

Technical description

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**Leak monitoring and permanent  
performance monitoring of  
radio networks with  
MULTICAL® 66-C  
MULTICAL® 601  
MULTICAL® 602  
MULTICAL® 603  
MULTICAL® 801  
MULTICAL® 803**

# Contents

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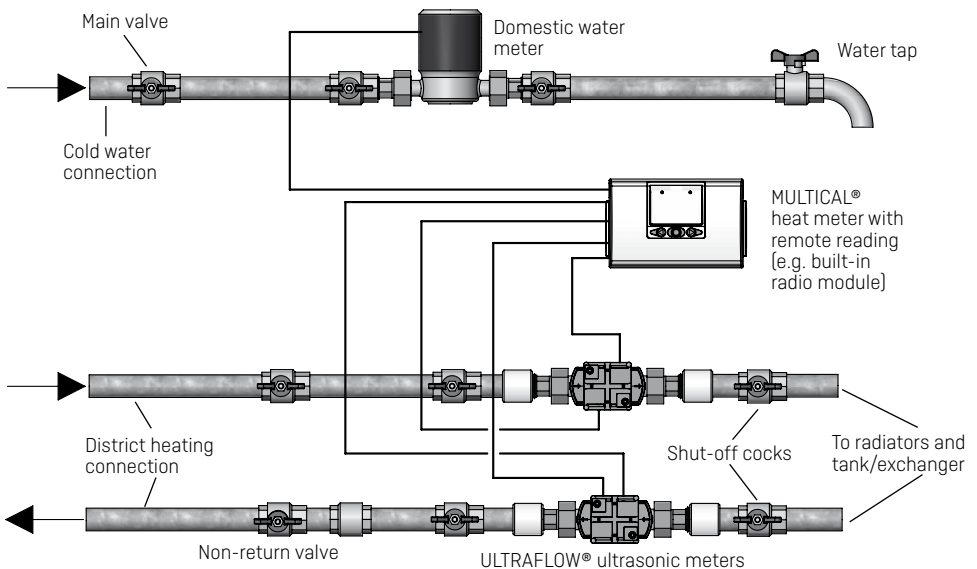
<b>1</b>	<b>General description</b>	<b>4</b>
1.1	District heating plant	4
1.2	Cold water systems	4
1.3	Receipt of alarm messages	4
1.4	Monitoring, no automatic blocking	4
1.5	Leak protection with automatic blocking	4
<b>2</b>	<b>Permanent performance monitoring</b>	<b>5</b>
2.1	Installation check	5
2.2	Check list for troubleshooting permanent performance monitoring	6
2.2.1	Flow difference error	6
2.2.2	Sensor error	7
2.3	Frequently occurring installation errors	8
<b>3</b>	<b>Responsibilities and liabilities</b>	<b>9</b>
3.1	Responsibility and installation agreement	9
3.2	Consumer Guidance	9
3.3	Proposal for installation agreement on leak monitoring	10
<b>4</b>	<b>Plumbing and heating installation</b>	<b>11</b>
4.1	Requirements to the heating system	12
4.2	Selection and position of flow sensor	13
4.3	Inlet conditions	14
4.4	Ascending pipe and downpipe	15
4.5	Selection and installation of cold water meter	15
4.6	Commissioning of heating system	17
4.7	Precautions in case of leak alarm	18
4.8	Troubleshooting the installation	19
4.9	Alteration from "Energy meter to leak monitoring"	19
<b>5</b>	<b>Electric installation</b>	<b>19</b>
<b>6</b>	<b>Insurance conditions and installation certificate</b>	<b>19</b>
6.1	Discount on insurance	19

## Preface

Kamstrup MULTICAL® 66-C, MULTICAL® 601, MULTICAL® 602, MULTICAL® 603, MULTICAL® 801 and MULTICAL® 803 are combined heat meters and leak monitoring units which secure continuous monitoring of both district heating and domestic water systems.

The combination of measuring and monitoring is simple, smart and reliable as many of the functions included in heat metering and cold water metering are identical with the functions involved in leak monitoring. The total number of components in the system can thus be reduced in favour of both reliability and costs.

