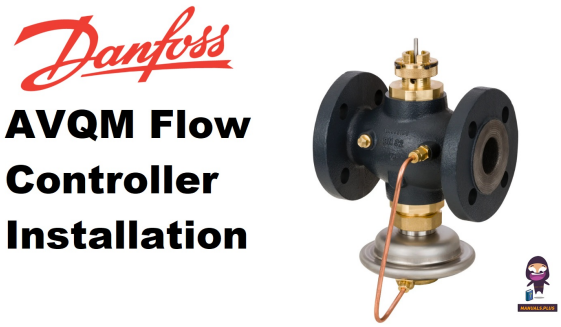

Danfoss AVQM Flow Controller Installation Guide

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3 Technical data
4 Combinations
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Danfoss AVQM Flow Controller Installation

Flow and temperature controller with integrated control valve, WE-version (PN 25)

- **AVQM-WE** – f low controller with integrated control valve
- **AVQMT-WE** – f low and temperature controller with integrated control valve

Description

AVQM-WE
DN 15-25

AVQM-WE
DN 32-50

AVQMT-WE
DN 15-25

- **AVQM-WE** is a self-acting flow controller with integrated control valve primarily for use in district heating systems. The controller closes when set max. flow is exceeded.
- **AVQMT-WE** is a self-acting flow and temperature controller with integrated control valve primarily for use in

district heating systems. The controller closes on rising temperature or when set max. flow is exceeded. All controllers have special designed (pressure relieved) control valve insert.

- **AVQM-WE** controller can be combined with Danfoss electrical actuators AMV(E) (and controlled by ECL electronic controllers).
- **AVQMT-WE** controller can be combined with Danfoss electrical actuators AMV(E) (and controlled by ECL electronic controllers) and with AVT or STM thermostatic actuators.

The controllers have a control valve with adjustable flow restrictor, connection neck for electrical actuator, connection neck for thermostat (AVQMT-WE only), and an actuator with one control diaphragm.

AVQM-WE and AVQMT-WE are used together with Danfoss electrical actuators:

- AMV 150 1)
- AMV(E) 10 1) / AMV(E) 20 / AMV(E) 30
- AMV(E) 13 1) / AMV(E) 23 / AMV(E) 33 with spring return function
- AMV 20 SL / AMV 23 SL / AMV 30 SL with stroke limitation

AMV 150 / AMV(E) 10 / AMV(E) 13 can be combined with DN 15 controller only.

AVQM(T)-WE combined with AMV(E) 13, AMV(E) 23 (SL) or AMV(E) 33 (SL) has been approved according to DIN 32730. The controllers combined with AVT and STM thermostats are type-tested acc. to EN 14597. Controllers combined with STM thermostats protect systems against exceeding temperatures.

Applications:

- District heating systems acc. to DIN 4747
- Heating systems acc. to EN 12828 (DIN 4751) and EN 12953-6 (DIN 4752)
- Water heating systems for drinking and industrial waters acc. to DIN 4753

Main data:

- DN 15-50
- kVS 2.5-25 m3/h
- PN 25
- **Setting ranges:**
  - AVT thermostat:
  - 10 … 40 °C / 20 … 70 °C / 40 … 90 °C / 60 … 110 °C and 10 … 45 °C / 35 … 70 °C / 60 … 100 °C / 85 … 125 °C
  - STM monitor 20 … 75 °C / 40 … 95 °C / 30 … 110 °C
- **Flow restrictor** Δp: 0.2 bar
- **Temperature:**
  - Circulation water / glycolic water up to 30%: 2 … 150 °C
- **Connections:**
  - Ext. thread (weld-on, thread and flange tailpieces)
  - Flange

- Flow and return mounting.

Ordering

Example 1 – AVQM-WE controller:
Flow controller with integrated control valve; DN 15; kVS 2.5; PN 25; flow restrictor Δp 0.2 bar; Tmax 150 °C; ext. thread

- 1× AVQM-WE DN 15 controller Code No: 003H7080

Option: 1× Weld-on tailpieces Code No: 003H6908

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

Example 2 –
AVT (or STM) / AVQMT-WE controller: Flow and temperature controller with integrated control valve, DN 15; kVS 2.5; PN 25; setting range 40 … 90 °C; flow restrictor Δp 0.2 bar; Tmax 150 °C; ext. thread

- 1× AVQMT-WE DN 15 controller Code No: 003H7084
- 1× AVT thermostatic actuator, 40 … 90 °C Code No: 065-0598

Option:

- – 1× Weld-on tailpieces
  Code No: 003H6908

The controller AVQMT-WE will be delivered completely assembled, inclusive impulse tube between valve and actuator. Thermostatic actuator AVT will be delivered separately. Electrical actuator AMV(E) must be ordered separately. In case of safety temp. monitoring STM should be ordered instead of AVT.

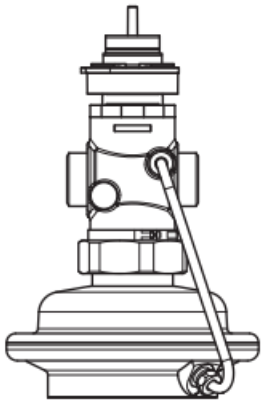
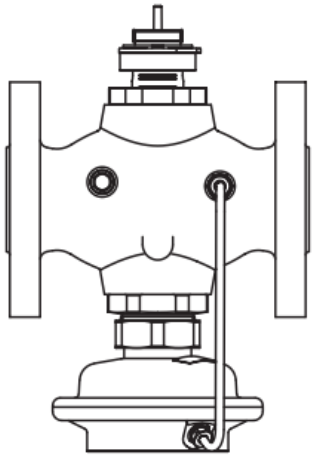
Example 3 –
STM / AVT / AVQMT-WE controller: Flow and temperature controller with safety temperature monitor and integrated control valve, DN 15, kVS 2.5; PN 25; setting range 40 … 90 °C; limit range 30 … 110 °C; flow restrictor Δp 0.2 bar; Tmax 150 °C; ext. thread

- 1× AVQMT-WE DN 15 controller Code No 0: 03H6787
- 1× AVT thermostatic actuator, 40 … 90 °C Code No 0: 65-0598
- 1× STM monitor, 30 … 110 °C Code No 0: 65-0608
- 1× K2 Combination piece Code No 0: 03H6855

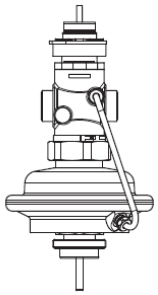
Option: 1× Weld-on tailpieces Code No: 003H6908

The controller AVQMT-WE will be delivered completely assembled, inclusive impulse tube between valve and actuator. Combination piece K2, thermostats AVT and STM will be delivered separately. Electrical actuator AMV(E) must be ordered separately.

