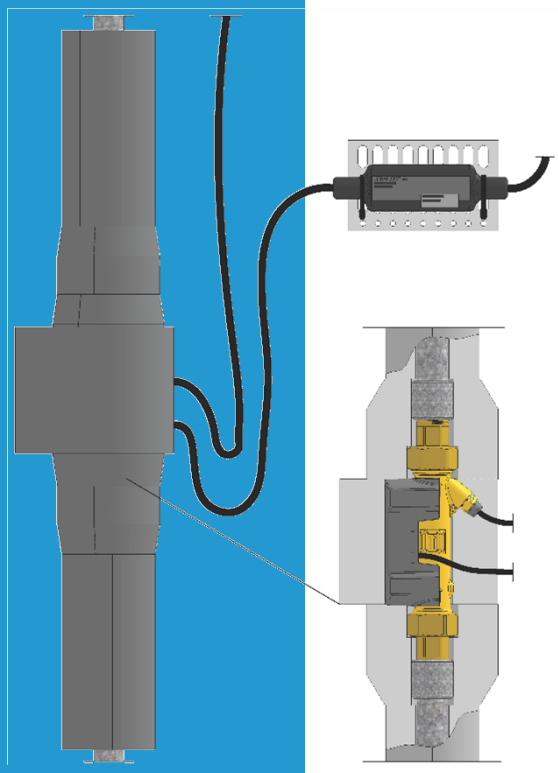
kamstrup

Insulation manual

Insulation of TemperatureSensor 63 & 83/ Flow sensors

MULTICAL® 303 (DN15-20)
MULTICAL® 403 (DN15-50)
ULTRAFLOW® 44 (DN15-125)
ULTRAFLOW® 54 (DN15-125)
ULTRAFLOW® 85 (DN150-300)



Content

1 Introduction

Insulation of pipes utilized for transmitting thermal energy conveying liquids is in general always recommended, because the insulation reduces losses of valuable heat energy or avoids heating of the medium, which is utilized for cooling. Thus, insulation optimizes the supply of thermal energy with thermal energy conveying liquids. To further optimize the supply, insulation of flow and temperature sensors, which are both in direct contact with the thermal energy conveying liquid, must also be addressed. Insulation of both sub-assemblies will reduce heat dissipation errors for temperature sensors and reduce stratification effects in the flow sensor and optimize thereby the metrological performance in installations with a large temperature gradient between pipes and the environment. To avoid stratification effects insulation of upstream pipes is at minimum equally important as insulation of the flow sensor. As the calculator of a heat/cooling meter is not in direct contact with the thermal energy conveying liquid, insulation of the calculator as such is not applicable. However, due to the possibility of mounting the calculator directly on the flow sensor, installation recommendations for the calculator must be considered depending on the temperature of the medium and the environment.

Insulation has the effect, that all parts under the insulation might reach temperatures up to the temperature of the thermal energy conveying liquid as thermal balance to the environment is prohibited. This might be critical to some components, in particular to sensitive electronics. Predominantly in cooling installations, humidity from the warm environment will condense on comparatively colder pipes. This is why they are often permanently wet. Insulation therefore requires temperature stability of the insulated parts within the approved range of the medium temperature as well as waterproof encapsulation of sensitive electronic components in cooling installations in warm and humid environments. Finally, note that local rules concerning insulation of pipes might apply.

The following general rules apply for installing heat/cooling meters:

- Calculators must in general be wall-mounted at medium temperatures higher than 90 °C to protect sensitive electronics inside.[1]

- Calculators usually have a lower IP-class than the connected flow sensor and must therefore NOT be mounted on the flow sensor in cooling installations to avoid condensation and water penetration into the calculator. Note, that condensation is induced from the flow sensor itself, but can also come from other parts of the installation. This becomes even more critical in warm and humid environments.[1]

- Cable connections must always point downwards, and cables must in general hang freely downwards to form a drip nose for drainage of condensation.

Kamstrup flow sensors are only designed for water as the thermal energy conveying medium.