Furthermore, the combination involves a number of advantages as to maintenance as both heat meters and cold water meters are subject to legal requirements for control measurement based on random sampling, which at the same time secures that the basic functions of leak monitoring are maintained. Leak monitoring can with advantage be extended to include permanent performance monitoring as it just requires the installation of a set of three sensors instead of a sensor pair. Permanent performance monitoring reduces the number of random samples to three meters per random sampling lot, no matter the size of the measuring lot as opposed to the approx. 10-15 % of the measuring lot that are usually taken for sampling. The purpose of these instructions is to provide caretakers, installers and consulting engineers with the information needed on Kamstrup's leak monitoring system. An example of such a system can be found below in Figure 1.



**Figure 1:** MULTICAL® connected to a water meter as well as two ULTRAFLOW® installed in inlet and outlet.

# 1 General description

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## 1.1 District heating plant

The leak monitoring system is primarily intended for direct connected district heating systems, i.e. systems without exchangers between the district heating network and the heating system of the house.

The monitoring equipment consists of two ultrasonically based flow sensors mounted in inlet and outlet pipes respectively as well as temperature sensors in both pipes. Furthermore, the electronics unit, MULTICAL®, calculates the heat energy and monitors the mass difference (temperature corrected volume) between inlet and outlet pipe, if any.

If a difference that exceeds 20 % of the measuring range (corresponding to approx. 300 l/h in a single-family house) is registered, an alarm will be sent within 120 sec. via the remote reading network.

Small leaks from 15 kg/h and upwards are monitored on the basis of daily average in order to exclude false alarms due to air pockets and quick flow changes from e.g. hot water exchangers.

## 1.2 Cold water systems

In addition to the above-mentioned functions, the pulse signal from the cold water meter of the house can be connected to the electronics unit MULTICAL®, thereby enabling MULTICAL® to monitor the cold water consumption. Possible running cisterns, untight heating spirals in tap water tanks, or other untightnesses will cause pulses to be received from the cold water meter 24 hours a day.

If MULTICAL® does not register at least one continuous hour/24 hours without pulses from the water meter, this implies a leakage in the water system and an alarm will be sent via the remote reading network.

## 1.3 Receipt of alarm messages

Incoming alarms are processed on the basis of a programmed operation pattern, which is laid down for each customer. Regular data readings from MULTICAL® to receiving station/control centre ensure that defective remote reading, if any, is detected.

## 1.4 Monitoring, no automatic blocking

The leak monitoring system is based on installation at a large number of private district heating customers. Normally the individual district heating stations install and maintain leak monitoring at all district heating customers in the area, as an integral part of compulsory heat metering. Therefore, the individual private district heating customers need neither take care of maintenance nor other technical matters in connection with the installed leak monitoring system, and at the same time the monitoring system must not involve increased risk of erroneous closing, which could lead to frost burst.

## 1.5 Leak protection with automatic blocking

Leak monitoring based on MULTICAL® can be extended by leak protection via DanTaet's district heating leak protection type KMP-F. The leak protection unit data communicates with the heat meter and automatically monitors the closing valves.

## 2 Permanent performance monitoring

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Permanent performance monitoring is a precise measuring system which is best compared to a combined main supply and control meter mounted in inlet and outlet pipes respectively. Permanent performance monitoring makes higher demands on both installation and meter than those applying to an "ordinary" heat meter.

After setup and adaptation, the permanent performance monitoring system will continuously check and "approve" the accuracy of the individual meters. If a meter, contrary to expectation, is exceeding the limits of the acceptable accuracy, the permanent performance monitoring system will inform about this. Since the permanent performance monitoring is continuously comparing results, irregularities can be registered in some installations for different reasons, e.g. due to installation error, measuring error, leakage, air in the system etc. Experience shows that installation error is the most frequently occurring reason for malfunction, and therefore it is extremely important to carry out the below-mentioned installation check.

### 2.1 Installation check

A permanent performance monitoring system has five metrological inputs:

- Inlet volume [V1]
- Outlet volume [V2]
- Inlet temperature [t1]
- Outlet temperature [t2]
- Control temperature [t3]

The installation check can be carried out using the meter's display provided that the selected display code can display current water flow V1 and current water flow V2 as well as current temperatures t1, t2 and t3. If the display code selected for the meter cannot display all five inputs, a "Leak tester", which is a device that can only display the values of the five inputs, can be used.

In order to make sure that the flow sensors in inlet and outlet pipes have been correctly installed, heat consumption must be established. Turn up one or two radiator thermostats, if necessary. The current water flow must be minimum 100 l/h. Now change between readings of water flow V1 and water flow V2 several times and observe the two flows for a couple of minutes. The two current water flows must not differ more than maximum 5 per cent. Normally, the inlet flow is a little higher than the outlet flow as the current water flows are not temperature corrected.

