

Installation and user guide

MULTICAL® 303



Information

Permissible operating conditions/measuring ranges

Heat meter with approval according to MID and EN1434:

Temperature range θ : 2 °C...180 °C $\Delta\theta$: 3 K...178 K
Flow sensor (media temperature) θ_q : 2 °C...130 °C (MULTICAL® 303-W)

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

Temperature range θ : 2 °C...180 °C $\Delta\theta$: 3 K...178 K
Flow sensor (media temperature) θ_q : 2 °C...130 °C (MULTICAL® 303-T)/
 θ_q : 2 °C...50 °C (MULTICAL® 303-C)

MID designation

Mechanical environment

Classes M1 and M2.

Electromagnetic environment

Class E1 (housing/light industry). The meter's signal cables must be drawn at a distance of minimum 25 cm to other installations.

Climatic environment

Non-condensing, closed locations (indoors), ambient temperature of 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.

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1 In general

**⚠ Read this guide before you start mounting the energy meter.
In case of incorrect mounting, Kamstrup's guarantee obligations no longer apply.**

Only use clean water on a damp cloth to clean the meter.

Please note that the following installation conditions must be observed:

- Pressure stage: PN16/PN25, PS25, see marking.

At media temperatures above 90 °C, wall-mounting of the calculator is recommended.

At media temperatures below the ambient temperature, MULTICAL® 303 must be wall-mounted.

2 Mounting of temperature sensors

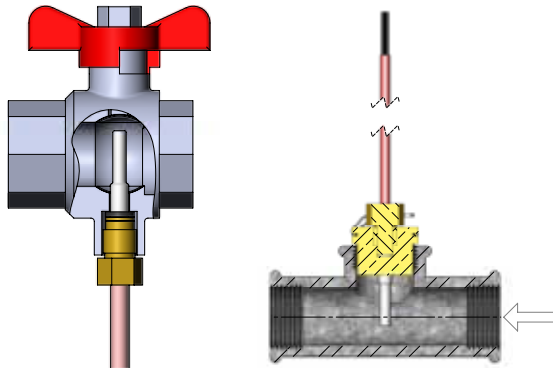
The temperature sensors used for measuring inlet and outlet temperatures, respectively, constitute a matched sensor set, which must never be separated. According to EN 1434/0IML R75, the cable length must not be changed. Should replacement be necessary, both sensors must be replaced.

The sensor marked with one line and the text t1 is to be installed in the inlet pipe. The other sensor, marked with two lines and the text t2, is to be installed in the outlet pipe. This applies to both heat installations, cooling installations and bi-functional heat- and cooling installations. Depending on the installation type the sensors will also be marked red and blue to indicate the correct installation position. However, the lines and the text t1 or t2 will always indicate the correct installation position.

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 and heat/cooling installations.

2.1 Direct short sensor (DS)

The direct short sensors up to DN25 can be mounted in special ball valves with built-in M 10 socket for the direct short sensor. They can also be mounted in installations with standard tee-pieces. Kamstrup A/S can supply R $\frac{1}{2}$ and R $\frac{3}{4}$ brass nipples that fit the direct short sensors. The direct short sensor can also be mounted directly in selected flow sensors from Kamstrup A/S. Fasten the sensors' brass unions lightly (approx. 4 Nm) using a 12 mm face wrench, and seal the sensors with seal and locking wire.



2.2 Ø5.0 mm / Ø5.2 mm temperature sensors

Both Ø5.0 mm and Ø5.2 mm temperature sensors are delivered with mounted composite unions and this is why they by default must be used as direct temperature sensor. The composite unions can be removed (see Figure 1) after which the temperature sensors can be used for installation in pockets. The temperature sensors are made from rustproof steel and have diameters of Ø5.0 mm or Ø5.2 mm. The temperature sensors are approved for both PN16 and PN25 installations, with PS25 as the maximum pressure. The temperature sensors are based on a 2-wire silicone cable and can thus be used at media temperatures up to 150 °C.

This also applies to the composite union that is made from the material PPS. One of the temperature sensors is mounted in the flow sensor on delivery and thus, only the other temperature sensor must be mounted.

