ENGINEERING
TOMORROW

Data sheet

Temperature controller for steam (PN 25)

AVT/VGS - external thread

Description

DIN Geprüft TR(TW)700

The AVT/VGS controller is a self-acting proportional temperature controller developed primarily for steam or hot water applications for temperatures up to 200 °C. Controller closes on rising temperature.

The controller has a control valve VGS, thermostatic actuator and handle for temperature setting. Thermostatic actuator consist of bellows, capillary tube and sensor.

The temperature controller is type-tested according to EN 14597 and can be used in combinations with safety temperature monitors STM and safety temperature limiters STL.

Main data:

- DN 15-25
- k_{VS} 1.0-6.3 m^3/h
- PN 25
- Setting ranges:
  –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
- Temperature:
  - Steam/circ. water/glycolic water up to 30%:
    2… 200 °C
- Connections:
  - Ext. thread (weld-on, thread and flange tailpieces)
  - Flow and return mounting.

Ordering

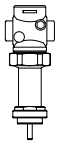
Example:
Temperature controller for steam, DN 15; k_{VS} 1.6; PN 25; setting range 40… 90 °C; T_{max} 200 °C; ext. thread

- *1× VGS DN 15 valve*
  Code No: ***065B0787***
- *1× AVT thermostatic actuator, 40… 90 °C*
  Code No: ***065-0602***

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

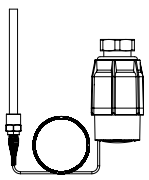
The valve will be delivered (assembled) together with an adapter M34 × M45.

VGS Valve [1)]

Picture	DN (mm)	k_{VS} (m^3/h)	Connection		Code No.
	15	1.0	Cylindrical external thread acc. to ISO 228/1	G ¾ A	065B0786
		1.6			065B0787
		3.2			065B0788
	20	4.5		G 1 A	065B0789
	25	6.3		G 1¼ A	065B0790

[1)] *Adapter M34 × M45 for connection to AVT thermostat is factory assembled on the valve.*
(info: Adapter M34 × M30 for connection to AMV(E) electrical actuators is part of the valve delivery too.)

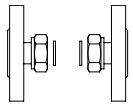
AVT Thermostatic actuator

Picture	For valves	Setting range (°C)	Temperature sensor with brass immersion pocket, length, connection	Code No.
	DN 15-25	–10… +40	210 mm, R ¾ [1)]	065-0600
		20… 70		065-0601
		40… 90		065-0602
		60… 110		065-0603
		10… 45	255 mm, R ¾ [1) 2)]	065-0604
		35… 70		065-0605
		60… 100		065-0606
		85… 125		065-0607

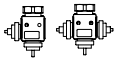
[1)] *conic male thread EN 10226-1*
[2)] *without immersion pocket*

Ordering *(continuous)*

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**

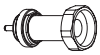
Accessories for thermostats

Picture	Type designation	PN	Material	Code No.
	Immersion pocket	25	Brass	**065-4416** [1]
			Stainless steel, mat. No. 1.4435	**065-4417** [1]
	Adapter [2]		M34 × 1.5 mm/M45 × 1.5 mm	**003H6927**
	Combination piece K2			**003H6855**
	Combination piece K3			**003H6856**

[1] *Not for AVT thermostatic actuator code numbers:* ***065-0604***, ***065-0605***, ***065-0606***, ***065-0607***

[2] *Adapter for VGS combinations with thermostatic actuators AVT, temperature monitors STM and temperature limiters STL*

Service kits

Picture	Type designation	for valves DN	k_{VS}	Code No.
	Valve body extension with stuffing box	15	3.2	**003H6877**
		20	4.5	
		25	6.3	
	Housing of sensor stuffing box	**for sensors**		**Code No.**
		AVT R ¾		**065-4421**

