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Installation and user guide

MULTICAL® 302

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Information

Permissible operating conditions / measuring ranges
Heat meter with approval according to MID and EN1434:

Temperature range	θ: 2 °C...150 °C	$\Delta\Theta$: 3K...130K
Flow sensor (temperature of medium)	θ: 2 °C...130 °C (MULTICAL® 302-T)	

Cooling meter with approval according to DK-BEK 1178 and EN1434:

Temperature range	θ: 2 °C...150 °C	$\Delta\Theta$: 3K...85K
Flow sensor (temperature of medium)	θ:2 °C...50 °C (MULTICAL® 302-C)	

Mechanical environment
Class M1 and M2.

Electromagnetic environment
Class E1 (housing/light industry). The meter's control cables must be drawn at min. 25 cm distance from other installations.

Climatic environment
Non-condensing, closed location (installation indoors), ambient temperature 5...55 °C.

Maintenance and repair
The flow sensor and the temperature sensors must not be separated from the calculator. Repairs require subsequent reverification in an accredited laboratory.

Contents

1 In general

Read this guide carefully before mounting the energy meter.
In case of incorrect mounting, Kamstrup's guarantee obligations no longer apply.
When working on the flow sensor in the installation, there is a risk of outflow of (hot) water under pressure.
At a medium temperature higher than 60 °C, the flow sensor should be shielded from unintended contact.

Please note that the following installation conditions must be obeyed:

- Pressure stage: PN16/PN25, see marking.
- Pressure stage
  sensor pair type ø5.2: PN16 and PN25

At medium temperatures above 90 °C, wall-mounting of the calculator is recommended.
At medium temperatures below the ambient temperature, MULTICAL® 302 must be wall-mounted.

2 Temperature sensors

The temperature sensors used for measuring inlet and outlet temperatures, respectively, consist of a matched pair of sensors, which must never be separated.

Temperature sensors are mounted in MULTICAL® 302 from the factory. According to EN 1434/OIML R75, the cable length must not be changed.

The temperature sensor which is mounted in the flow sensor from the factory has no marking on the sensor cable. The other temperature sensor is marked with a green plastic ring on the cable. This temperature sensor is mounted in the pipe opposite the flow sensor.

2.1 Mounting of temperature sensors

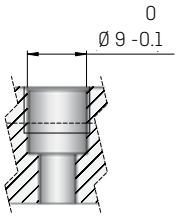
MULTICAL® 302 comes with a ø5.2 mm Pt500 sensor pair with 1.5 m silicone cable. This sensor type can be used as direct sensor using a coupling and an O-ring or as pocket sensor to be mounted in a sensor pocket.

One temperature sensor is mounted in the flow sensor from the factory. The other sensor ought to be mounted as direct sensor. Alternatively, both temperature sensors must be mounted in sensor pockets, with reference to the requirement for symmetric sensor installation in EN 1434. If one of the temperature sensors is not to be mounted in the flow sensor, it must instead be mounted as close to the outlet of the flow sensor as possible so that the distance between the flow sensor and the temperature sensor is max 12 cm.

Asymmetrical sensor installation (one direct temperature sensor and one pocket sensor) is only advisable where national regulations allow this, and never in systems with low differential temperature and/or low water flow.

Note: The sensor cables must neither be exposed to jerking nor pulling. Please be aware of this when binding the cables, and be careful not to pull the binders unnecessarily tight as this may damage the cables. Please also note that temperature sensors must be mounted from below in cooling or heat/cooling installations.

No matter where the direct sensor is installed, it is very important to observe the tolerances stated in the drawing to the right. If not, the O-ring may not provide correct sealing.



3 Mounting of flow sensor

Prior to installation of the flow sensor, the system should be flushed and protection plugs/plastic diaphragms removed from the flow sensor.

Correct position of the flow sensor appears either from the calculator's type label or from the display where indicates the position in inlet, whereas indicates the position in outlet. The flow direction is symbolised by an arrow on the flow sensor.