Subsequently, check that inlet and outlet temperatures are realistic. Now change between temperature readings t3/t1 (or t3/t2) for a couple of minutes and check that t3 matches t1 (or t2) within max.  $\pm 0.20$  °C.

If the result of this check is not satisfactory, the error must be found and corrected. The below check list can be used for troubleshooting.

## 2.2 Check list for troubleshooting permanent performance monitoring

This check list can be used as a help in checking permanent performance monitoring installations that have displayed errors.

### 2.2.1 Flow difference error

Permanent performance monitoring has registered a difference of more than 6 per cent between the two flow sensors.

**Note:** Check whether a bypass, pipe or hose is connected before the flow sensor in the inlet pipe.

#### Outlet flow higher than inlet flow

- 1 Check the installation for flow disturbances:
  - A Control valves, strainer/filter, temperature sensors and other flow disturbing components must be placed on the flow sensor's outlet side.
  - B If the installation includes strainer/filter, it/they must be checked for dirt. If installation/thermostats permit it, remove the filter.
  - C Have the flow sensors been mounted according to instructions? (The flow sensors are marked "Inlet" and "Outlet").
  - D Having dismantled the flow sensor, check for scale that can disturb the sensor. Scale inside the sensor can be the cause of the error. (Check the hot water tank for untightnesses).
- 2 Leakage test:
  - A Close the main valve for the inlet flow (cut off the flow leading into the house).
  - B Check for leaks of domestic water into the heating system by reading both current inlet flow and current outlet flow (use leak tester or calculator top programmed to display both current flows).
  - C Alternatively, the system must be pressure tested.

#### Inlet flow higher than outlet flow

- 1 Check the installation for flow disturbances:
  - A Control valves, strainer/filter, temperature sensors and other flow disturbing components must be placed on the flow sensor's outlet side.
  - B If the installation includes strainer/filter, it/they must be checked for dirt. If installation/thermostats permit it, remove the filter.
  - C Have the flow sensors been mounted according to instructions? (The flow sensors are marked "Inlet" and "Outlet"). If flow sensors for inlet and outlet respectively have been interchanged, this can result in permanent performance monitoring registering an error of approx. 4 %.
- 2 Leakage test:
  - A Close the main valve for the outlet flow (cut off the flow leading from the house).
  - B Check that the current inlet flow diminishes to 0.
  - C Alternatively, the system must be pressure tested.

### 2.2.2 Sensor error

[Difference between  $t_1/t_2$  and  $t_3$  is higher than the permitted  $0.75\text{ }^{\circ}\text{C}$ ].

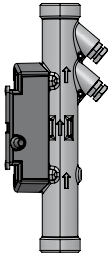
**Note:** One metre of uninsulated iron pipe loses  $2\text{ }^{\circ}\text{C}$  at  $15\text{ l/h}$ .

#### **$t_3$ lower than $t_1/t_2$**

- 1** Check for correct mounting:
  - A** Is the distance between the two temperature sensors observed (maximum  $12\text{ cm}$  without insulation or  $40\text{ cm}$  with insulation)?
  - B** Has  $t_3$  been mounted at correct depth compared to pipe dimension?

#### **$t_3$ higher than $t_1/t_2$**

- 1** Check for correct mounting:
  - A** Has  $t_3$  been mounted before  $t_1/t_2$ ?
  - B** Has  $t_1/t_2$  been mounted at correct depth compared to pipe dimension?



The ideal solution is to use Kamstrup's ULTRAFLOW® 54 ( $6\frac{3}{4} \times 165\text{ mm}$ ) with two sensor sockets.

### 2.3 Frequently occurring installation errors

Below we have listed some of the most frequently occurring installation errors.

#### **Flow sensors for inlet and outlet pipes are interchanged during installation**

The volume of the hot water in the inlet pipe is a little bigger than that of the cold water in the outlet pipe. As the calculator temperature corrects the measured volumes, interchanged flow sensors will result in an error of 4-6 %.

#### **A filter/strainer is mounted before the inlet flow sensor**

If the filter/strainer is new and clean, the flow disturbance will be very small and may not produce any measuring error, but a dirty filter can cause heavy flow disturbance, which may produce a measuring error.

#### **Insufficient straight inlet before flow sensors**

There must be minimum 100 mm straight inlet before both flow sensors\*, when they are used for leak monitoring or permanent performance monitoring. All flow disturbing components (sensors, filters, elbows, valves etc.) must be installed on the outlet side of the flow sensor.