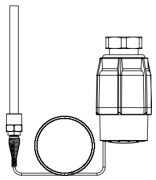
AVQM-WE Controller

Picture	DN (mm)	Kvs (m³/h)	Connection	Code No.
	15	2.5	G ¾ A	003H7080
	15	4.0	Cylindrical external thread acc. to ISO 228/1	003H7081
	20	6.3	G1 A	003H7082
	20	8.0	G 1¼ A	003H7083
	25 / 32 / 40	12.5		003H7088
	20		Flanges PN 25, acc. to EN 1092-2	003H7089
	50	25		003H7090

AVQMT-WE Controller

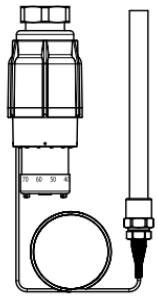
Picture	DN (mm)	kVS (m^3/h)	Connection		Code No.
	15	2.5	Cylindr. ext. thread acc. to ISO 228/1	G ¾ A	**003H7084**
		4.0			**003H7085**
	20	6.3		G 1 A	**003H7086**
	25	8.0		G 1¼ A	**003H7087**

AVT Thermostatic actuator

Picture	For valves	Setting range (°C)	Temperature sensor with brass immersion pocket, length, connection	Code No.
	DN 15-25	–10 … +40	170 mm, R ½ [1]	**065-0596**
		20 … 70		**065-0597**
		40 … 90		**065-0598**
		60 … 110		**065-0599**
		10 … 45	255 mm, R ¾ [1] [2]	**065-0604**
		35 … 70		**065-0605**
		60 … 100		**065-0606**
		85 … 125		**065-0607**

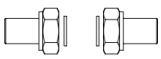
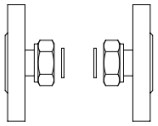
1. conic male thread EN 10226-1
2. without immersion pocket

STM Safety temperature monitor (actuator)

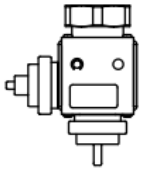
Picture	For valves	Limit range (°C)	Temperature sensor with brass immersion pocket, length, connection	Code No.
	DN 15-25	30 … 110	210 mm, R ¾ [1)]	**065-0608**
		20 … 75		**065-0609**
		40 … 95		**065-0610**

conic male thread EN 10226-1

Accessories for valves

Picture	Type designation	DN	Connection		Code No.
	Weld-on tailpieces	15	–		**003H6908**
		20			**003H6909**
		25			**003H6910**
	External thread tailpieces	15	Conical ext. thread acc. to EN 10226-1	R ½	**003H6902**
		20		R ¾	**003H6903**
		25		R 1	**003H6904**
	Flange tailpieces	15	Flanges PN 25, acc. to EN 1092-2		**003H6915**
		20			**003H6916**
		25			**003H6917**

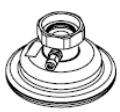
Accessories for thermostats

Picture	Type designation	PN	For thermo stats	Material	Code No.
	Immersion pocket	25	AVT	Brass	**065-4414** [1)]
				Stainless steel, mat. No. 1.4571	**065-4415** [1)]
			STM	Brass	**065-4416** [1)]
				Stainless steel, mat. No. 1.4435	**065-4417** [1)]
	Combination piece K2				**003H6855**

Not for AVT thermostatic actuator code numbers: 065-0604, 065-0605, 065-0606, 065-0607

Service kits

Picture	Type designation	DN	k_{VS} (m³/h)	Code No.
	Valve insert [1)]	15	2.5	**003H6863**
			4.0	**003H6864**
		20	6.3	**003H6865**
		25	8.0	**003H6866**
		32/40/50	12.5/20/25	**003H6868**
	Control valve insert [1)]	15	2.5	**003H6988**
			4.0	**003H6989**
		20	6.3	**003H6990**
		25	8.0	**003H6991**
		32/40/50	12.5/20/25	**003H6992**

	Type designation	For controller	Δp settin range (bar)	Code No.
	Actuator	AVQM-WE	0.2	**003H6841**
		AVQMT-WE		**003H6843**

		for sensors	
	Housing of sensor stuffing box	AVT R ½	**065-4420**
		AVT R ¾	**065-4421**

Technical data

Valve

Nominal diameter			**DN**	**15**		**20**	**25**	**32**	**40**	**50**
kVS value of dp controller				2.5	4.0	6.3	8.0	12.5	16/20[1)]	20/25[1)]
Range of max. flow setting	pMCV = 0.2 bar	Qmin	m^3/h	0.07	0.07	0.16	0.2	0.4	0.8	0.8
		Qmax		1.6	2.4	3.5	4.5	10	10.5/12[1)]	12/14[1)]
Avalible p required for Qmax2)			bar	0.6	0.6	0.5	0.5	0.8	0.8/0.6[1)]	0.8/0.6[1)]
Stroke			mm	5		7		10		
Control valve authority				1 (100%) in the range of flow setting						
Control characteristic				Logarithmic						
Cavitation factor z				≥ 0.6			≥ 0.55		≥ 0.5	
Leakage acc. to standard IEC 534			% of kVS	≤ 0.02				≤ 0.05		
Nominal pressure			PN	25						
Min. differential pressure			bar	see remark [2)]						
Max. differential pressure				20				16		
Medium				Circulation water / glycolic water up to 30%						
Medium pH				Min. 7, max. 10						
Medium temperature			oC	2 … 150						
Connections	valve			External thread				Flange		
	tailpieces			Weld-on, external thread and flange				/		

Materials			
Valve body		Red bronze CuSn5Zn Pb (Rg5)	Ductile iron EN-GJS-400-18-LT (GGG 40.3)
Valve seat		Stainless steel, mat. No. 1.4571	
Valve cone		Dezincing free brass CuZn36Pb2As	
Sealing DP, CV		EPDM	
Pressure relieve system	Control valve insert	Piston	
	Valve insert		

Note: DP – diff. pressure controller, MCV – control valve

1. Flanged version
2. For flows smaller than

$$Q_{max} \rightarrow \Delta p_{min} = \left(\frac{Q}{k_{VS}} \right)^2 + \Delta p_{MCV}$$

Actuator

Type			AVQM-WE, AVQMT-WE
Actuator size		cm^2	54
Nominal pressure		PN	25
Flow restrictor diff. pressure		bar	0.2
Materials			
Housing	Upper housing of actuator		Stainless steel, mat. No.1.4301
	Lower housing of actuator		Dezincing free brass CuZn36Pb2As
Diaphragm			EPDM
Impulse tube			Copper tube Ø 6 × 1 mm

