Data sheet

Flow-compensated thermostatic valve AVTQ DN 15

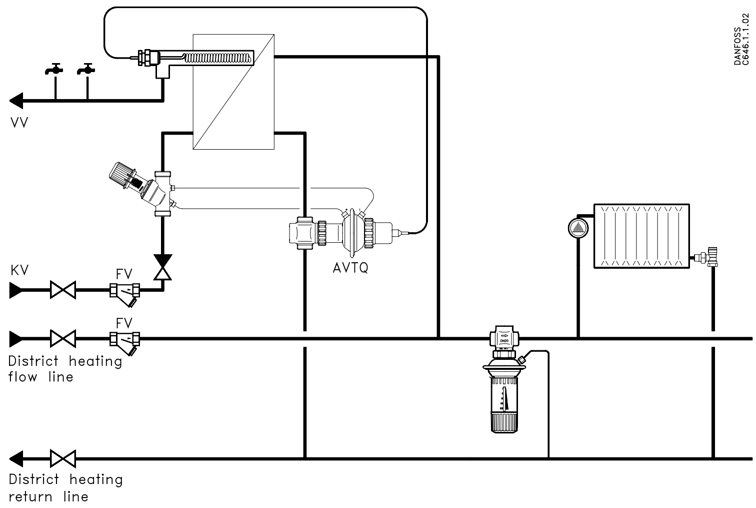
Description

AVTQ is a self-acting thermostatic valve that controls hot water service using the flow-compensation principle. The valve is for use with instantaneous water heaters. It has been developed for systems with plate heat exchangers.

AVTQ prevents high temperatures in the heat exchanger when no hot water is tapped by rapidly shutting off the heat supply (e.g. hot district heating water). AVTQ can be used with most plate heat exchangers. However, the manufacturer of the exchanger should be contacted to make sure that the chosen exchanger has been approved for use with the AVTQ.

Characteristics
- Closes on rising sensor temperature
- Pressure-controlled opening/closing on start/stop tapping
- Can be installed in the return
- Sensor can be mounted in any position
- Infinite adjustment of operating temperature
- Permanent no-load opening temperature (approx. 40 °C)
- Valve section designed for PN 16 pressure stage

Principle



AVTQ consists of a temperature control and a control valve. The temperature control is installed on the district heating side and, via impulse lines, connected to the control valve installed on the service hot water side.

Function

When hot water service is tapped, flow through the control valve creates a pressure drop which is used to increase the temperature level from no-load to tapping temperature. This temperature increase causes the control to open for flow on the district heating side and close when the temperature level again falls to the no-load operating level. No-load operation prevents the district heating line becoming cold.

Ordering

Type	DN	Connection: Control ISO 228/1	Connection: Control valve ISO 228/1	k_v [m³/h]	**Code no.**
AVTQ 15	15	G ¾ A	G 1 A	1.6	**003L7015**

Incl. gland and compression fittings for mounting on Ø6 x 0.8 mm copper impulse tube.

1 set of nipples consists of 2 nipples, 2 nuts and washers

DN	Threaded nipples [1]) **Code no.**	Welded nipples **Code no.**
15	**003N5070**	**003N5090**

[1]) Ms 558

Spare parts

Description:	**Code no.**
Compression fittings for Ø6 mm copper tube (4 ferrules and 4 nuts)	**003L7101**
Gasket for diaphragm housing	**003L3154**
Sensor gland incl. gasket	**003L7120**
Control valve excl. compression fittings	**003L7108**
Diaphragm element excl. compression fittings	**003L7111**
Sensor element with complete gland	**003L7100**
Valve body with complete valve insert	**003L7109**