Technical data

Valves

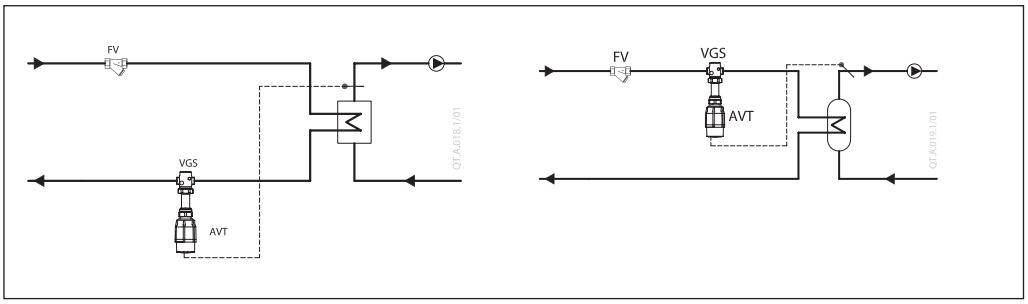
Nominal diameter	**DN**	**15**			**20**	**25**
k_{VS} value	m^3/h	1.0	1.6	3.2	4.5	6.3
Stroke	mm	3			5	
Control ratio		>1:50				
Control characteristic		linear				
Cavitation factor z		≥ 0.6				≥ 0.55
Leakage acc. to standard IEC 534	% of k_{VS}	≤ 0.05				
Nominal pressure	PN	25				
Max. differential pressure	bar	10				
Media		Steam/Circulation water/glycolic water up to 30%				
Media pH		Min. 7, max. 10				
Media temperature	°C	2… 200				
Connections	valve	External thread				
	tailpieces	Weld-on, external thread and flange				
Materials						
Valve body		Red bronze CuSn5ZnPb (Rg5)				
Valve seat		Stainless steel, mat. No. 1.4571				
Valve cone		Stainless steel, mat. No. 1.4122				
Pressure relieve system		Bellows				

Thermostatic actuator

Setting range X_s	°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 (210 mm), max. 30 (255 mm)
Gain K_s	mm/°K	0.3 (210 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 immersion pocket		
Capillary tube length		5 m (210 mm), 4 m (255 mm)
Materials		
Temperature sensor		Cooper
Immersion pocket [1]	Ms design	Brass, nickel-plated
	Stainless steel design	Mat. No. 1.4435 (210 mm)
Handle for temp. setting		Polyamide, glass fiber-reinforced
Scale carrier		Polyamide

[1] *for sensor 210 mm*

Application principles



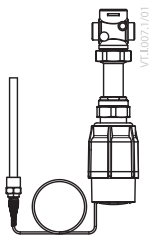
Combinations

Example:
Temperature controller with safety temperature monitor for steam, DN 15, k_{VS} 1.6, PN 25, setting range 40… 90 °C, T_{max} 200 °C, ext. thread

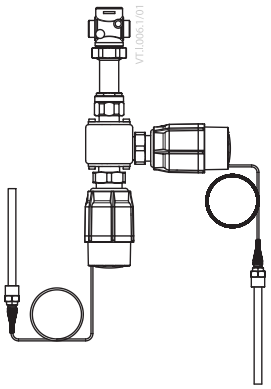
- *1× VGS DN 15 valve*
  Code No: 065B0787
- *1× AVT thermostatic actuator, 40… 90 °C*
  Code No: ***065-0602***
- *1× STM thermostat, 30… 110 °C*
  Code No: ***065-0608***
- *1× K2 combination piece*
  Code No: ***003H6855***

Products will be delivered seperatly.