[1] Due to the mechanical design of ULTRAFLOW® 85 with an extension tube, MULTICAL® 603 might still be mounted on the calculator mount bracket 3026-1392 as this provides sufficient distance to the pipe.

2 Overview – Insulation recommendations for Kamstrup flow and temperature sensors

<table>
<tr><td rowspan="2">Flow sensor</td><td colspan="2">Cooling</td><td colspan="2">Heat</td></tr>
<tr><td>T_{medium} < ambient</td><td>T_{medium} < 110 °C</td><td>T_{medium} > 110 °C</td><td>T_{medium} > 120 °C</td></tr>
<tr><td>MULTICAL® 303
MULTICAL® 403
ULTRAFLOW® 44
DN15-125</td><td colspan="2">YES – recommended</td><td colspan="2">YES – recommended
(⚠ except the plastic casing)</td></tr>
<tr><td>ULTRAFLOW® 54
DN15-125</td><td>N/A</td><td colspan="3">YES – recommended
(⚠ except the plastic casing)</td></tr>
<tr><td rowspan="2">ULTRAFLOW® 85
DN150-300</td><td colspan="3">YES – recommended
(⚠ except the plastic casing)</td><td>YES –
⚠ REQUIRED</td></tr>
<tr><td colspan="4">⚠ The hole of the extension tube must NOT be covered</td></tr>
<tr><td>TemperatureSensor 63 & 83</td><td colspan="4">YES</td></tr>
</table>

Table 1: *Overview of insulation recommendations for different flow sensors and for TemperatureSensor 63 & 83.*

3 Cooling installations

3.1 Examples – MULTICAL® 303 (DN15-20), MULTICAL® 403 (DN15-50)

Flow sensors MULTICAL® 303 and MULTICAL® 403 for cooling (Type C) are particularly protected against wet conditions.

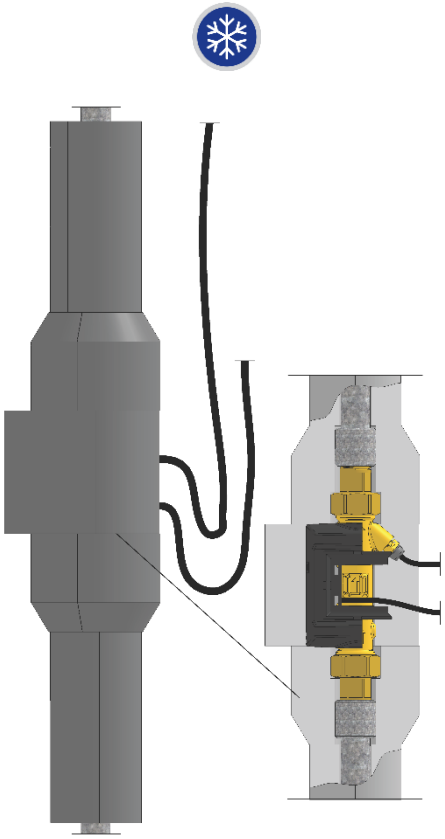


Figure 1: *Insulation example of MULTICAL® 303 and MULTICAL® 403 in a cooling installation.*

3.2 Examples – ULTRAFLOW® 44 (DN15-125)

The flow sensor ULTRAFLOW® 44 including the electronics box is particularly protected against wet conditions.

Nevertheless, the electronics box must NEITHER be mounted on the flow sensor NOR on pipes and due to EMC, it must NOT be mounted on cable trays, because the recommended minimum distance to other cables is 25 cm. Instead, we recommend mounting the electronics box elsewhere, e.g. fixed horizontally with cable strips on a grating. Note that thereby the type label is still visible.