#### **The flow sensors are not installed with the same orientation**

The best results are obtained by installing the flow sensors symmetrically, i.e. both flow sensors vertically or both flow sensors horizontally.

#### **Control sensor (t3) has been mounted too far from inlet sensor (t1) or outlet sensor (t2)**

At low water flow, there is a big temperature drop over even a short length of pipe. In order to secure correct function, the distance between inlet/outlet sensor and control sensor may be max. 12 cm. The best solution is to use ULTRAFLOW® with two sensor sockets.

#### **Control sensor (t3) measures too low temperature**

If the control sensor is installed in special cross connections or angles/elbows, the water flow past the sensor may not be optimal, or the sensor does not reach the centre of the pipe diameter. In both cases the control temperature is too low. The best solution is to use ULTRAFLOW® with two sensor sockets.

#### **Several burst alarms at severe frost**

Today most houses are so well insulated that the thermostats in some rooms are mostly closed, and especially the floor heating coils may thus possess air. These thermostats only open at severe frost, and therefore the content of air is washed out with the outlet water. When the flow sensor in the outlet pipe is exposed to large amounts of air, it stops briefly and the sensor registers a burst alarm.

**Note:** Do not forget to air the system at the start of the heating season and after possible pipework.

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\* This requirement can be dispensed with if a test has been made with positive result and Kamstrup has made an evaluation.

## 3 Responsibilities and liabilities

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The object of this paragraph is to provide advice to district heating stations that consider introducing leak monitoring as a supplement to heat metering.

The purpose of installing leak monitoring at district heating consumers is to offer the consumers better service as well as to reduce the risk of water damage to house and contents. Furthermore, leak monitoring shall contribute to minimizing water waste in the house, to the benefit of both the environment and the economy. Leak monitoring also prevents extra water bills and minimizes the risk of long leakage of district heating water to tap water or vice versa.

### 3.1 Responsibility and installation agreement

Prior to the installation of leak monitoring each district heating consumer ought to sign a written installation agreement with the district heating station, partly to prevent misunderstandings about operation/responsibilities and partly to define, how the district heating station is to react if a leakage is found. Furthermore, it ought to appear from the installation agreement that the district heating station is neither responsible for pipe installations nor consequential damage occurring after a leakage.

The installation agreement can be prepared on the basis of "Proposal for installation agreement on leak monitoring" overleaf. However, the agreement ought to be re-examined with a view to optimal adaption to the local conditions of the district heating station in question and we recommend district heating stations to involve a solicitor in the final preparation.

As an alternative to individual installation agreements leak monitoring conditions can be included in the station's general terms.

As the monitoring system depends on various external factors, e.g. intact remote reading, the monitoring service, which the district heating station carries out for the consumer, ought not to involve liability for damages, it should only be seen as the consumer service it is.

### 3.2 Consumer Guidance

In order to obtain optimal monitoring of pipe installations the consumers ought to be informed how they can contribute to optimal operation of the system:

- Cancellation of leak alarms after pipe work and after airing of radiators and floor heating.
- Visual control of visible installations and pipes.
- Manual closing of outlet valve, while current inlet flow is read on the heat meter.

The consumers ought also to be informed:

- Who to call in if a leak is suspected; District heating station or heating and sanitary engineer?

Further, the consumers ought to be informed that leak monitoring may involve "false alarms" in case of prolonged water consumption, e.g. due to the use of "perforated hoses" for garden irrigation, in connection with keeping of animals or due to similar consumption patterns.

### 3.3 Proposal for installation agreement on leak monitoring

E. Consumer

Energy Street 4

9999 District Heating City

**Consumer No.: 123456**

The district heating station hereby offers to install leak monitoring in your:

- Heating system
- Cold water installation

The district heating station offers leak monitoring as a service with a view to discovering possible leakages and pipe bursts in your installations. The system is installed by your district heating station which also maintains it and checks the heat meter according to applicable rules in this area.

The district heating station does not take over responsibility for your installation or house content but offers you a monitoring service, which makes it possible for you to minimise consequential damage, if any.

Leak monitoring is an individual service, for which the consumer pays EUR xxx/year in addition to the fixed connection charge.