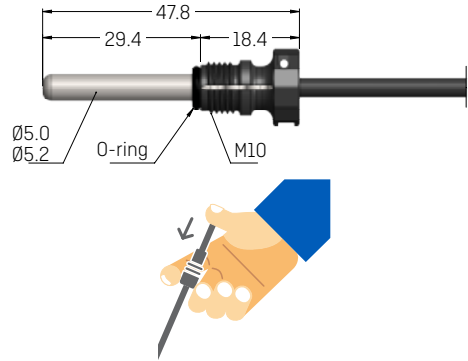


Figure 1

2.3 Installation of Ø5.0 mm / Ø5.2 mm temperature sensors as direct temperature sensors

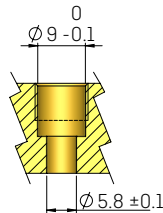
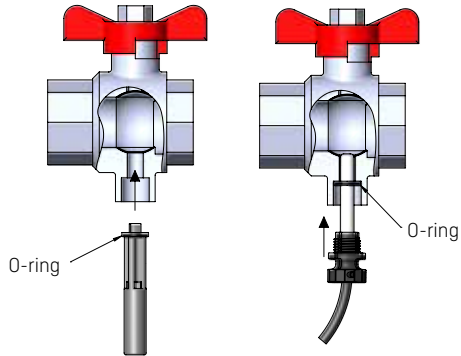
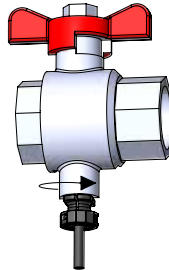


Figure 2 Measurement and tolerance requirements at installation of direct Ø5.0 mm or Ø5.2 mm temperature sensor.

No matter where the direct Ø5.0 mm or Ø5.2 mm temperature sensor is installed, it is very important to observe the tolerances stated in Figure 2. If not, the O-ring may not provide correct sealing. To avoid damaging the O-ring at installation, it is important to use the provided guide when installing Ø5.0 mm or Ø5.2 mm temperature sensors as direct temperature sensors.



The O-ring guide is used for pushing the O-ring into place after which the temperature sensor can be pushed to the bottom.



The composite union is tightened by hand. Do not use any tools.



2.4 Sensor compatibility with flow sensors

One of the two temperature sensors is always mounted in the flow sensor on delivery, but can be mounted in a ball valve if required. Remember to mount a blind plug in the flow sensor if the temperature sensor is moved and installed at another location.

Flow sensor			Temperature sensor	
qp	DN	G	Can be mounted in flow sensor	
			DS 27.5	Ø5.0 mm/ Ø5.2 mm
0.6-1.5	15	G½B	X	X
1.5-2.5	20	G1B	X	X

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.

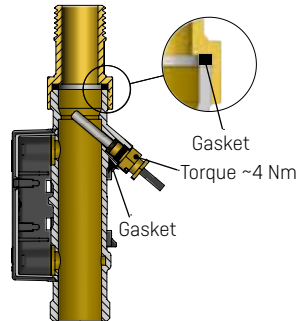
3.1 Mounting of couplings and direct short sensor in flow sensor

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 G½Bx110 mm and G1Bx110 mm, it must be checked if the thread run-out is sufficient.

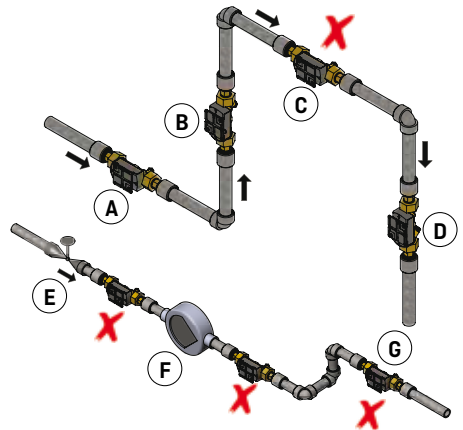
Couplings and gaskets are mounted as shown in the figure. Make sure to position the gasket correctly in the recess of the gland as shown in the details excerpt in the figure.



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.

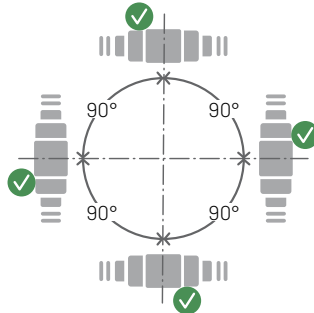
3.2 Flow sensor position

- 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.



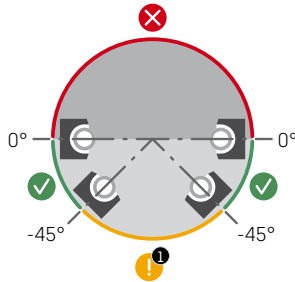
In order to avoid cavitation, the back pressure at the flow sensor (the pressure at the flow sensor outlet) must be minimum 1.5 bar at q_p (nominal flow) and minimum 2.5 bar at q_s (maximum flow). This applies to temperatures up to approx. 80 °C. The flow sensor must not be exposed to pressure lower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