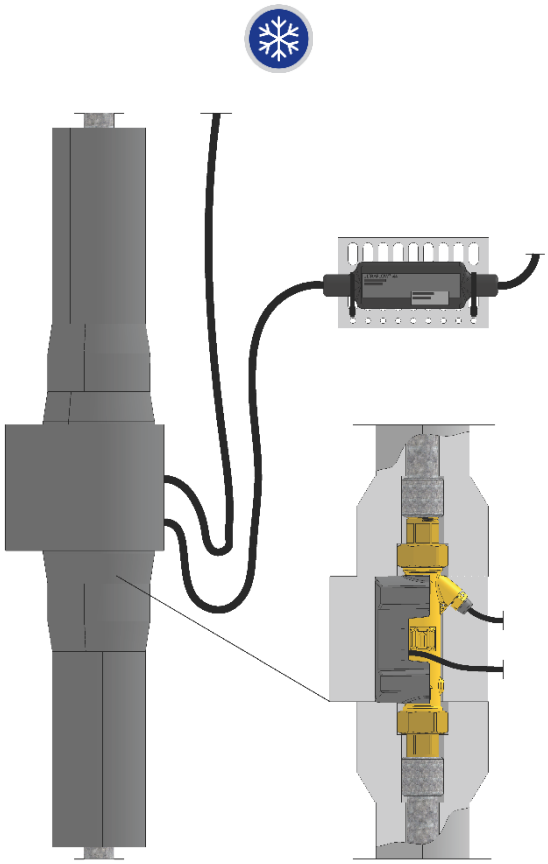


Figure 2: *Insulation of ULTRAFLOW® 44 in a cooling installation.*

3.3 Examples – ULTRAFLOW® 54 (DN15-125)

ULTRAFLOW® 54 (DN15-125) is designed for use in heat installations only, and for that reason neither approved nor technically suitable for cooling installations.

3.4 Examples – ULTRAFLOW® 85 (DN150-300) /

The electronics of ULTRAFLOW® 85 DN150-300 is placed in a separate electronics box (within top cover and base part) connected to the meter housing via an extension tube made of composite material.

The flow part (meter housing) may in general be insulated. However, the electronics box must NOT be insulated and the hole in the extension tube must NOT be covered. **This applies to both cooling and heat installations.**

⚠ At medium temperature below room temperature in a humid environment, the display of ULTRAFLOW® 85 (DN150-300) **must not** be positioned downward. Consult the installation manual.

⚠ At medium temperature above 120 °C, the flow part of ULTRAFLOW® 85 (DN150-300) **must** be insulated.

The insulation will shield the electronics box from excessive heat radiation from the pipe. This becomes necessary because the temperature inside the electronics box of above 60 °C will lead to degradation of the display.

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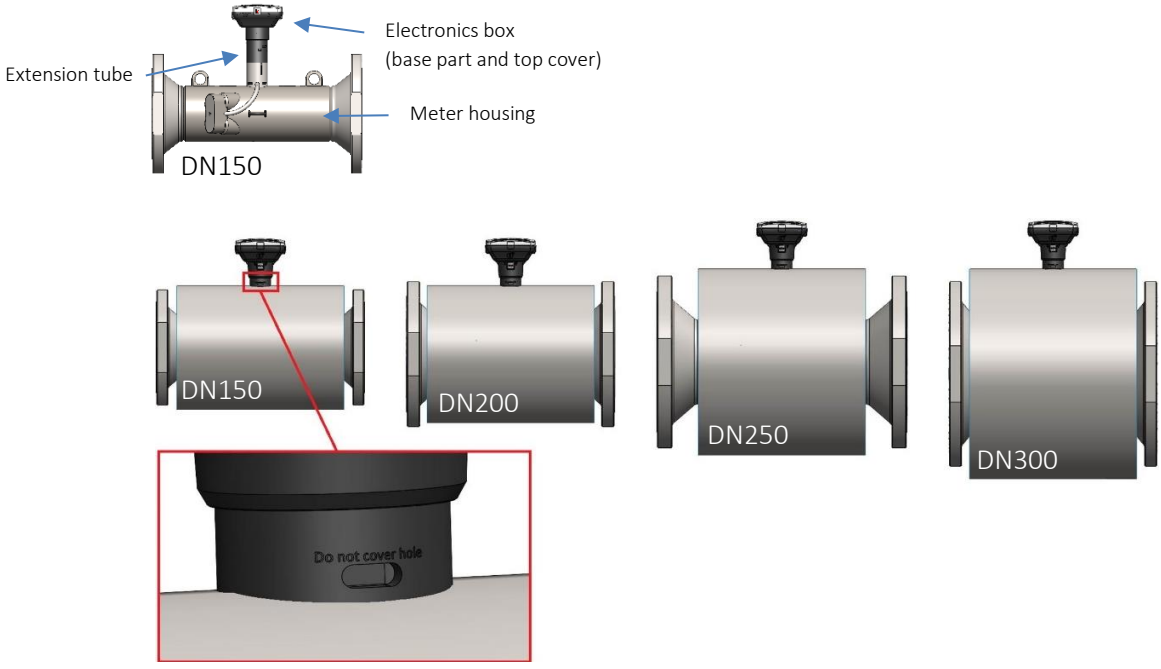
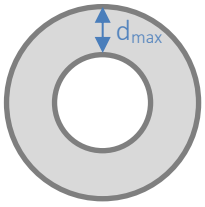