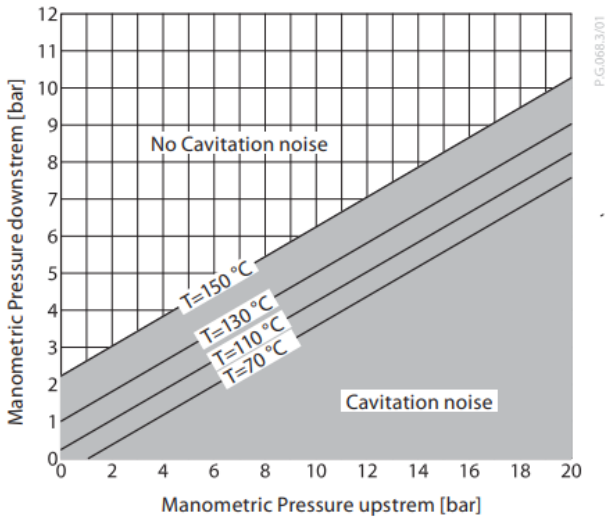
AVT Thermostatic actuator

Setting range Xs		°C	–10 … 40 / 20 … 70 / 40 … 90 / 60 … 110 10 … 45 / 35 … 70 / 60 … 100 / 85 … 125
Time constant T acc. to EN 14597		s	max. 50 (170 mm, max. 30 (255 mm)
Gain Ks		mm/°K	0.2 (170 mm); 0.7 (255 mm)
Max. adm. temperature at sensor			50 °C above maximum setpoint
Max. amb. temperature at thermostat		°C	0 … 70
Nominal pressure sensor		PN	25
Nominal pressure immerison pocket			
Capillary tube length			5 m (170 mm), 4 m (255 mm)
Materials			
Temperature sensor			Cooper
Immersion pocket [1)]	Ms design		Brass, nickel-plated
	Stainless steel design		Mat. No. 1.4571 (170 mm)
Handle for temp. setting			Polyamide, glass fiber-reinforced
Scale carrier			Polyamide

for sensor 170

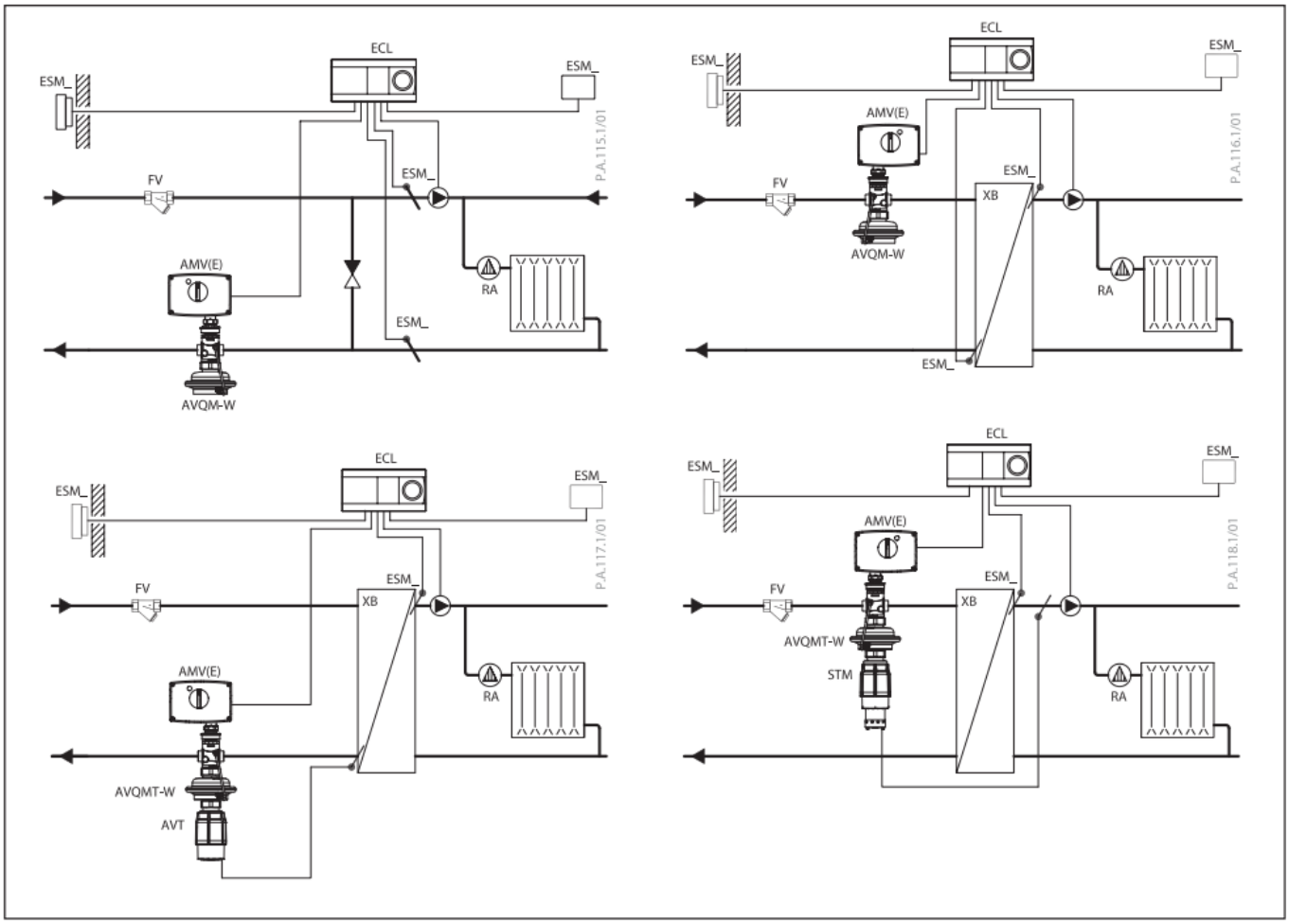
STM Safety temperature monitor (actuator)

Limit range Xs		°C	20 … 75 / 40 … 95 / 30 … 110
Time constant T acc. to EN 14597		s	max. 100
Gain Ks		m m/ °K	0.3
Max. adm. temperature at sensor			80 °C above maximum setpoint
Max. amb. temperature at thermostat		°C	0 … 70
Nominal pressure sensor		P N	25
Nominal pressure immerison pocket			
Capillary tube length		m	5
Materials			
Temperature sensor			Cooper
Immersion pocket	Ms design		Brass, nickel-plated
	Stainless steel design		mat. No. 1.4435
Handle for temp. setting			Polyamide, glass fiber-reinforced
Scale carrier			Polyamide