Data

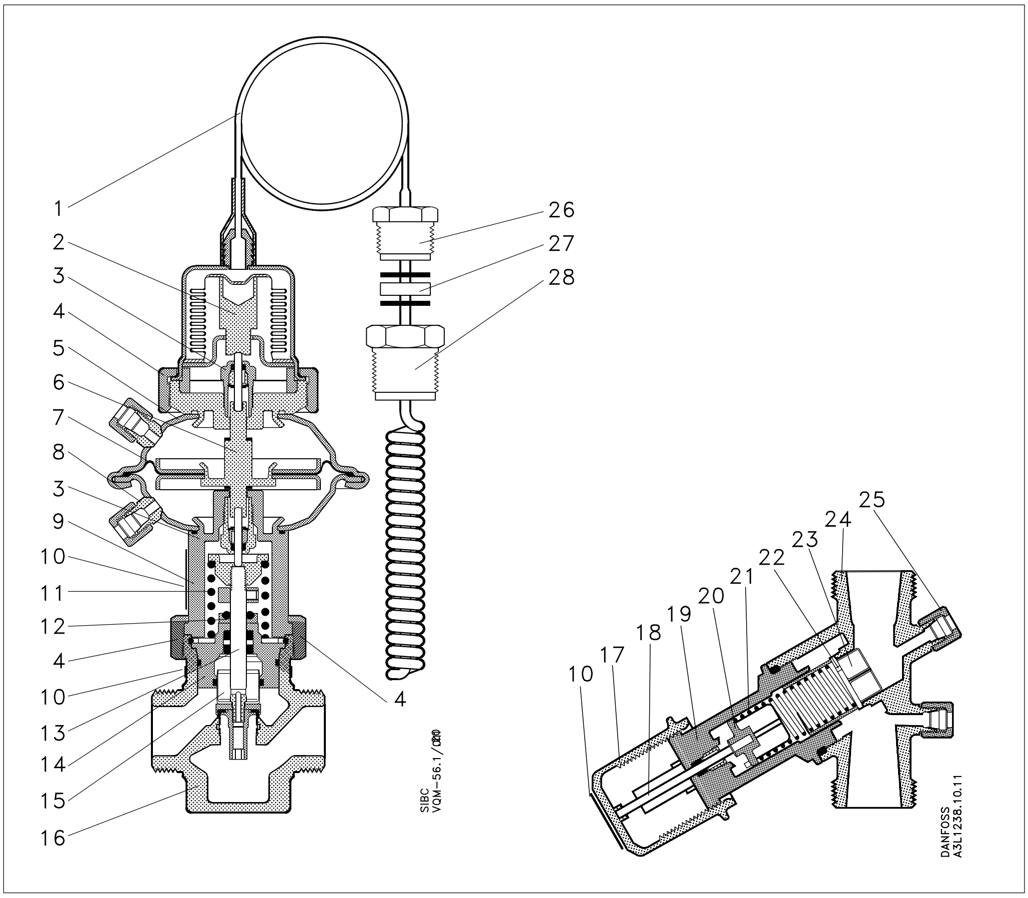
Pressure stage	Primary	(valve body)		PN 16
	Secondary	(diaphragm and control valve)		PN 10
Max. test pressure	Primary	(valve body)		25 bar
	Secondary	(diaphragm and control valve)		16 bar
Max. water temperature	Primary			100 °C
	Secondary			90 °C[1])
Max. sensor temperature				130°C
Max. water velocity around the sensor				1.5 m/s
Max. differential pressure	Control			6 bar
	Closing			12 bar
Length of sensor capillary tube				1 m
Control ratio				100 : 1
Cavitation factor				Z ≥ 0.6
Medium	**Primary**	District and central hot water		pH. min. 7, max. 10
	Secondary	District and central hot water		pH. min. 7, max. 10
		Service hot water	chlorine (cl) content	max. 200 ppm
			with pH lower than 7 - the hardness of the water must be larger than the sulphate content.	$\frac{HCO_3^{-}}{SO_4^{--}} > 1$

[1]) Recommended temperature range 45 - 60 °C

Design

Temperature control

1. Sensor with gland
2. Pressure spindle
3. Gland
4. Nut
5. Diaphragm housing
6. Diaphragm spindle
7. Control diaphragm
8. Compression connection for impulse tube
9. Intermediate ring
10. Nameplate
11. Main spring
12. Damping + teflon ring
13. Valve spindle
14. Valve insert
15. Pressure relief cylinder
16. Valve body
17. Setting knob
18. Spindle
19. Valve base
20. Spring retainer
21. Setting spring
22. Pressure equalizing hole
23. Valve cone
24. Valve body
25. Compression connection for impulse tube
26. Sensor gland
27. Gasket for sensor gland
28. Housing for sensor gland



Materials of parts in contact with water:

Temperature control

Valve body: .... RG5, DIN 1705 W.no. 2.1096.01
Valve insert: .... Dezincification resistant .... brass BS 2874
Valve cone: .... Dezincification resistant brass BS 2874
Valve plate: .... EPDM
Valve seat: CrNi steel, DIN 17440 W.no. 1.4404
Pressure relief cylinder: .... CrNi stell, DIN 17440 W.no. 1.4404
Valve spindle: ..... CrNi steel, DIN 17440 W.no. 1.4435
O-ring: .... EPDM
Diaphragm: .... EPDM
Diaphragm housing: .... CrNi steel, DIN 17440 W.no. 1.4435
Diaphragm plate: CrNi steel, DIN 17440 W.no. 1.4436
Diaphragm spindle:................ Dezincification resistant brass BS 2874

Diaphragm housing gland:

Housing: .... Dezincification resistant brass, BS 2874
Spindle: .... CrNi steel, DIN 17440 W.no. 1.4401

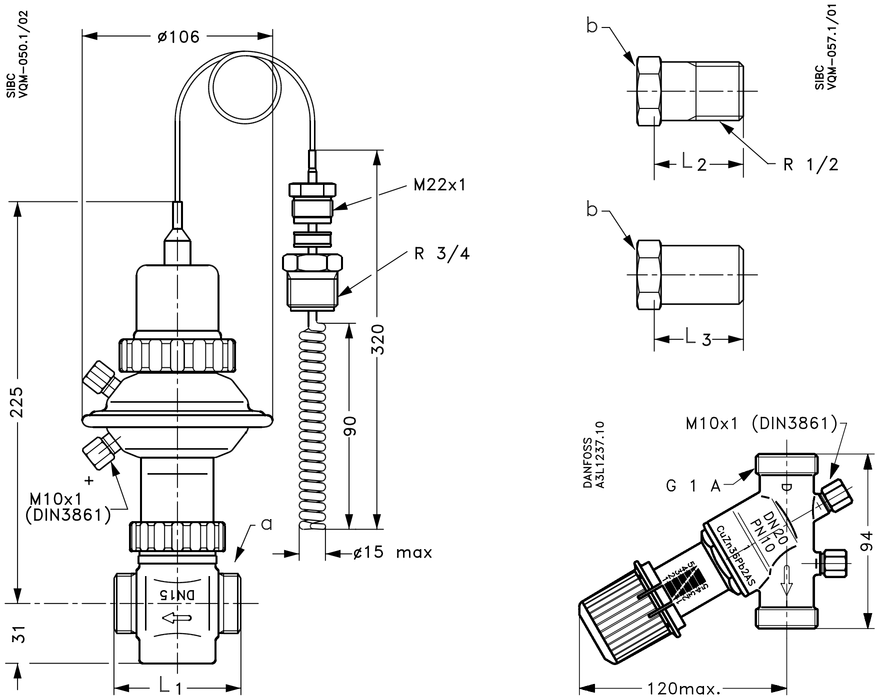
Sensor:

Sensor: .... Copper
Capillary tube gland: .... Dezincification resistant brass, BS2874
Gasket: .... EPDM
Charge .... Carbon dioxide

Control valve

Valve body: .... Dezincification resistant brass, BS2872
Valve base: .... Dezincification resistant brass, BS2874
Valve spindle: ..... CrNi steel, DIN 17440 W.no. 1.4401
Setting spring: CrNi steel, DIN 17440 W.no. 1.4568
Cone, spring retainer: .... PPS-plastic
O-ring: .... EPDM

Dimensions



	L1	L2	L3	a ISO 228/1	b ISO 228/1
DN 15	65	33	25.5	G ¾ A	G ¾ A

Setting

The AVTQ valve can be used with plate heat exchangers of up to 75 kW. As a result of the flow compensation principle an actual dimensioning of the valve is unnecessary, because the valve will always adjust around the required temperature without regard to the flow. This means that if the valve is set to 50 °C (this is done at 75% of max. tapping flow to obtain optimum control), then this temperature will be maintained whether or not the actual flow is 120 l/h, 900 l/h or more. Between 120 l/h and 900 l/h the temperature will vary approx. 4 °C.