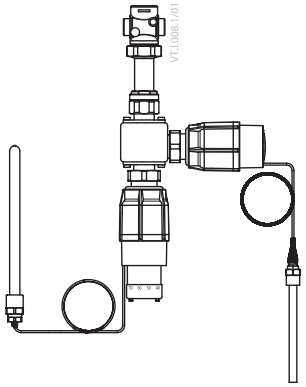
Note:
For safety temperature monitor STM/VGS data and safety temperature limiter STLS data see relevant data sheet



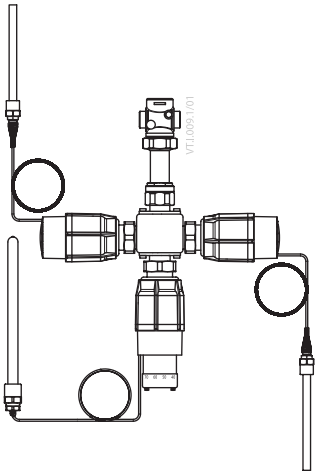
AVT/VGS
- temperature controller



AVT/AVT/VGS
- two temperature controllers



STM/AVT/VGS
- temperature controller with safety temperature monitor for steam

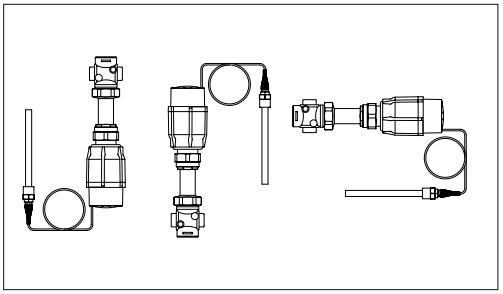


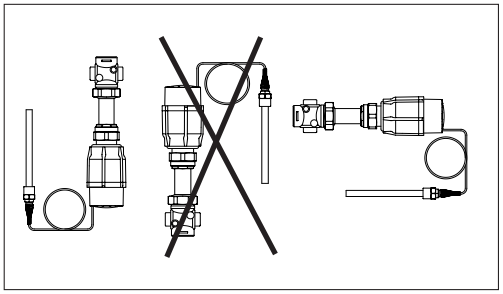
STM/AVT/AVT/VGS
- two temperature controllers with safety temperature monitor for steam

Installation positions

Temperature controller
Up to media temperature of 160 °C the controllers AVT / VGS can be installed in any position.

For higher temperatures the controllers AVT / VGS have to be installed horizontal and in horizontal pipes with the actuator oriented downwards.

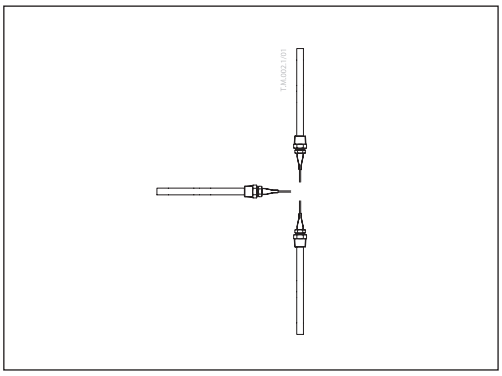




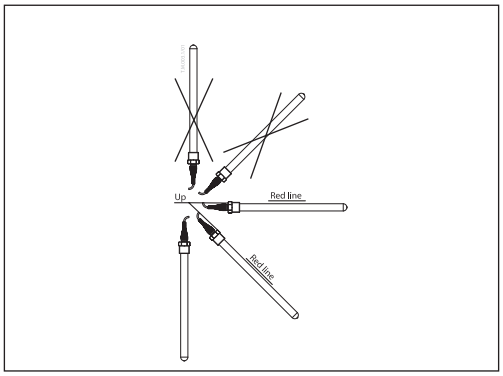
Installation positions
(continuous)

Temperature sensor
The place of installation must be chosen in a way that the temperature of the media is directly taken without any delay. Avoid overheating of temperature sensor. The temperature sensor must be immersed into the media in its full length.

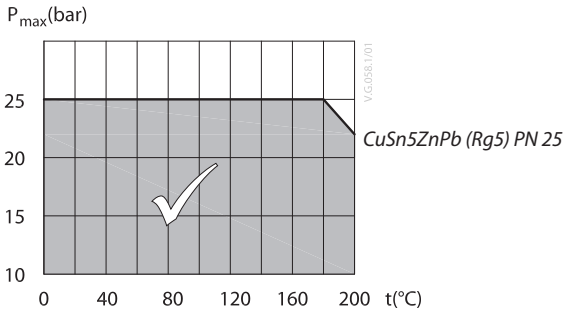
Temperature sensor 210 mm R¾":
- The temperature sensor may be installed in any position.