If the district heating station discovers a leakage in my installation via the monitoring system, the following action should be taken:

- Personal call on telephone number \_\_\_\_\_, alternatively \_\_\_\_\_
- Automatic SMS message to my mobile phone no.: \_\_\_\_\_
- Message to the security services company: \_\_\_\_\_ Tel. no.: \_\_\_\_\_, with which I have signed an agreement.

Electronic monitoring always involves some uncertain factors. Therefore, neither producer nor district heating station can be held responsible for consequential damage caused by leakages or bursts in the consumer's installations. Furthermore, the district heating station cannot be held responsible for consequential damage caused by interruptions in the operation of the monitoring service.

The undersigned hereby accepts the installation agreement and at the same time fully agrees to the above:

\_\_\_\_\_

Date

\_\_\_\_\_

Signature

## 4 Plumbing and heating installation

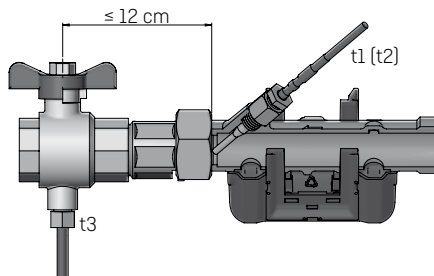
The installation of the leak monitoring equipment by a heating and sanitary engineer must follow the same guidelines that apply to heat meters in general. During mounting the flow directions of both inlet and outlet sensors must be observed. Please note that the flow sensors are marked "Inlet" and "Outlet", which must be obeyed.

Short direct temperature sensors according to EN 1434 must be used, because they can be mounted in the flow sensors to make the installation work easier. Furthermore, Kamstrup can deliver flow meters with two installation sockets for direct short sensors.

As the monitoring principle is based on a comparison of inlet and outlet, it is crucial for the system's reliability that inlet and outlet sensors are symmetrically mounted.

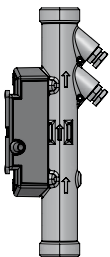
Before mounting the flow sensors, the system is to be thoroughly flushed with a fitting piece mounted. Chips and dirt, if any, are thus washed away.

In connection with permanent performance monitoring, t3 must always be mounted as close to the t1/t2 as possible so that the distance between t1 and t3 (or between t2 and t3) will be maximum 12 cm.



**Figure 2:** ULTRAFLOW® sensor with temperature sensor, t3, installed within 12 cm distance from ULTRAFLOW®.

The three temperature sensors have been measured in sets (one serial number applying to all three sensors) in order to make sure that the accuracies of the three sensors are the same. If a sensor needs to be replaced, all three sensors must be replaced by a new set.

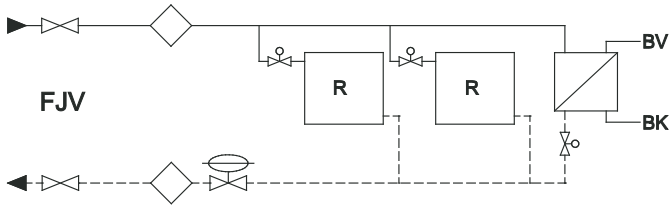


The ideal solution is to use flow meters with two sensor sockets.

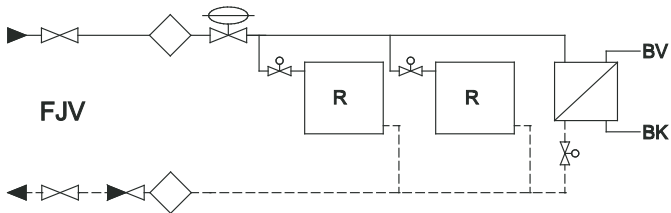
#### 4.1 Requirements to the heating system

Under normal operating conditions and in systems with minor leakages the flow direction of a heating system always is from inlet to outlet, controlled by the differential pressure in the district heating network.

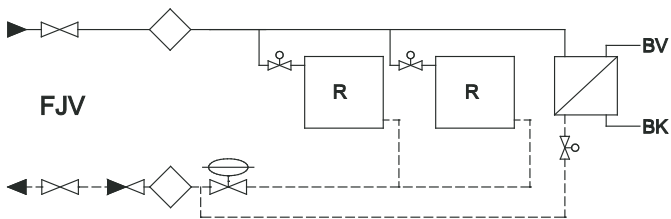
In case of pipe bursts in the heating system's outlet pipes and radiators it may occur that radiator thermostats and tap water exchangers block the inlet flow, whereby the outlet pressure from the district heating network may cause a reverse flow direction and thereby increase the leakage. Such situations ought to be prevented by mounting a non-return valve in the outlet pipe.