Typical settings:

Minimum:

Designation	Application values	Control valve setting
Flow temperature, primary	Tp = 65 °C	3.0
Differential pressure across the AVTQ valve	Δp = 0.5 bar	
Hot water temperature, secondary	Ts (hot) = 50 °C	
Cold water temperature, secondary	Ts (cold) = 10 °C	
Secondary flow	Qs = 750 l/h	

Maximum:

Designation	Application values	Control valve setting
Flow temperature, primary	Tp = 100 °C	2.0
Differential pressure across the AVTQ valve	Δp = 6.0 bar	
Hot water temperature, secondary	Ts (hot) = 50 °C	
Cold water temperature, secondary	Ts (cold) = 10 °C	
Secondary flow	Qs = 750 l/h	

The values mentioned above are reference values and therefore corrections of control valve settings might be necessary in order to obtain the required temperature.

Other settings:

Tapping temperature = 50 °C
Tapping flow = 750 l/h

Δp (bar) / $T_{primary}$	0.5	1.0	3.0	6.0
65 °C	3.0	2.5	2.5	2.5
80 °C	2.75	2.5	2.25	2.25
100 °C	2.5	2.5	2.25	2.0

Sizing

If calculations as regards primary flow, k_{vs} values and the efficiency of the heat exchanger at specific flows as well as pressure drop across the control valve are required, see the following calculation example (see fig. 1).

Cold water temperature
T_4 = 10°C
Hot water temperature
T_3 = 50°C
Hot water service flow (max.) Q_2 = 900 l/h (15 l/min)
The necessary heat exchange output (W) is calculated thus:

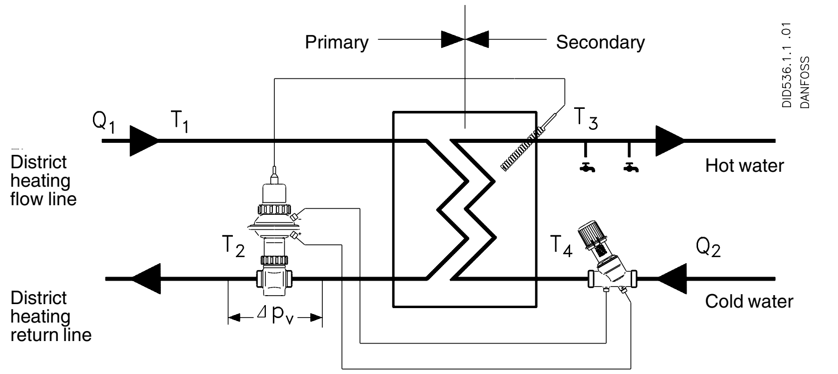


Fig. 1

The differential pressure across the AVTQ valve
Δp_v = 0.5 bar
District heating water flow temperature
T_1 = 65°C
The selection is a heat exchanger requiring the following primary flow:

$$W = Q_2(T_3 - T_4) = 900 \text{ x } (50 - 10) = \frac{36.000 \text{ kcal/h}}{0.86} = 42 \text{kW}$$

W [kW]	Secondary flow Q_2 [l/h]	Primary flow Q_1 [l/h]	k_v [m³/h]	Cooling $\Delta T_{primary}$ °C
14	300	280	0.39	43
28	600	600	0.85	40
42	900	925	1.31	39

In the example the chosen cooling is 43 °C, 40 °C and 39 °C respectively.
Information as regards the cooling across the exchanger can be acquired either by contacting the manufacturer of the exchanger or by using the manufacturer's dimensioning diagram.
Using the above data, the necessary capacity (k_v) of the valve can be calculated:

$$k_v\left[m^3/h\right] = \frac{Q\left[m^3/h\right]}{\sqrt{\Delta p_v[bar]}} = \frac{0.280}{\sqrt{0.5}} = 0.39 m^3/h$$

Values for flows of 300 and 600 l/h must be calculated in the same way and entered in the table.

The pressure drop across the control valve can be read from the diagram below (fig. 2).