Temperature sensor 255 mm R¾":
- The temperature sensor must be installed as shown on the picture.

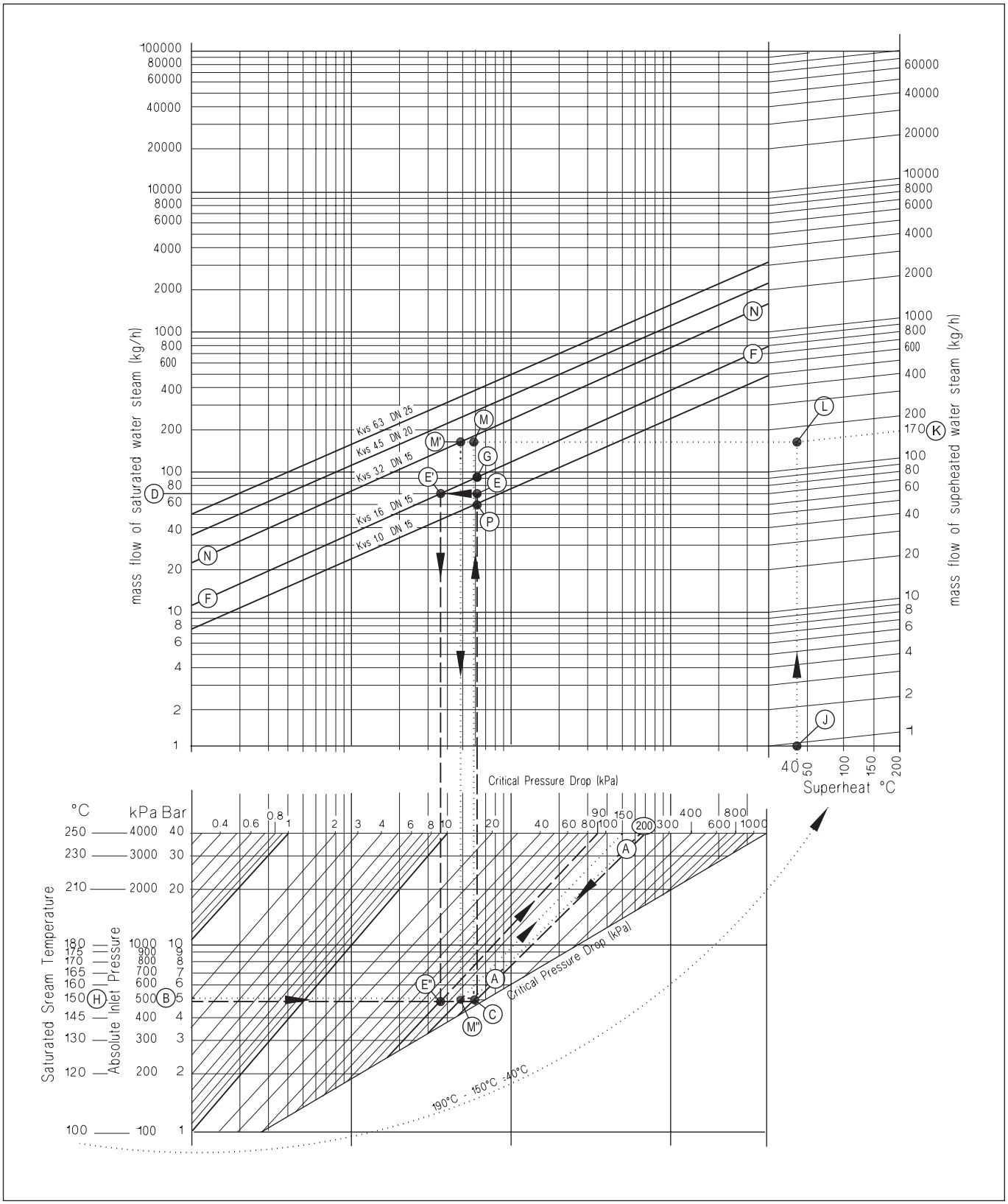


Pressure temperature diagram



Maximum allowed operating pressure as a function of media temperature (according to EN 1092-3).