Cavitation area for cavitation factor z = 0.6

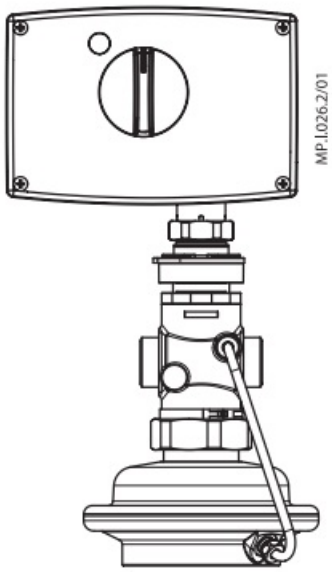
Application principles



Combinations

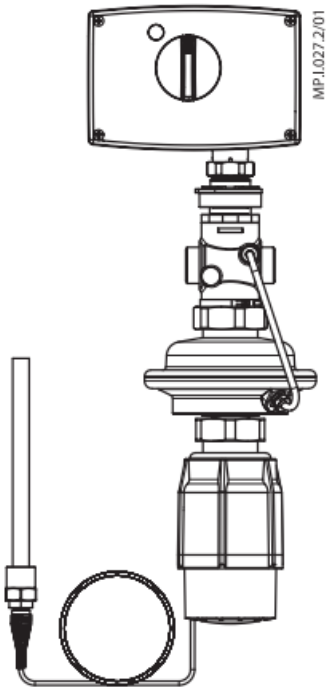
- **AVQM-WE** / **AMV(E)**

  Flow controller with electrical actuator



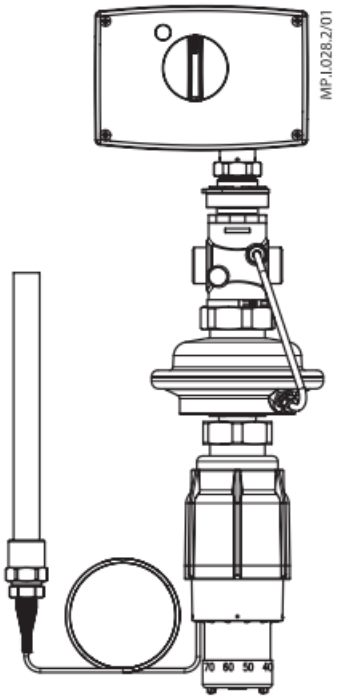
- **AVT** / **AVQMT-WE** / **AMV(E)**

  Flow and temperature controller with electrical actuator



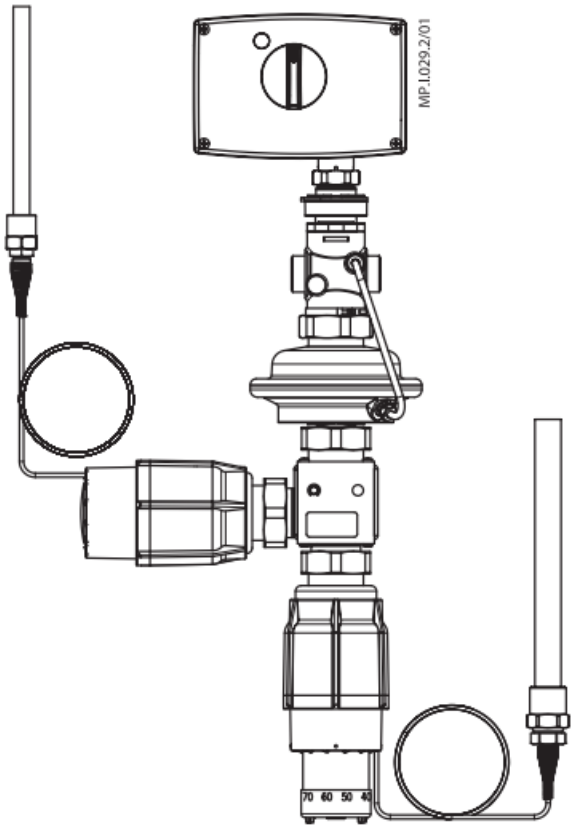
- **STM** / **AVQMT-WE** / **AMV(E)**

  Flow controller with safety temperature monitor and electrical actuator



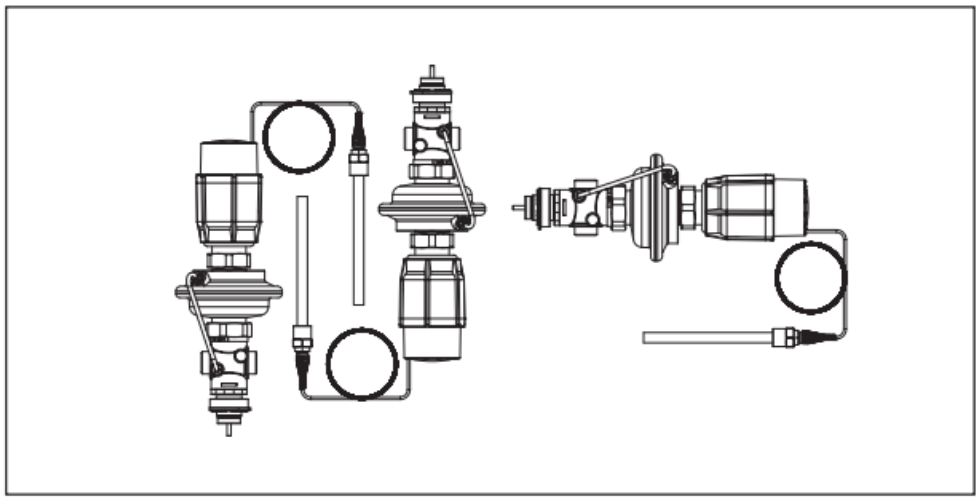
- **STM** / **AVT** / **AVQMT-WE** / **AMV(E)**

  Flow and temperature controller with safety temperature monitor and electrical actuator

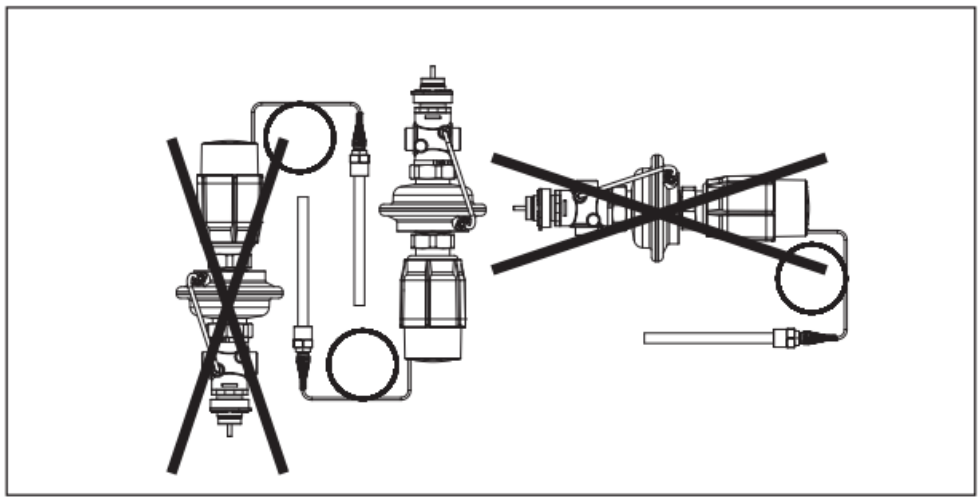


Installation positions

- Flow and temperature controller with integrated control valve (with AVT or STM)
- Up to medium temperature of 100 °C the controllers can be installed in any position.



- For higher temperatures the controllers have to be installed in horizontal pipes only, with a pressure and temperature actuator oriented downwards.