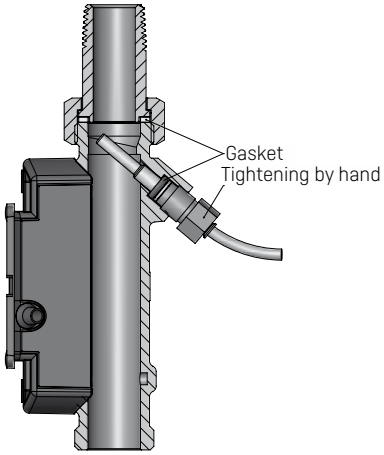
3.1 Mounting of couplings and short direct sensor in flow sensor

The flow sensor can be used in connection with either PN16 or PN25 (see marking).

Any provided blind plug, extension and gland can be used with both PN16 and PN25.

In connection with flow sensors with the nominal dimensions G¾Bx110 mm and G1Bx110 mm, it must be checked if the thread run-out is sufficient.

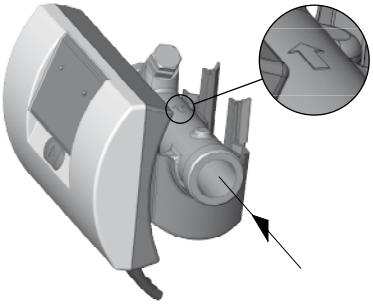
Couplings and gaskets are mounted as shown in the figure. Make sure to position the gasket correctly in the recess of the gland as shown in the details excerpt in the figure.



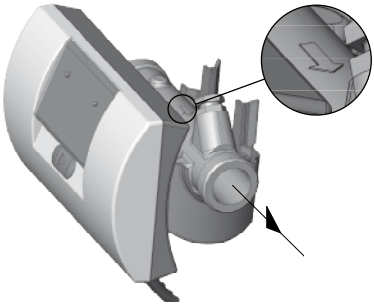
Kamstrup flow sensors require neither straight inlet nor straight outlet to meet the Measuring Instruments Directive (MID) 2014/32/EU, OIML R75:2002 and EN 1434:2015. A straight inlet section will only be necessary in case of heavy flow disturbances before the meter. It is recommended to follow the guidelines of CEN CR 13582.

3.2 Flow direction

When the meter is installed in the application, it must be ensured that the flow direction is correct.



Flow direction out of the figure – the direction is indicated on the flow sensor.



Flow direction into the figure – the direction is indicated on the flow sensor.

3.3 Flow sensor position

A Recommended position.

B Recommended position.

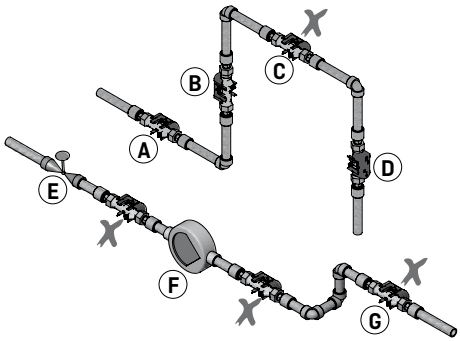
C Unacceptable position due to risk of air build-up.

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.

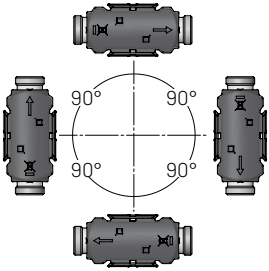
F Ought not to be placed immediately before or after a pump.

G Ought not to be placed immediately after a double bend in two planes.

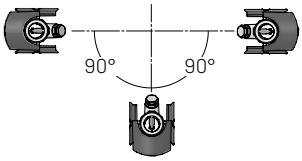


In order to avoid cavitation, the back pressure at the flow sensor (the pressure at the flow sensor outlet) must be minimum 1.5 bar at q_p (nominal flow) and minimum 2.5 bar at q_s (maximum flow). This applies to temperatures up to approx. 80 °C. The flow sensor must not be exposed to pressure lower than the ambient pressure (vacuum).

3.4 Mounting of ULTRAFLOW® ≤ DN125



The flow sensor can be mounted horizontally, vertically or at an angle.



The flow sensor can be mounted at 0° and may be turned downwards to 90°.