Valve sizing



Steam valve sizing is based on 40% drop of the steam pressure across the valve when fully open. At this condition the steam is travelling at or close to its critical velocity (approx. 300 m/s) and throttling would occur over the full valve stroke.

If the steam is travelling slower than this, then the first part of the valve stroke would merely increase the velocity of the steam without reducing the volumetric flow.

Valve sizing *(continuous)*

1. For saturated steam

Given data:
Flow rate: 70 kg/h
Absolute inlet pressure: 5 bar (500 kPa)

Remark:
For this example follow dashed line

The absolute inlet pressure is 500 kPa. Critical pressure drop (40% of 500 kPa) is 200 kPa. Locate the diagonal line corresponding to the pressure drop of 200 kPa (line A-A).

Read the absolute inlet pressure on the lower left hand scale (point B), and draw a horizontal line across until it meets the pressure drop diagonal A-A at point C.

From this point C extend a vertical line upwards until it meets the horizontal line representing the steam flow of 70 kg/h from point D. The intersection of this is point E.

The nearest diagonal k_{VS} line above this is line F-F with a k_{VS} of 1.6. If the ideal valve size is not available the next largest size should be selected to ensure design flow.

The pressure drop through valve at the flow rate is found by the intersection of the 70 kg/h line with F-F (point E') and dropping a vertical line downwards; this actually hits the horizontal line for 500 kPa absolute inlet pressure (point E'') at a pressure drop diagonal of 90 kPa. This is only 18 % of the pressure drop accross the valve and the control quality will not be good until the valve has partially closed. As with all steam valves this compromise is necessary since the next smaller valve would not pass the required flow (maximum flow would be about 60 kg/h; point P).

The maximum flow for the same inlet pressure is found by extending the vertical line (C-E) through point E until it crosses the k_{VS} 1.6 line F-F (point G) and reading off the flow (90 kg/h).

2. For superheated steam

Given data:
Flow rate: 170 kg/h
Absolute inlet pressure: 5 bar (500 kPa)
Steam temperature: 190 °C

Remark:
For this example follow dotted line
The procedure for superheated steam is much the same as for saturated steam, but uses a different flow scale which slightly elevates the readings according to the degree of superheat.