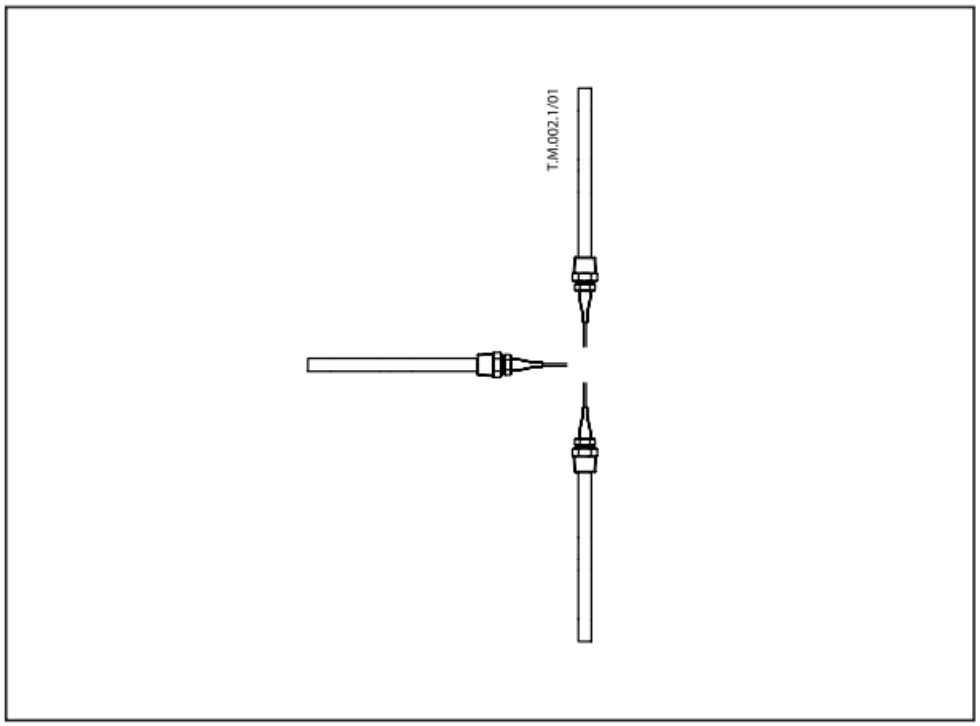


Electrical actuator
Note! Installation positions for electrical actuators AMV(E) have to be observed as well. Please see relevant Data sheet.

- **Temperature sensor**

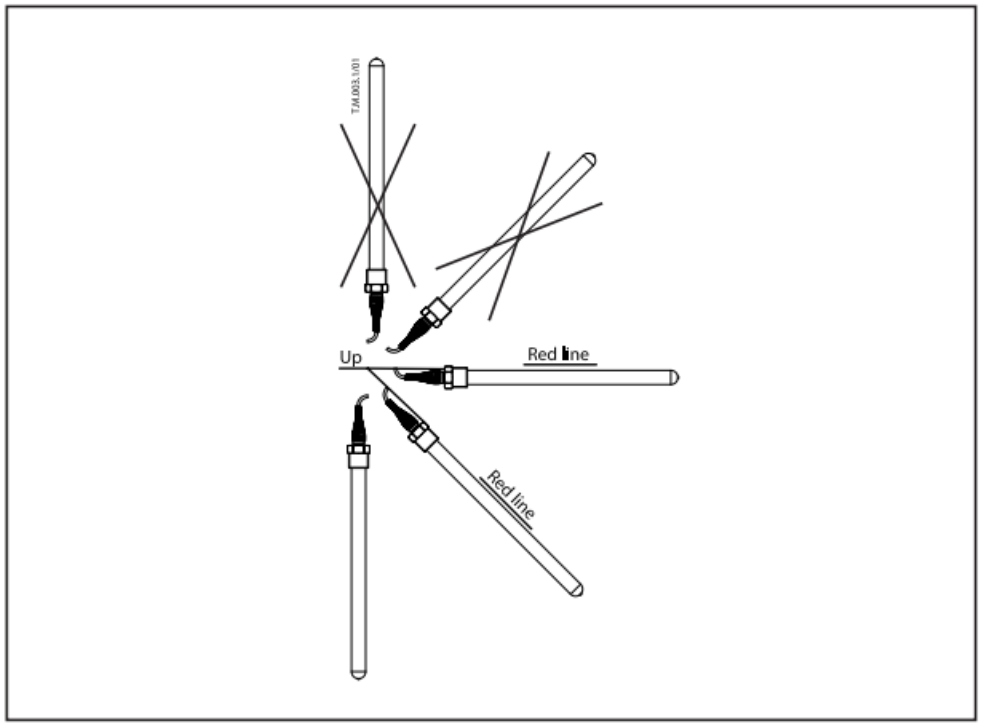
  The place of installation must be chosen in a way that the temperature of the medium is directly taken without any delay. Avoid overheating of temperature sensor. The temperature sensor must be immersed into the medium in its full length.
- **Temperature sensors 170 mm R½**

  The temperature sensor may be installed in any position.