3.5 Installation position

In the upper left corner of the meter display, an icon indicates if the meter is positioned in the inlet or outlet pipe.

It is very important to ensure that the meter is correctly positioned as either inlet meter or outlet meter. The installation position of the meter can be changed in the SETUP loop (for further information, see paragraph 9.1, page 13).

Icon for inlet meter

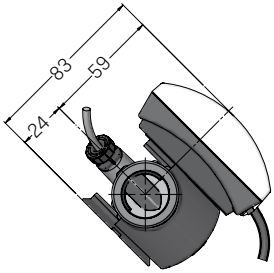
Icon for outlet meter

4 Mounting the calculator

4.1 Compact mounting

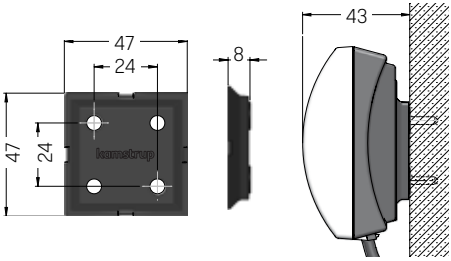
The calculator is mounted directly on the flow sensor. The calculator is sealed from the factory, and therefore, further sealing is unnecessary, unless the seals on the back of the calculator have been broken.

At the risk of condensation (e.g. in cooling applications), the calculator must be wall-mounted.



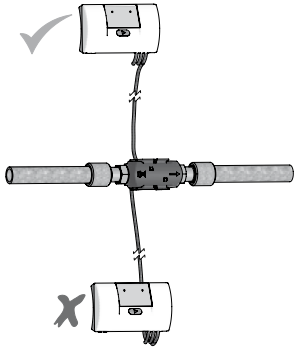
4.2 Wall-mounting

The wall fitting (3026-655.A) makes it possible to mount MULTICAL® 302 directly on an even wall. Use the fitting as a template to mark and drill two 6 mm holes in the wall. Then mount the wall fitting with screws and rawlplugs.



4.3 Position of calculator

If the flow sensor is installed in a humid or condensing environment, the calculator must be mounted higher than the flow sensor.



5 Battery supply

MULTICAL® 302 is battery-supplied with either 1 or 2 A-cell batteries. Optimal battery lifetime is obtained by keeping the battery temperature below 30 °C, e.g. by wall-mounting.

The voltage of a lithium battery is almost constant throughout the lifetime of the battery (approx. 3.65 V). Therefore, it is not possible to determine the remaining capacity of the battery by measuring the voltage. Info code 128, however, indicates that the battery voltage is low.

The battery cannot and must not be charged and must not be short-circuited. Used batteries must be handed in for approved destruction, e.g. at Kamstrup A/S. For further information, see document about handling and disposal of lithium batteries (5510-408).

6 Testing of function

Carry out an operational check when the energy meter has been fully mounted. Open thermoregulators and valves to enable water flow through the heating system. Activate the front key of MULTICAL® to change display reading, and check that the displayed values for temperatures and water flow are credible values.

7 Information code

MULTICAL® 302 constantly monitors a number of important functions. If there is an error in the metering system or installation, a flashing "INFO" appears and remains in the display until the error has been corrected, regardless of the selected display.

"INFO" automatically switches off when the error has been corrected. For indicating current errors in MULTICAL®, it is possible to scroll to the information code in the display. This is the display in which "INFO" does not flash, but is shown permanently.

Info code	Description	Response time
0	No irregularities	-
1	Supply voltage has been interrupted	-
4	Temperature sensor t2 outside measuring range	< 32 s
8	Temperature sensor t1 outside measuring range	< 32 s
32	Temperature difference has wrong polarity	< 32 s and 0.05 m^3
128	Supply voltage too low	< 10 s
16	Flow sensor with weak signal or air	< 32 s
2	Flow sensor with wrong flow direction	< 32 s

If several info codes appear at the same time, the sum of info codes is displayed. For example, if both temperature sensors are outside the measuring range, info code 12 (info codes 4+8) is displayed.

The info codes 4 and 8 are set when the temperature falls below 0.00 °C or exceeds 155.00 °C. The info codes 4 and 8 are also set for short-circuited and disconnected sensors.