**Figure 3:** In heating systems with a differential pressure regulator mounted in the common outlet string close to the main valve, however, this will not happen as the differential pressure regulator will block the outlet water due to the pressure in the inlet pipe.



**Figure 4:** In heating systems without a regulator, or with the differential pressure regulator placed in the inlet pipe a non-return valve ought to be mounted close to the outlet pipe's main valve.

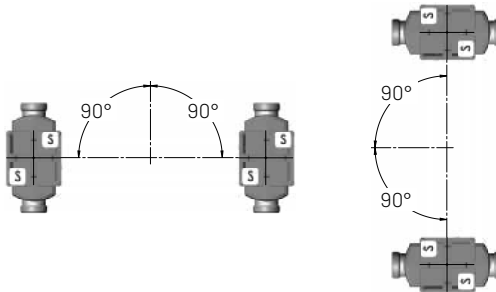


**Figure 5:** In heating systems, in which outlet flow from the tap water tank or exchanger has been bypassed around the differential pressure regulator, a non-return valve must be mounted close to the outlet pipe's main valve.

## 4.2 Selection and position of flow sensor

The installation of leak monitoring equipment by a heating and sanitary engineer must follow the same guidelines that apply to heat meters in general. During mounting the flow directions of both inlet and outlet sensor must be observed. The flow direction is marked on the flow sensors.

The leak surveillance system can only be used together with flow sensors type ULTRAFLOW® as they have the necessary accuracy, resolution and long-term stability required in order to obtain a reliable leak monitoring system.



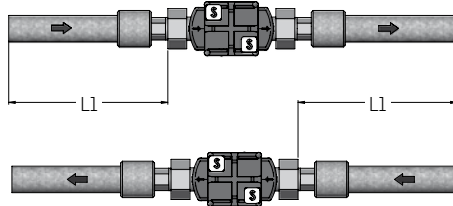
**Figure 6:** The two flow sensors must be similarly mounted, i.e. not one vertically and one horizontally.



**Figure 7:** In case of small and medium-sized ULTRAFLOW® ( $\leq$ DN100), the electronics box must be mounted on the side and is allowed to be turned maximum  $-45^\circ$  in relation to the pipe axis.

### 4.3 Inlet conditions

Installing ULTRAFLOW® in connection with permanent performance monitoring and leak monitoring systems, the flow sensors must be mounted with straight inlet in order to secure the best possible measuring accuracy. This applies to all sizes. In connection with leak monitoring systems the straight inlet must as a minimum observe the following rules:



**Figure 8:** For ULTRAFLOW® with a diameter  $\leq$  DN20, it applies that the straight inlet  $L1 \geq 100$  mm\*.  
For ULTRAFLOW® with a diameter of  $\geq$  DN25, it applies that  $L1 \geq 10 \times DN^*$ .

\* This requirement can be dispensed with if a test has been made with positive result and Kamstrup has made an evaluation.

If flow disturbing components (e.g. strainers) have been installed within a distance of 20 cm before the flow sensor (size 1.5 m<sup>3</sup>/h) they must be removed. This applies to both inlet and outlet sensor. For other flow sensor sizes the distance is  $20 \times DN$ .

A non-return valve ought to be mounted in the outlet sensor's outlet unless a differential pressure regulator has been mounted rendering the non-return valve superfluous.

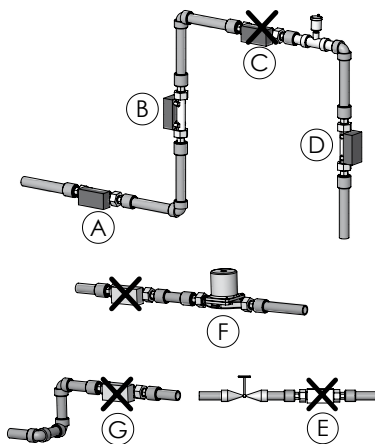
District heating units must either fulfil the above-mentioned requirements or have been tested with a satisfactory result [see Danfoss test specification VF.HE.C1.D2].

#### 4.4 Ascending pipe and downpipe

In heating installations, in which the piping is inappropriate with a view to the installation of leak monitoring, minor reconstructions may be necessary in order to secure optimal positions for the two flow sensors of the leak monitoring system.

Examples of acceptable and unacceptable installations can be seen below.