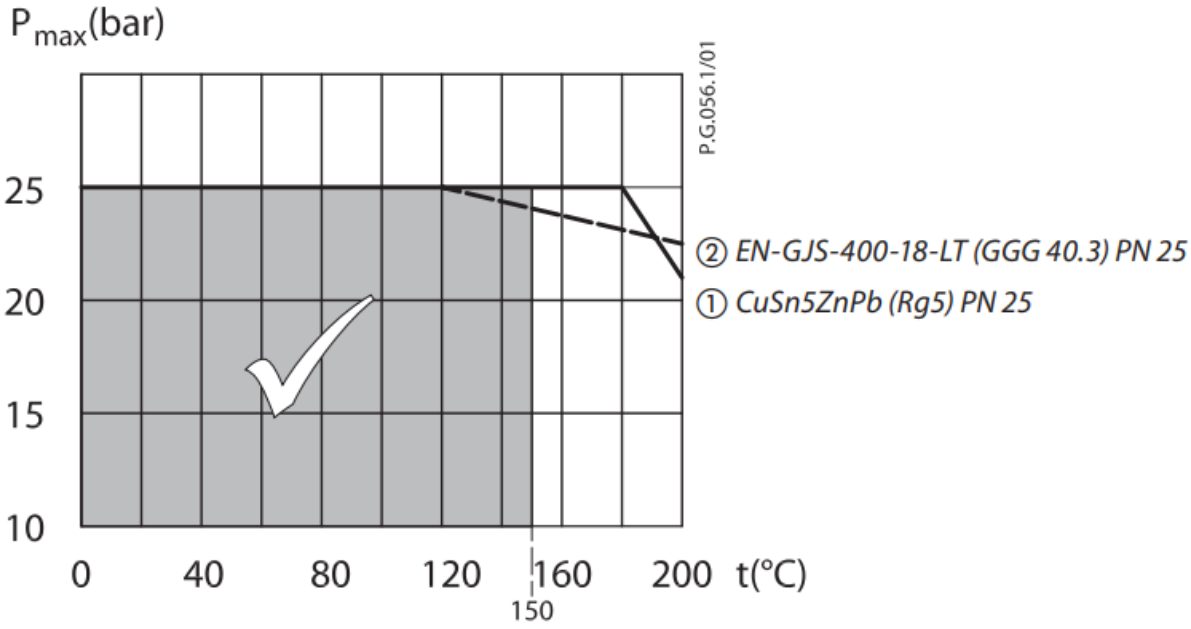


- **Temperature sensor 255 mm R¾**

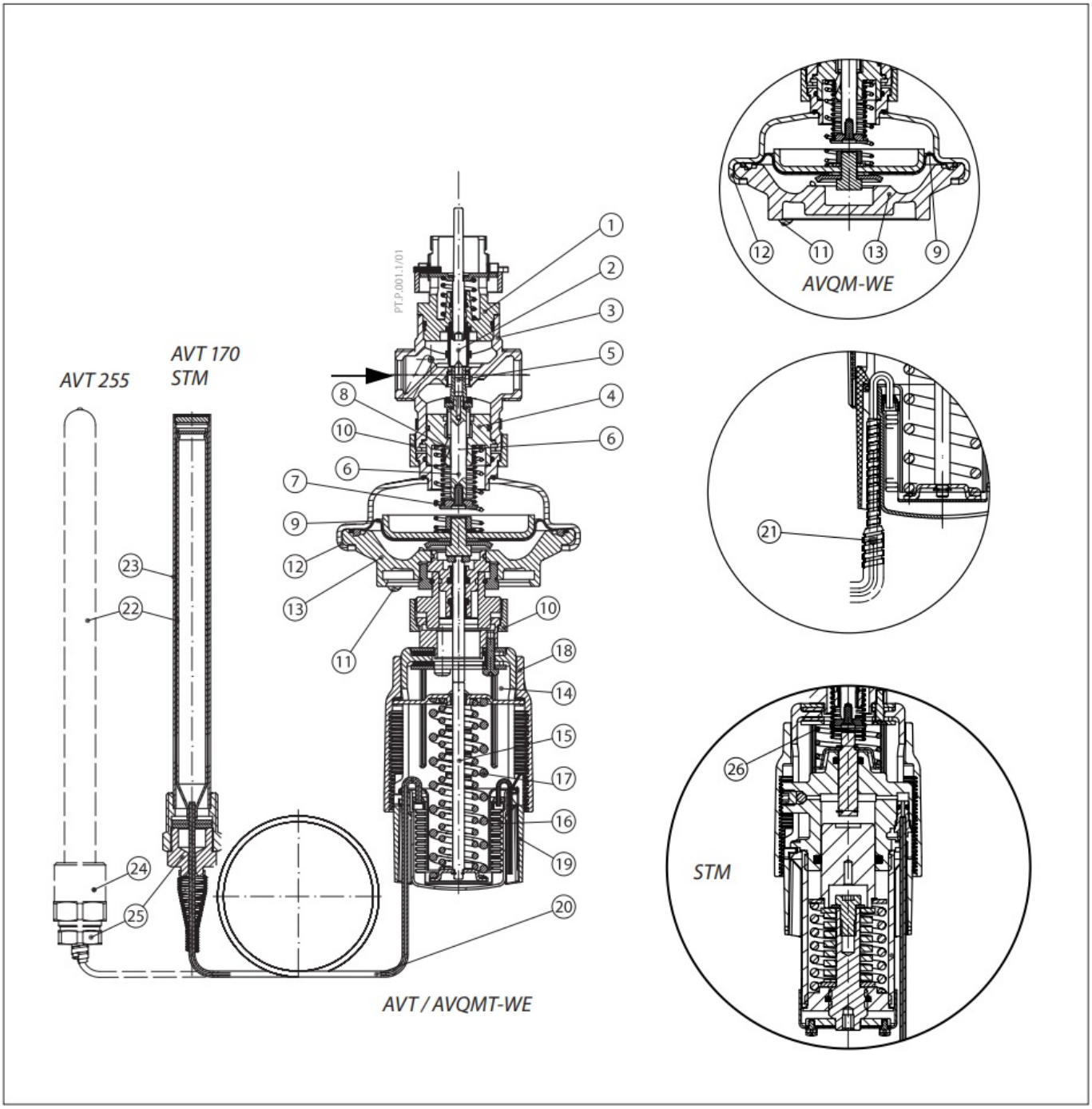
  The temperature sensor must be installed as shown on the picture.



Pressure temperature diagram



Design



1. Control valve insert
2. Adjustable flow restrictor
3. Valve body
4. Valve insert
5. Pressure relieved valve cone
6. Valve stem
7. Built-in spring for flow rate control
8. Control drain
9. Control diaphragm
10. Union nut
11. Impulse tube
12. Upper casing of diaphragm
13. Lower casing of diaphragm

14. Thermostat AVT, STM
15. Thermostat stem
16. Bellows
17. Setting spring for temperature control
18. Handle for temperature setting, prepared for sealing
19. Scale carrier
20. Capillary tube
21. Flexible protected pipe (at 255mm only)
22. Temperature sensor
23. Immersion pocket
24. Sensor stuffing box
25. Housing of sensor stuffing box
26. Safety spring

Function

- **Flow and temperature controller with integrated control valve (AVQM-WE, AVQMT-WE)**
  Flow volume causes pressure drop across the adjustable flow restrictor. Resulting pressures are being transferred through the impulse tubes and/or control drain in the actuator stem to the actuator chambers and act on control diaphragm for flow control. The flow restrictor diff. pressure is controlled and limited by means of built-in spring for flow control. Control valve closes on rising differential pressure and opens on falling differential pressure to control max flow. Additionally the electrical actuator will operate from zero to set max. flow according to the load.
- **Safety Temperature Monitor (STM): Function**
  The safety temperature monitor is proportional temperature controller which controls temperature and protects the system against exceeding temperatures. The valve cone is soft sealed and pressure relieved. In case the temperature at the temperature sensor exceeds the adjusted set point, safety temperature monitor interrupts energy supply by closing the valve. As soon as the temperature at the temperature sensor drops, the valve opens automatically. Handle for limit setting can be sealed.
- **Extended safety function**
  If there is a leakage in the area of the temperature sensor, the capillary tube, or the thermostat, the valve closes by a safety spring in the safety thermostat. In this case safety temperature monitor (actuator) must be replaced.
- **Physical Function Principle**
  The safety temperature monitor operates in accordance with the liquid expansionprinciple. The temperature sensor, the capillary tube and the bellows are filled with liquid. As the temperature at the temperature sensor rises, the liquid expands, the thermostat stem moves out and closes the valve.
- **Temperature Controller (AVT): Function**
  By increasing of medium temperature control valve cone moves towards the seat (valve closes), by decreasing of medium temperature valve cone moves away from the seat (valve opens). Handle for temperature setting can be sealed.
- **Physical Function Principle**
  Medium temperature changes cause pressure changes in temperature sensor. Resulting pressure is being transferred through the capillary tube to the bellows. Bellows moves thermostat stem and opens or closes the valve.