(a)

max thickness d_{max} of insulation (to avoid covering of hole):

DN150 d_{max} = 80 mm
DN200 d_{max} = 80 mm
DN250 d_{max} = 120 mm
DN300 d_{max} = 120 mm



(b)

Figure 3: *Insulation examples for ULTRAFLOPW® 85:*
(a) Sizes DN150, DN200, DN250 and DN300 are illustrated. The hole in the extension tube must not be covered.
(b) To avoid covering of the hole in the extension tube the stated max thickness of the insulation must be followed.

4 Heat installations

4.1 Examples – MULTICAL® 303 (DN15-20), MULTICAL® 403 (DN15-50)

If the medium temperature is above 110 °C (T_{medium} > 110 °C) the plastic casing must NOT be insulated. Insulation of the plastic casing at a medium temperature above 110 °C can severely damage the plastic casing, because the temperatures inside the insulation get close to the glass transition temperature of the plastic casing.

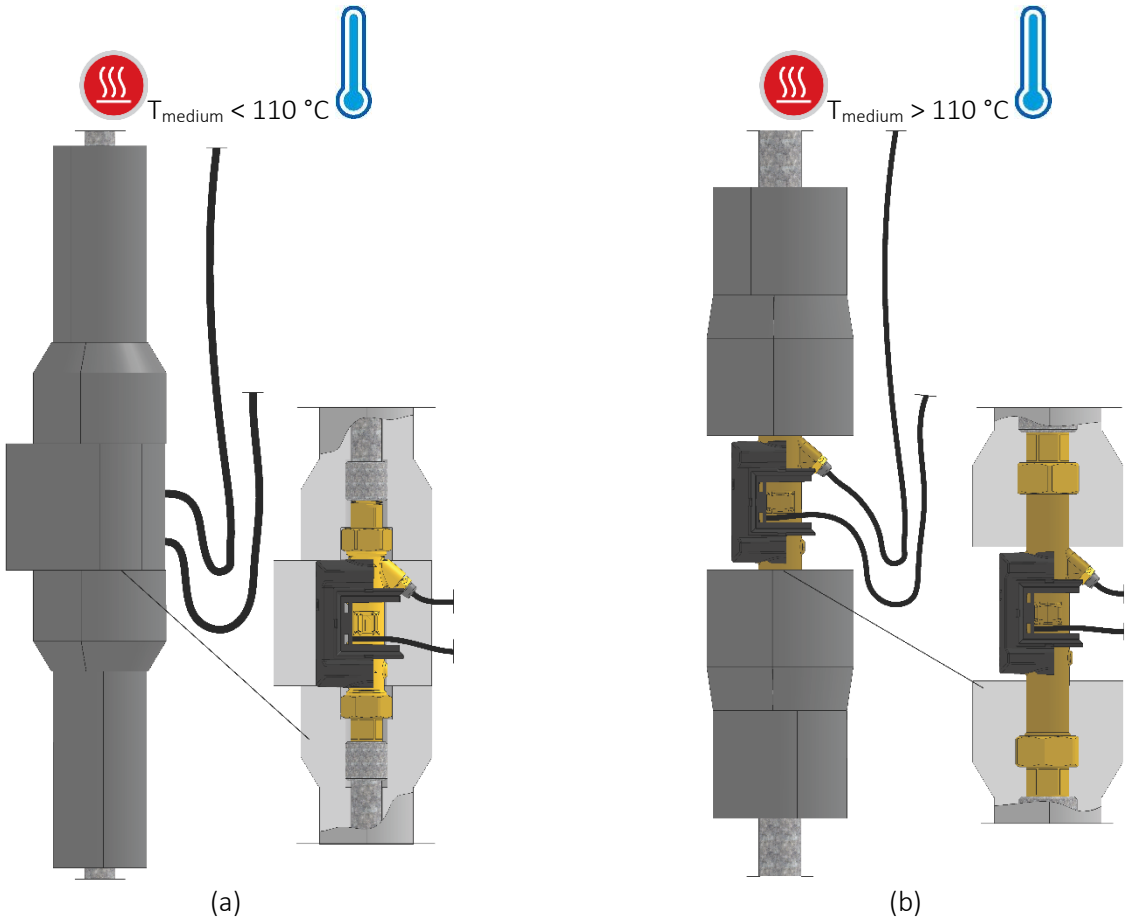


Figure 4: *Insulation of flow sensors MULTICAL® 303/ MULTICAL® 403 in a heat installation (a) with T_{medium} < 110 °C and (b) with T_{medium} > 110 °C.*

4.2 Examples – ULTRAFLOW® 44 (DN15-125)

The electronics box must NEITHER be mounted on the flow sensor NOR on pipes. Instead, it can hang freely on cables.

If the medium temperature is above 110 °C (T_{medium} > 110 °C), the plastic casing must NOT be insulated. Insulation of the plastic casing at a medium temperature above 110 °C can severely damage the plastic casing, because the temperatures inside the insulation get close to the glass transition temperature of the plastic casing.