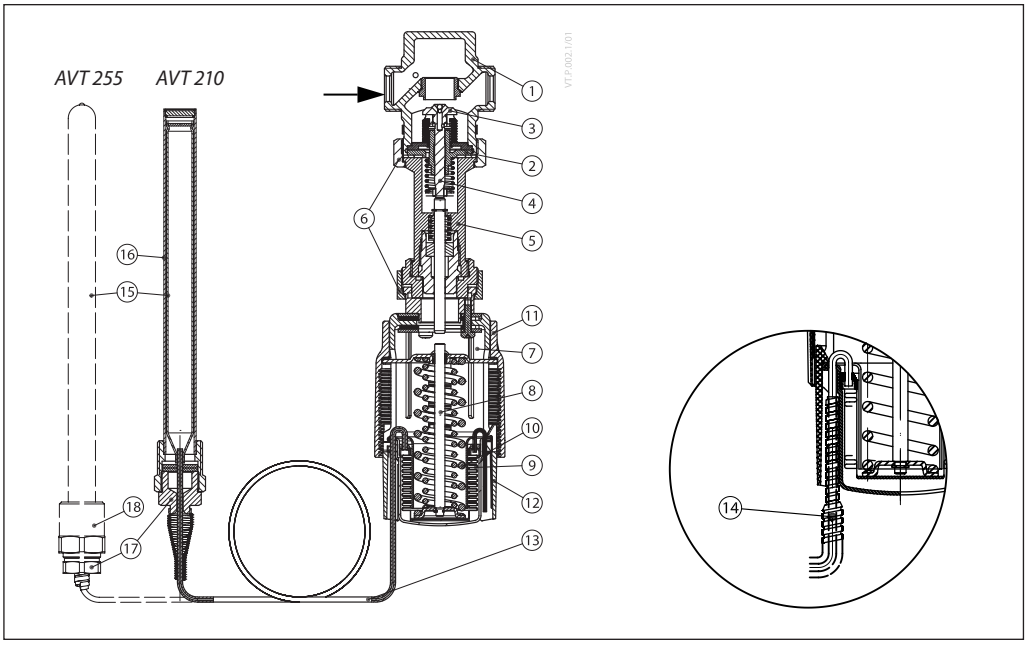
As before, the diagonal critical pressure drop line A-A is located at 40% of 500 kPa (200 kPa). The horizontal inlet pressure line through point B is now extended to the left to read off the corresponding saturated steam temperature at point H (150 °C). The difference between the saturated steam temperature and the superheated steam temperature is 190 °C – 150 °C = 40 °C (see point J).

The superheated steam flow 170 kg/h is found on the upper right hand scale (point K). From here the diagonal line is followed down until it meets a vertical line from the steam temperature elevation (40 °C, point J) at point L.

As before, the horizontal line through point B is drawn to cut line A-A at point C. The point where the vertical line from point C meets the horizontal line from point L is the operating point (point M). This horizontal line, L-M, is the corrected flow line. The nearest diagonal line above this is line N-N with a k_{VS} 3.2. A vertical line dropped from the intersection of L-M line with line N-N (point M') intersects the 500 kPa absolute inlet pressure line (point M'') at a pressure drop diagonal of about 150 kPa. This is about 30% of the pressure drop accross the valve which will give reasonable control quality (compared to recommended ratio of 40 %).

Design

1. Valve VGS
2. Valve insert
3. Pressure relieved valve cone
4. Valve stem
5. Valve body extension
6. Union nut
7. Thermostatic actuator AVT
8. Thermostat stem
9. Bellows
10. Setting spring for temperature control
11. Handle for temperature setting, prepared for sealing
12. Scale carrier
13. Capillary tube
14. Flexible protected pipe (only at AVT 255 mm)
15. Temperature sensor
16. Immersion pocket
17. Sensor stuffing box
18. Housing of sensor stuffing box



Function

Media 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.

By increasing of media temperature valve cone moves towards the seat (valve closes), by decreasing of media temperature valve cone moves away from the seat (valve opens).

Handle for temperature setting can be sealed.

Settings

Temperature setting
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.

Adjustment diagram

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

Note: *The values given are approximate*

AVT Thermostat ... 210 mm

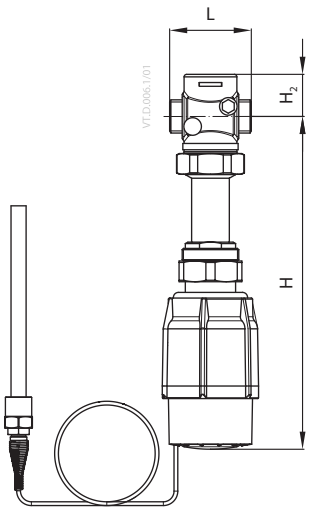
I	II	III	IIII	IIIII	
-10	3	15	28	40	°C
20	33	45	58	70	
40	53	65	78	90	
60	73	85	98	110	