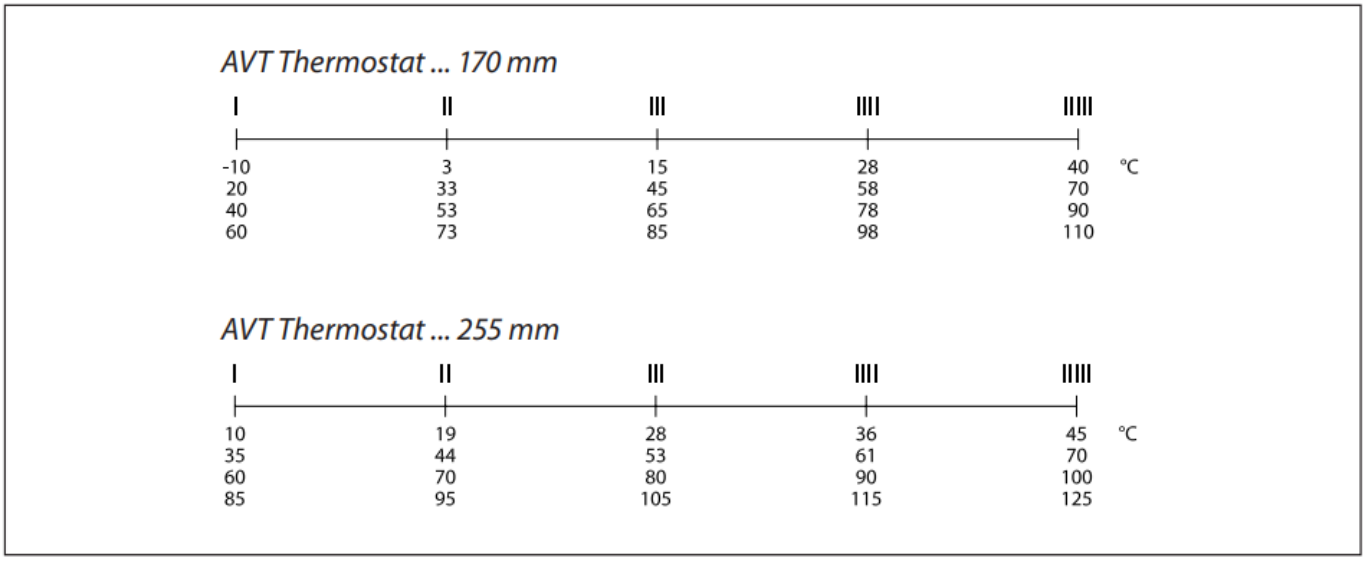
Settings

- **Flow setting**
  Flow setting is being done by the adjustment of the flow restrictor position. The adjustment can be performed on the basis of flow adjustment diagram (see relevant instructions) and/or by the means of heat meter.
- **Temperature setting (AVT)**
  Temperature setting is being done by the adjustment of the setting spring for temperature control. The adjustment can be done by means of handle for temperature setting and/or temperature indicators.
- **Limit setting (STM)**
  Limit setting is being done by the adjustment of the setting spring for temperature control. The adjustment can be done by means of handle for limit setting and/or temperature indicators.

Adjustment diagram

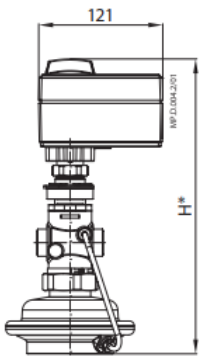
Temperature setting
Relation between scale numbers 1-5 and closing temperature.

Note: The values given are approximate

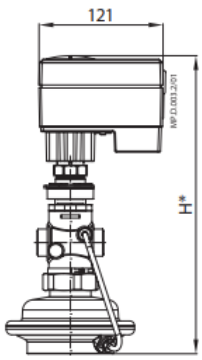


Note: STM Safety temperature monitor (actuator): temperature scale is already written on the product

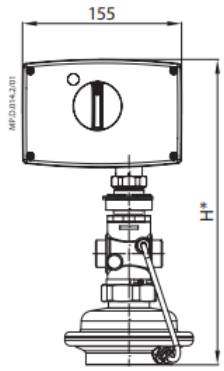
Dimensions



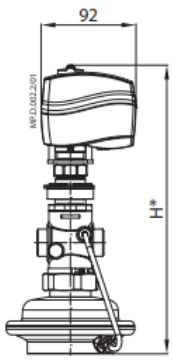
AMV(E) 10 +
AVQM-WE (DN 15)



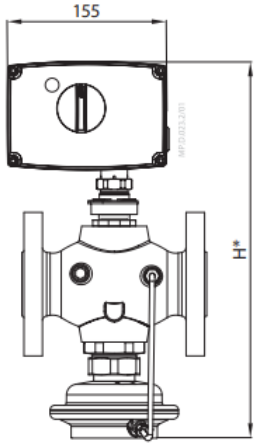
AMV(E) 13 +
AVQM-WE (DN 15)



AMV(E) 2./3. +
AVQM-WE (DN 15-25)

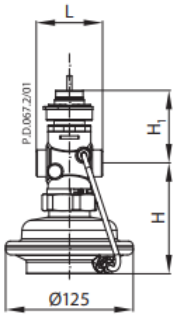


AMV 150 +
AVQM-WE (DN 15-25)

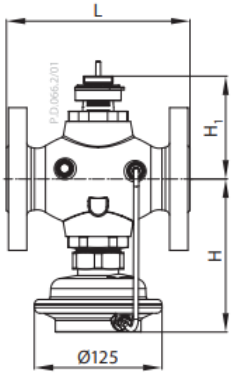


AMV(E) 2./3. +
AVQM-WE (DN 32-50)

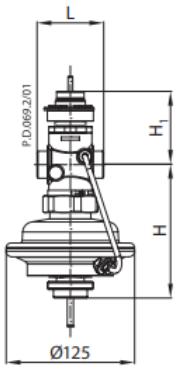
Type	DN			15	20	25	32	40	50
AVQM-WE	H*	AMV(E) 10	mm	292	-	-	-	-	-
		AMV(E) 13		295	-	-	-	-	-
		AMV(E) 2./3.		305	305	308	386	386	386
		AMV 150		293	-	-	-	-	-



AVQM (DN 15-25)



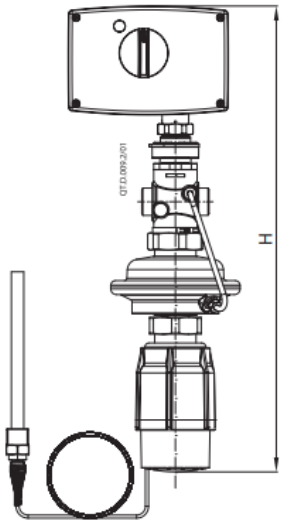
AVQM (DN 32-50)



AVQMT (DN 15-25)