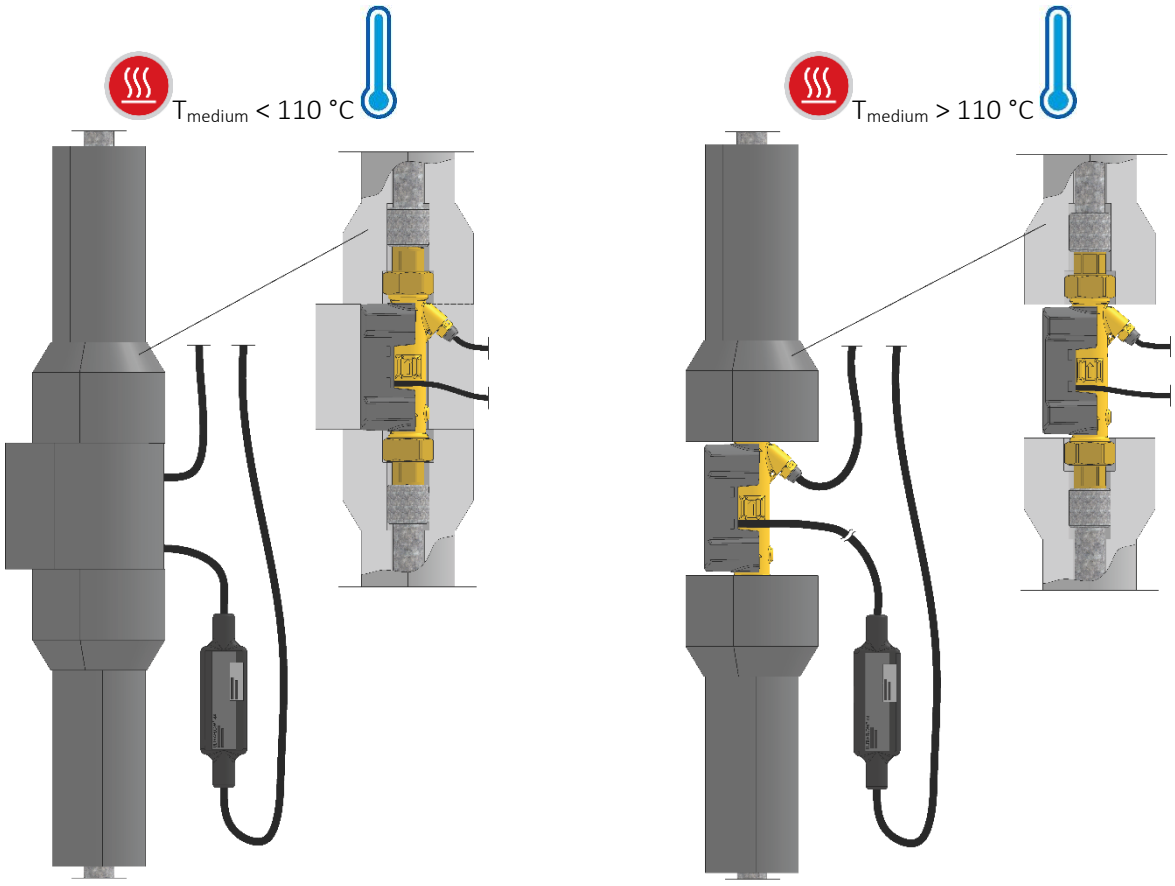


Figure 5: *Insulation of ULTRAFLOW® 44 in a heat installation (a) with T_{medium} < 110 °C and (b) with T_{medium} > 110 °C.*

4.3 Examples – ULTRAFLOW® 54 (DN15-125)

⚠ The plastic casing must never be insulated. It contains sensitive electronics (flow sensor PCB), which must NOT be exposed to high temperatures. Furthermore, insulation of the plastic casing at a medium temperature above 110 °C can severely damage the plastic casing itself, because the temperatures inside the insulation get close to the glass transition temperature of the plastic casing.

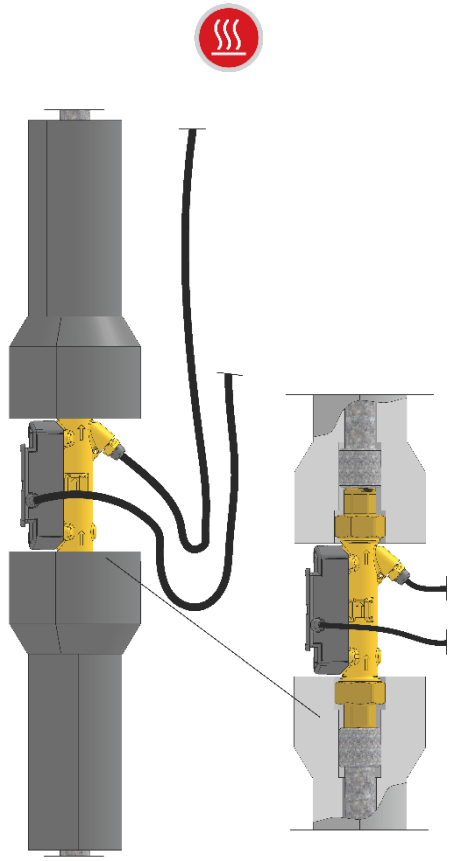


Figure 6: *Insulation of ULTRAFLOW® 54 (DN15-125) in a heat installation.*

4.4 Examples – ULTRAFLOW® 85 (DN150-300)

The electronics of ULTRAFLOW® 85 DN150-300 is placed in a separate electronics box (within top cover and base part) connected to the meter housing via an extension tube made of composite material.

The flow part (meter housing) may in general be insulated. However, the electronics box must NOT be insulated and the hole in the extension tube must NOT be covered. **This applies to both cooling and heat installations.**

At medium temperature above 120 °C, the flow part of ULTRAFLOW® 85 (DN150-300) **must** be insulated.

The insulation will shield the electronics box from excessive heat radiation from the pipe. This becomes necessary because the temperature inside the electronics box of above 60 °C will lead to degradation of the display.

For further information about insulation of ULTRAFLOW® 85 (DN150-300), see paragraph 3.4 Examples – ULTRAFLOW® 85 (DN150-300).