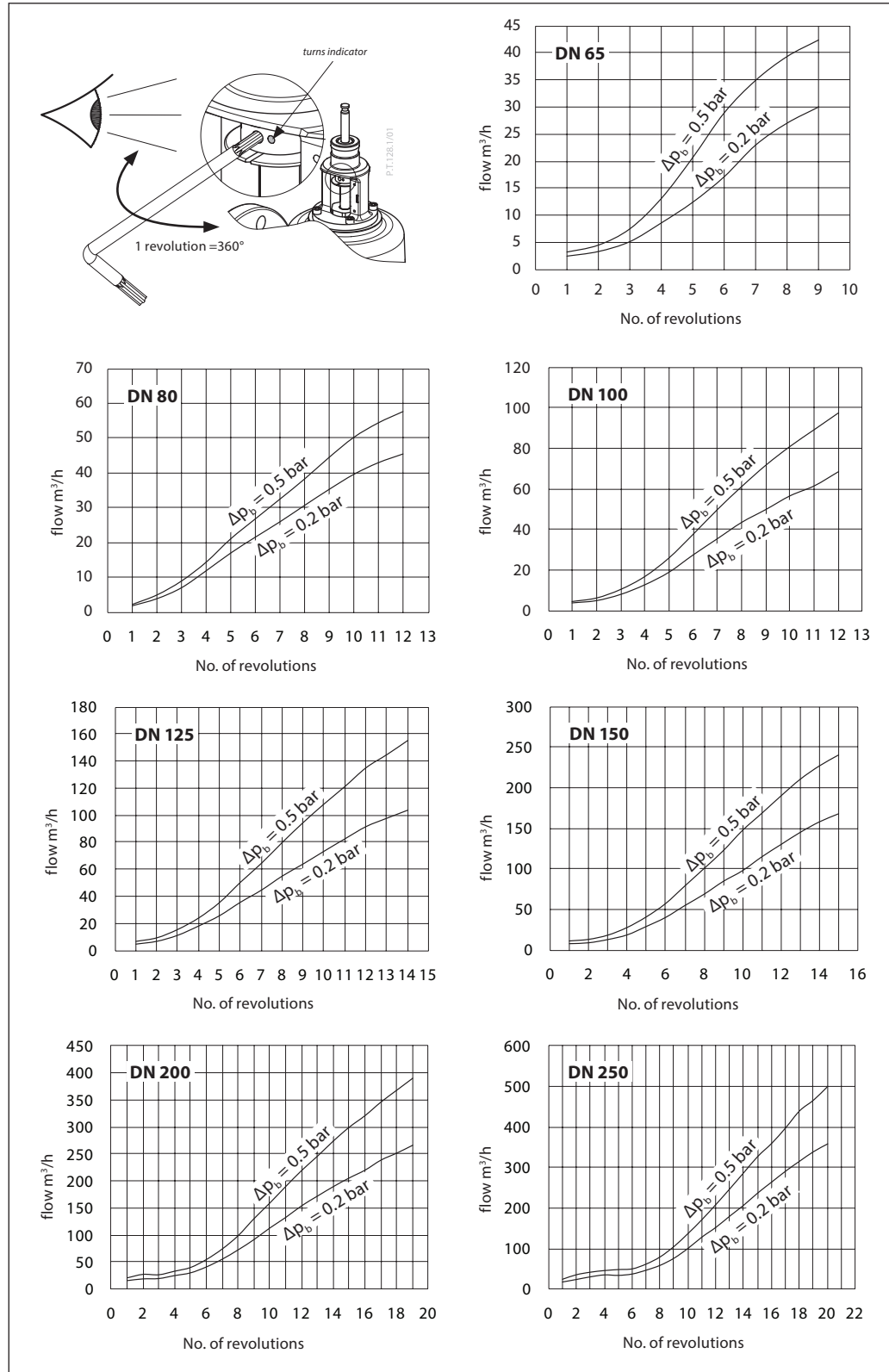
Settings

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

Flow limiting curves in diagrams represent informational values, for more accurate flow limitation setting use flow/heat meter.

Flow limiting



**Function**

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.

**Dimensions**

AMV(E) 55/AFQM 2 DN 65-250, PN 16/25/40  
AMV(E) 56/AFQM 2 DN 65-125, PN 16/25/40

AMV(E) 65X/AFQM 2  
DN 65-250, PN 16/25/40

DN	L	mm				Valve weight (kg)		
		H <sub>1</sub> (PN16)	H <sub>1</sub> (PN25/40)	H <sub>2</sub>	H <sub>3</sub>	PN 16	PN 25	PN 40
65	290	355	360	520	545	36	48	51
80	310	355	360	520	545	41	53	56
100	350	395	400	545	575	60	73	78
125	400	395	400	580	610	79	91	99
150	480	460	465	610	635	135	156	171
200	600	495	500	665	695	242	264	293
250	730	555	560	680	703	394	421	475



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