Note: If Information code 4 or 8 is present, the meter's energy calculation and volume accumulation stops.

8 Communication

MULTICAL® 302 can be delivered with or without communication. Possible communication types are either M-Bus or Wireless M-Bus.

8.1 M-Bus

If the meter is supplied with built-in M-Bus, M-Bus protocol according to EN 13757-3:2013 is used. The connection to M-Bus master is established via the fixed M-Bus cable. Connection is independent of polarity and the M-Bus interface is galvanically separated from the rest of the meter.

M-Bus comes with primary, secondary and enhanced secondary addressing. The M-Bus address is indicated when placing the order, but can be changed subsequently in the SETUP loop (see paragraph 9, page 12).

8.2 Wireless M-Bus

If the meter has integrated wireless M-Bus, it is possible to select between Mode C1 or Mode T1 OMS. Mode C1 is used in connection with Kamstrup's reading systems and in general for drive-by meter reading. Mode T1 OMS is used in connection with OMS-based stationary networks.

The meter has an internal antenna.

Mode C1

Protocol according to EN 13757-4:2013. Transmission interval 16 s. Individual 128 bit AES encryption.

Mode T1 OMS

Protocol according to EN13757-4:2013 and OMS Specification, Volume 2, Issue 3.0.1. Transmission interval of 900 s. Individual 128-bit AES encryption.

9 Setup

When delivered, the meter is in transport state, which means that the SETUP loop is available.

The SETUP loop is accessed by activating the front key continuously for 9 seconds until "3-SEtUP" is displayed.

The meter remains in the SETUP loop until the front key is pressed for 5 seconds. However, a time-out secures that the meter reverts from the SETUP loop to the USER loop after 4 minutes.

Below, the readings in the SETUP loop are listed including index numbers:

SETUP loop		Index number in display
1.0	Customer number (Nº 1)	3-01
2.0	Customer number (Nº 2)	3-02
3.0	Date	3-03
4.0	Time	3-04
5.0	Target date (MM.DD)	3-05
6.0	Flow sensor: Inlet or outlet (A code)	3-06
7.0	Measuring unit and resolution (B code)	3-07
8.0	M-Bus primary address (Nº 31)	3-08
9.0	Average time of max P and Q	3-09
10.0	θ_{hc} *(Can only be changed in meter type 6. Other meter types show 180 °C without the option to change it)*	3-10
11.0	Radio "ON" or "OFF"	3-11
12.0	EndSetup	3-12

After 4 minutes without activation of the key, the meter reverts to the energy reading in the USER loop.

The meter leaves the transport state when it has registered the first integration, either at 0.01 m^3 (10 L) or at 0.001 m^3 (1 L) – depending on the selected resolution.

When the transport state has been cancelled, you only have access to the SETUP loop if the SETUP seal is broken and the contact points behind the seal are short-circuited.

Note: The option of accessing the SETUP loop can be blocked when ordering the meter.

9.1 Changing the installation position

At delivery, the meter is configured for either inlet or outlet.

The setup of the meter's installation position can be changed from inlet meter to outlet meter (and vice versa):

For this purpose, display 3-06 is used.

Inlet

If the meter is set to be an inlet meter, the text "Inlet" is displayed. To change the setting, press the key for two seconds. "3-SEtUP" is briefly displayed, and then "Inlet" flashes. Press the key once, and "Outlet" is displayed. If you want to save the setting, press the key for two seconds until "OK" appears in the display.

Outlet

If the meter is set to be an outlet meter, the text "Outlet" is displayed. To change the setting, press the key for two seconds. "3-SEtUP" is briefly displayed, and then "Outlet" flashes. Press the key once, and "Inlet" is displayed. If you want to save the setting, press the key for two seconds until "OK" appears in the display.

9.2 Changing the energy unit

The energy unit can be changed. In order to do so, follow the example in paragraph 9.1, page 13, but instead of reading 3-06, reading 3-07 is to be used.