- A** Recommended position.
- B** Recommended position.
- C** Unacceptable position due to risk of air build-up.
- D** Acceptable position in closed systems.
- E** Ought not to be placed immediately after a valve, with the exception of block valves (ball valve type) which must be fully open when not used for blocking.
- F** Ought not to be placed immediately before or after a pump.
- G** Ought not to be placed immediately after a double bend in two planes.



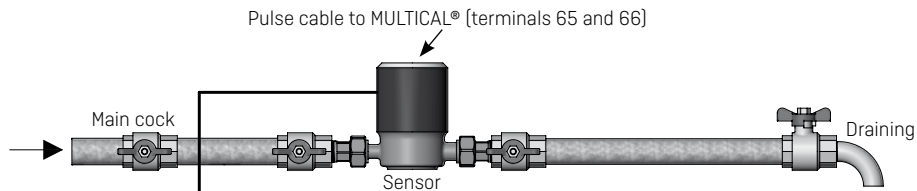
\* Furthermore, we refer to "CEN/CR 13582" concerning the installation of heat meters.

#### 4.5 Selection and installation of cold water meter

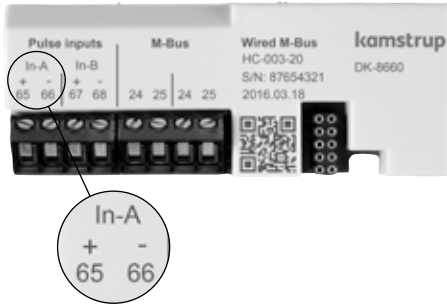
The cold water meter of the house ought to be connected to MULTICAL® in order to extend leak monitoring to comprise the domestic water system too.

An approved billing meter with bounce protected pulse output must be used. As the quality of the meter is decisive for both remote reading and leak monitoring, only high-quality meters with satisfactory operating experience ought to be used.

The recommended pulse value is 10 l/imp., which gives the best result in most installations. However, other pulse values can be used. If higher pulse values are used, e.g. 100 l/imp., the sensitivity is reduced, and a possible leakage in the tap water system will be discovered later than it would have been if a lower pulse value had been selected.



**Figure 9:** The sensor is installed according to water supply directives. We recommend installation of the sensor immediately after the main valve so that the total water consumption of the house is measured.



The pulse cable is drawn to MULTICAL®, where the two wires are connected to terminals nos. 65 and 66 (Input A). The polarity is unimportant and the pulse cable may be extended up to 25 metres provided that the cable is drawn at a distance of minimum 25 cm to other cables.

Please do not forget that extending the cold water meter's cable a sealable junction box must be used in order to protect the installation against tampering.

The cold water meter's pulse value (e.g. 10 litres/pulse) must be programmed into MULTICAL® in order to obtain compliance in accumulation. For further information, see Technical Description for MULTICAL®.



**MULTICAL® 66-C**



**MULTICAL® 601**



**MULTICAL® 603**



**Figure 10:** The meter's current count can be programmed into MULTICAL® as initial value by means of the PC-tool METERTOOL to allow accumulations to proceed synchronously.

#### 4.6 Commissioning of heating system

Prior to commissioning, the meter's energy and volume counts are noted.

When the installation has been completed, water flow can be turned on. The valve on the meter's inlet side must be opened first in order to keep the system under pressure. Subsequently the outlet valve is slowly opened.

Increase the water flow by turning up the thermostats of the house. If the house has a domestic water exchanger, also turn on the domestic hot water. After a few minutes with large consumption, check the current readings of MULTICAL®. Press the top front button (arrow) until inlet and outlet temperatures are displayed. Subsequently, activate the front key until the measuring unit "l/h" is displayed. The display is updated every 10 sec.

When the heating system is in operation, air the complete heating system thoroughly. Do not forget radiators and floor heating, if any.

The energy measurement is checked by reading the meter's energy and volume counts. Compare the readings to the counts noted before commissioning. The installation cannot be "approved" until an increase of both energy and volume reading has been registered.

House meters accumulate the volume reading after a consumption of only 10 litres district heating water (0.01 m<sup>3</sup>), whereas the energy reading can require 20-40 litres of district heating water in order to register 1 kWh (= 0.001 MWh), depending on the system's cooling. The counts of large systems have fewer decimals (coarser resolution).

Before ending the installation move to INFO code in the display, wait 30 sec. and check that the INFO code is still 0. If INFO is different from 0, see the section "troubleshooting the installation", for possible localization of faults.