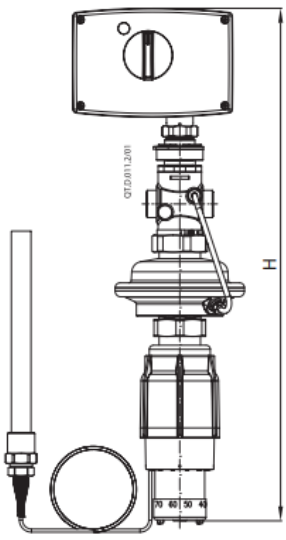
Type	DN		15	20	25	32	40	50
AVQM-WE	L	mm	65	70	75	180	200	230
	H		109	109	109	150	150	150
	H_1		76	76	79	101	101	101
	Valve weight	kg	3.0	3.0	3.2	10.3	11.8	13.9

Type	DN		15	20	25
AVQMT -WE	L	mm	65	70	75
	H		131	131	131
	H_1		76	76	79



AVT / AVQMT-WE / AMV(E)

DN			15	20	25
H	AMV/E 10	mm	442	-	-
	AMV/E 13		445	-	-
	AMV/E 2.,/3.		455	455	458



STM / AVQMT-WE / AMV(E)

DN			15	20	25
H	AMV/E 10	mm	486	-	-
	AMV/E 13		489	-	-
	AMV/E 2.,/3.		499	499	502

Adjustment diagram

Temperature setting

Relation between scale numbers 1-5 and closing temperature.

Note: The values given are approximate

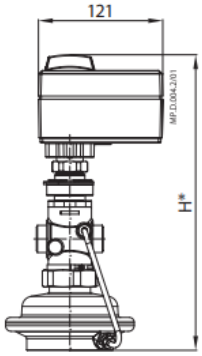
AVT Thermostat ... 170 mm

I	II	III	IIII	IIIII	
-10	3	15	28	40	°C
20	33	45	58	70	
40	53	65	78	90	
60	73	85	98	110	

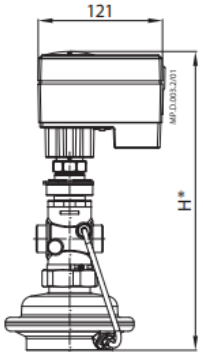
AVT Thermostat ... 255 mm

I	II	III	IIII	IIIII	
10	19	28	36	45	°C
35	44	53	61	70	
60	70	80	90	100	
85	95	105	115	125	

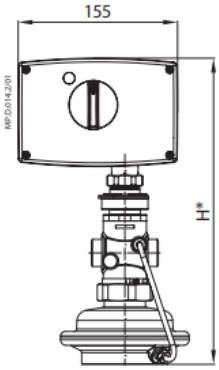
Note: STM Safety temperature monitor (actuator): temperature scale is already written on the product



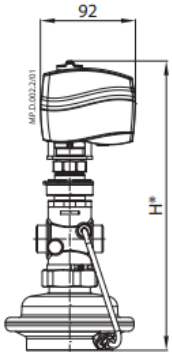
AMV(E) 10 + AVQM-WE (DN 15)



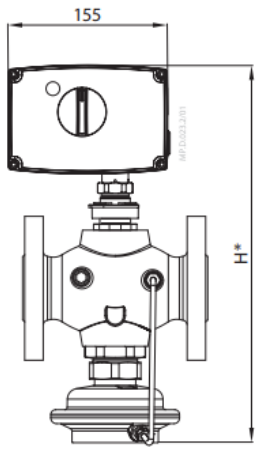
AMV(E) 13 + AVQM-WE (DN 15)



AMV(E) 2./3. + AVQM-WE (DN 15-25)

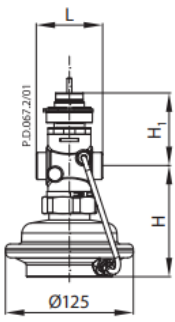


AMV 150 + AVQM-WE (DN 15-25)

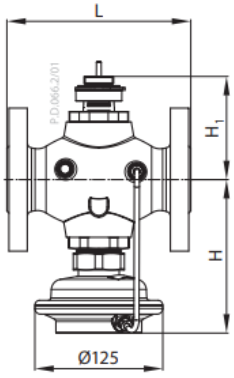


AMV(E) 2./3. + AVQM-WE (DN 32-50)

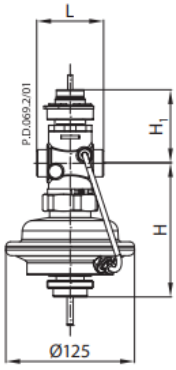
Type	DN			15	20	25	32	40	50
AVQM-WE	H*	AMV(E) 10	mm	292	-	-	-	-	-
		AMV(E) 13		295	-	-	-	-	-
		AMV(E) 2./3.		305	305	308	386	386	386
		AMV 150		293	-	-	-	-	-



AVQM (DN 15-25)



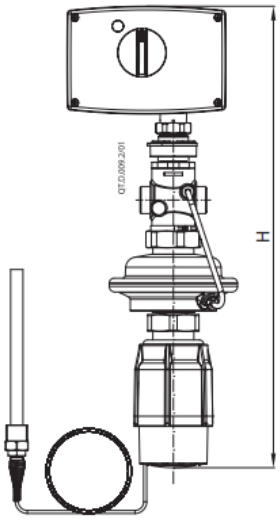
AVQM (DN 32-50)



AVQMT (DN 15-25)

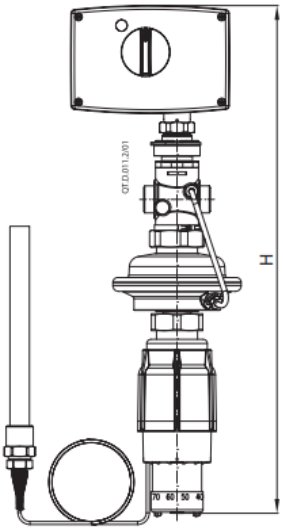
Type	DN		15	20	25	32	40	50
AVQM-WE	L	mm	65	70	75	180	200	230
	H		109	109	109	150	150	150
	H_1		76	76	79	101	101	101
	Valve weight	kg	3.0	3.0	3.2	10.3	11.8	13.9

Type	DN		15	20	25
AVQMT-WE	L	mm	65	70	75
	H		131	131	131
	H_1		76	76	79



AVT / AVQMT-WE / AMV(E)

DN			15	20	25
H	AMV/E 10	mm	442	-	-
	AMV/E 13		445	-	-
	AMV/E 2.,/3.		455	455	458



STM / AVQMT-WE / AMV(E)

DN			15	20	25
H	AMV/E 10	mm	486	-	-
	AMV/E 13		489	-	-
	AMV/E 2.,/3.		499	499	502

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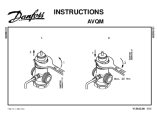
Documents / Resources

	Danfoss AVQM Flow Controller [pdf] Installation Guide 003R9131, 7369170-2, VI.56.I2.00, AVQM Flow Controller, AVQM, Flow Controller, Controller

References

- User Manual