If you change the energy unit setting in the SETUP loop, you must be aware that the change can influence the most significant digits of the display. If you, for example, change from GJ with 2 decimals to GJ with 3 decimals, the most significant digit disappears. The same applies if you change from kWh without decimals to kWh with 1 decimal. Conversely, the least significant digit disappears if you, for example, change from kWh with 1 decimal to 0 decimals. See examples below:

GJ with 2 decimals (B=2)
This is an example of how the energy reading E1 can appear – counted in GJ.

Example 1

GJ with 3 decimals (B=6)
Here the most significant digit has disappeared compared to example 1. In return you receive a higher resolution.

Example 2

kWh without decimals (B=3)
This is an example of how energy reading E1 can appear – counted in kWh.

Example 3

GJ with 1 decimal (B=7)
Here the most significant digit has disappeared compared to example 3. In return you receive a higher resolution.

Example 4

MWh with 3 decimals (B=4)
In principle, this is the same resolution as in example 3, but energy is now counted in MWh.

Example 5

Energy measurement

MULTICAL® 302 functions as follows:

The flow sensor registers the amount of water circulating through the system in m^3 (cubic metres).

The temperature sensors placed in inlet and outlet pipes register the temperature difference, i.e. the difference between input and output temperatures.

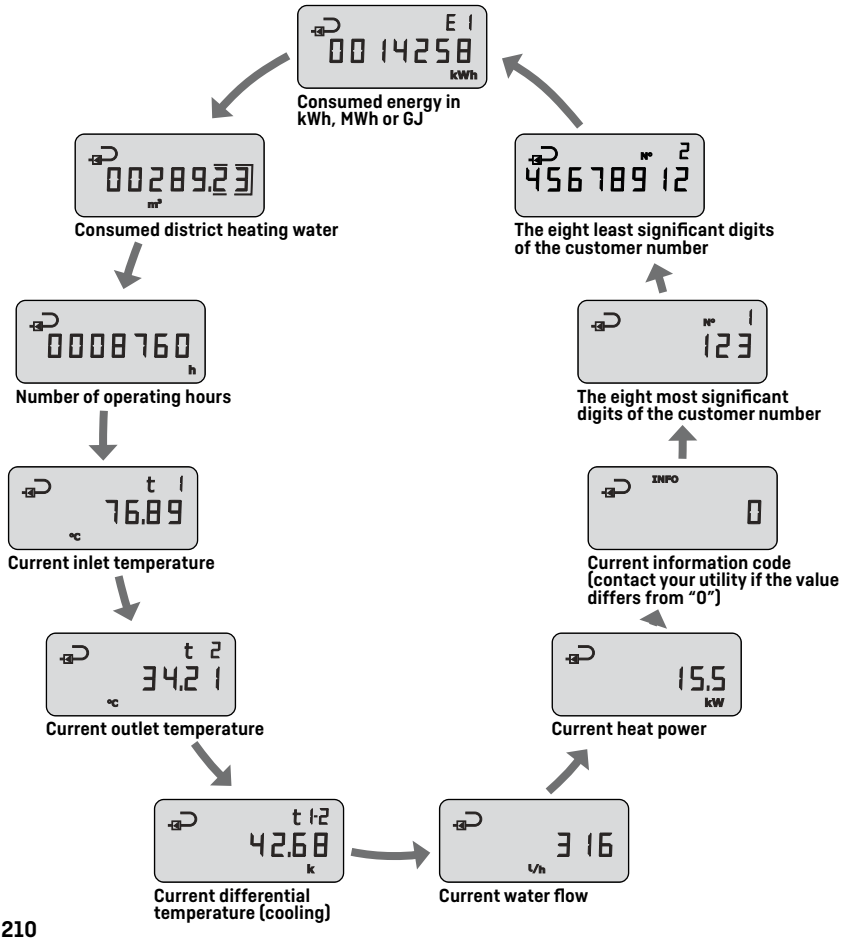
MULTICAL® 302 calculates consumed energy based on the volume of water and the temperature difference.

Readings in the display

The display is activated by pressing the front key. Then, press the key to change to another display.

Four minutes after the latest activation of the front key, the meter automatically changes to consumed energy.

Display readings



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Moreover, see the interactive user guides at products.kamstrup.com

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