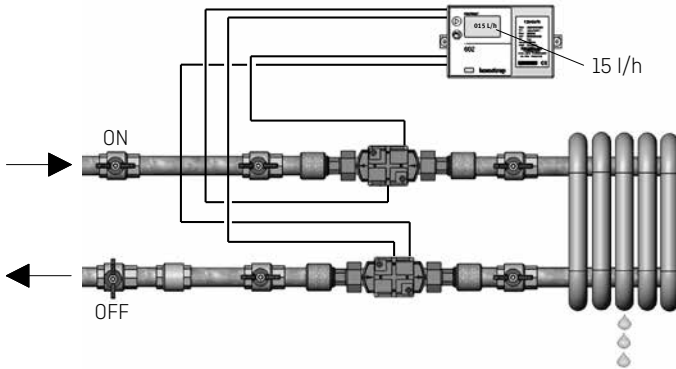
Do not forget to check that all connections are tight and finally seal MULTICAL®, all flow sensors, temperature sensors and junction boxes, if any.

**Note:** The ULTRAFLOW® flow sensors must not be exposed to pressure lower than the ambient pressure (vacuum).

The heating system must not be subjected to soldering or "freezing" with flow sensors or temperature sensors mounted in the system.

#### 4.7 Precautions in case of leak alarm

In case of leak alarm or a suspected leakage in the heating system, first of all a visual inspection of all visible parts of the installation is carried out, and subsequently a "simple" test of the system's tightness is performed: Close the heating system's main outlet valve and read the inlet flow in the display. The flow reading is updated every 10 sec. and after 20-30 sec. the reading ought to have fallen to 0 l/h. If the tightness of the main valve in closed condition is suspected, the closing valves at the outlet sensor, if any, should also be closed.



**Figure 11:** Shut off of outlet main tap in case of leakage in the heat system.

If after one minute the reading exceeds 5 l/h, the complete heating system, including radiators and possible floor heating, is to be thoroughly aired.

Now repeat the tightness test. If the reading still exceeds 5 l/h, this indicates a leakage in the heating system, and an expert must be called in to check the system.

The heat supplier ought to inform the private heat consumers about the measures to be taken in case a leakage is found; should the consumer contact the district heating station or an authorized plumber who carries out leakage detection.

Repair and/or scrapping must never be based on the leakage alarm alone. A professional evaluation by an authorized plumber and/or leakage detection company must always be made.

Do not forget, if relevant, to report the damage to your insurance company before starting the repair work.

#### **4.8 Troubleshooting the installation**

If leak monitoring results in false alarms, the following ought to be checked:

- Do both flow sensors have the correct orientation in the installation? (Flow arrow in the direction of the water flow)
- Are the ULTRAFLOW® in inlet and outlet correctly connected?
- Are the ULTRAFLOW® in inlet and outlet correctly mounted with a view to bypass?
- Has the heating system been aired?
- Has the heating system been repaired?

See Kamstrup document 5512-924 "Check list for troubleshooting permanent performance monitoring" for further instructions.

#### **4.9 Alteration from "Energy meter to leak monitoring"**

MULTICAL® heat energy meters supplied as type 66-Cx-xx1-xxx or 67-Cx-xxxx1-xxx can be reprogrammed for leak monitoring [re selection of flow sensor; see paragraph 3.2].

**Contact Kamstrup for advice on programming as well as compliance with current regulations.**

## **5 Electric installation**

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The MULTICAL® permanent performance monitoring system can also be powered by mains supply. MULTICAL® is available in mains supplied versions for connection to 24 VAC.

With a view to obtaining optimal personal safety during service etc., we recommend you to use a 24 V installation, in which the meter is supplied via a safety transformer mounted in the electrical panel of the house.

A safety transformer can be supplied by Kamstrup [type 66-99-403].

No matter which type of mains supply you choose, the electrical installation must fulfil the requirements of "Installation of mains supplied heat meters" issued by the Danish Safety Technology Authority.

Regarding power supply see technical descriptions.

Concerning radio installation, see "Radio installation MULTICAL® leak monitoring".

## **6 Insurance conditions and installation certificate**

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### **6.1 Discount on insurance**

When the leakage monitoring system is supplemented with leak protection from DanTaet, the consumers can obtain discounts on their insurance premium for extended burst pipe coverage as the insurance companies of course have an interest in minimizing consequential damages. Discount agreements on the insurance premium are normally entered into by and between the consumers and their individual insurance companies.

Leak monitoring and permanent performance monitoring