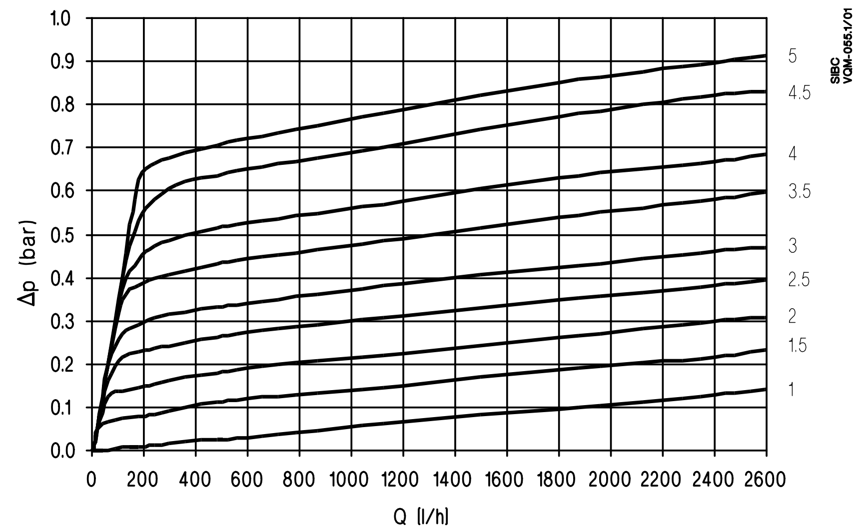


Fig. 2
Pressure drop ($\Delta p_{control}$) across control valve as a function of the setting value and secondary flow

Installation

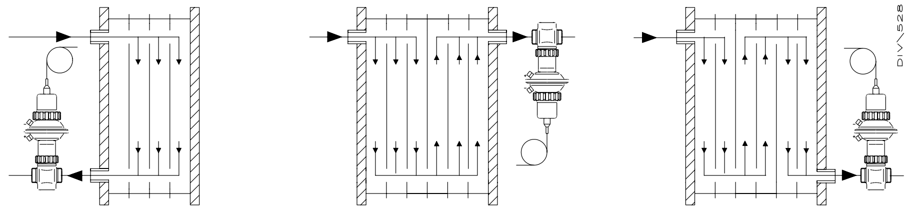


Fig. 3

AVTQ can be used with most types of plate heat exchangers.

The system functions best when the sensor is installed right inside the heat exchanger (see page 1). However, the sensor head should be placed approx. 5 mm from the plate which divides the primary and the secondary side of the exchanger. If the sensor head is placed too close to the dividing plate, the sensor might measure the temperature of the plate and not the temperature of the medium. For correct no-load operation, thermal flow should be avoided since hot water rises and increases the no-load consumption.

Contact the manufacturer to determine the correct material for connecting heat exchanger and control.

Note that water velocity around the sensor must be in accordance with the requirements for copper tube.

The temperature control can be installed in the return line on the primary side of the heat exchanger.

The diaphragm element can be turned in any position in relation to the valve body so that impulse tube can be connected in the required direction.

The sensor can be installed in any position (fig. 4), but the control valve must not be installed with the nipples downwards (fig. 5) to avoid dirt ingress.

Also the control valve must only be installed in the flow line on the secondary side of the heat exchanger.

It is recommended that the primary and secondary sides of the heat exchanger be flushed through before the heating system is used the first time. In addition the (+) and (–) side of the diaphragm should be vented.

It is also recommended that dirt strainers with a mesh size of max. 0.6 mm be installed both in the cold water line ahead of the control valve and in the flow line from the district heating station.

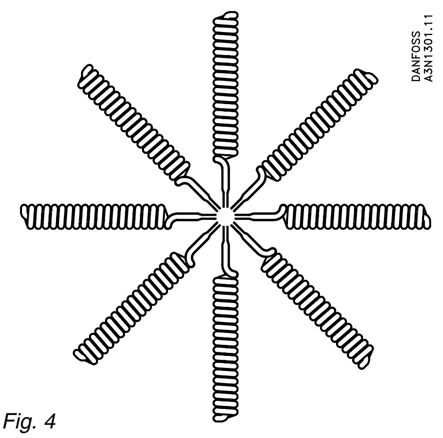


Fig. 4

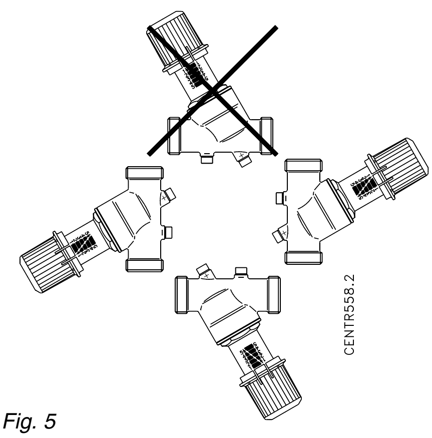


Fig. 5