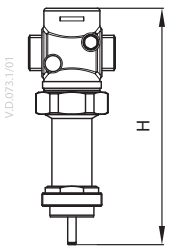
AVT Thermostat ... 255 mm

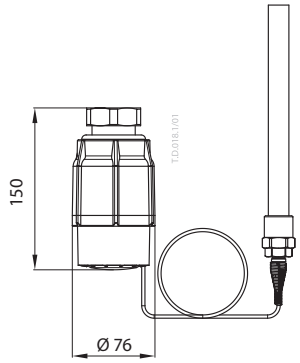
I	II	III	IIII	IIIII	
10	19	28	36	45	°C
35	44	53	61	70	
60	70	80	90	100	
85	95	105	115	125	

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

Dimensions







AVT/VGS

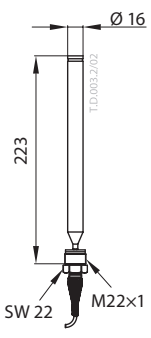
DN	L	H	H_2
	mm		
15	65	257	34
20	70	257	34
25	75	257	37

VGS

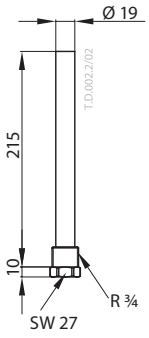
DN	H (mm)	Weight (kg)
15	178	1.3
20	178	1.4
25	178	1.6

AVT

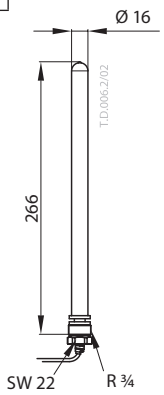
Type		Weight
sensor 210 mm	kg	1.5
sensor 255 mm		1.6



AVT 210

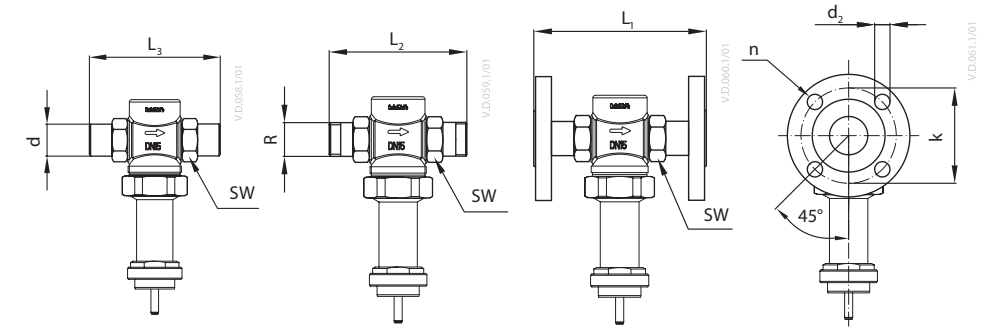


AVT 210
Immersion pocket



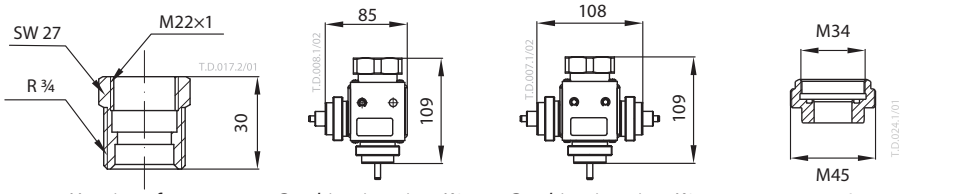
AVT 255

Dimensions *(continuous)*



DN	R [1]	SW	d	L_1 [2]	L_2	L_3	k	d_2	n
		mm							
15	½	32 (G ¾A)	21	130	120	139	65	14	4
20	¾	41 (G 1A)	26	150	131	154	75	14	4
25	1	50 (G 1¼A)	33	160	145	159	85	14	4

[1] Conical ext. thread acc. to EN 10226-1
[2] Flanges PN 25, acc. to EN 1092-2



Housing of sensor stuffing box

Combination piece K2

Combination piece K3

Adapter M34 × 1.5 mm/ M45 × 1.5 mm