3.3 Mounting of MULTICAL® 303 flow sensor



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

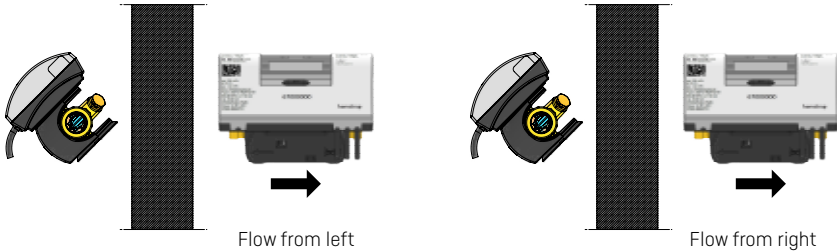
3.3.1 Threaded meters 0.6...2.5 m³/h



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

3.4 Installation examples

Threaded meter:



3.5 Humidity and condensation

At the risk of condensation, e.g. in cooling installations, MULTICAL® 303 must be used in a condensation-proof variant, type 303-C. At bifunctional heat/cooling energy measurements, type 303-T is used.

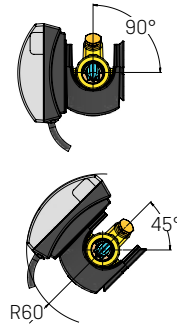
4 Mounting the calculator

The MULTICAL® 303 calculator can be mounted in several ways either directly on the flow sensor (compact mounting) or on a wall (wall-mounting).

4.1 Compact mounting

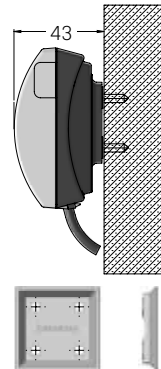
At compact mounting, the calculator is mounted directly on the flow sensor. If there is a risk of condensation (e.g. in cooling applications), the calculator must be wall-mounted. Furthermore, MULTICAL® 303 in cooling applications must be the condensation-proof version, type 303-C. In case of bifunctional heat/cooling energy measurements, type 303-T is used.

MULTICAL® 303 is constructed in such a way that you always obtain minimal mounting depth at compact mounting. The design ensures that the mounting radius in critical places remains 60 mm, both at 45° and 90° mounting of the flow sensor.



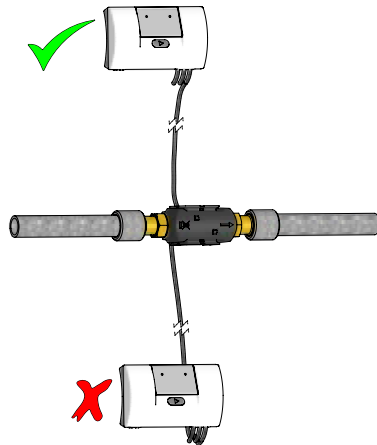
4.2 Wall-mounting

MULTICAL® 303 can be mounted directly on a plane wall. Wall-mounting requires the use of a wall bracket (3026-655) that is available as accessory for MULTICAL® 303. Use the wall bracket as a template and bore two holes of 6 mm diameter in the wall. Then mount the wall bracket with the provided screws and rawplugs. Mount MULTICAL® 303 on the wall bracket by pushing the calculator down over the bracket, in the same way as by compact mounting.



4.3 Positioning the calculator

If the flow sensor is installed in humid or condensing surroundings, the calculator must be wall-mounted and placed higher than the flow sensor.



5 Information codes “INFO”

MULTICAL® 303 constantly monitors a number of important functions. In case of serious errors in the measuring system, or in the installation, a flashing “INFO” appears in the display. The “INFO” field flashes as long as the error is present, regardless of the view selected. The “INFO” field turns off automatically when the error has been corrected. The info code can be seen in the display by changing the view with the front key until “INFO” is constantly lit, indicating any current errors in MULTICAL® 303. The info code consists of 8 digits and each functionality has its own dedicated digit for showing relevant information. All information relating to temperature sensor t1 will, for example, be shown as digit number two from the left in the display.

Display digit								Description
1	2	3	4	5	6	7	8	
Info	t1	t2	0	V1	0	0	0	
1								Supply voltage is missing
2								Low battery level
	1							t1 above measuring range or disconnected
		1						t2 above measuring range or disconnected
	2							t1 below measuring range or short-circuited
		2						t2 below measuring range or short-circuited
	9	9						Invalid temperature difference (t1-t2)
				3				V1 Air
				4				V1 Wrong flow direction
				6				V1 > qs for more than one hour

Example:

⋮ 0 ⋮ 0 ⋮ 2 ⋮ 0 ⋮ 0 ⋮ 0 ⋮ 0 ⋮ 0 ⋮ 0 ⋮

6 Voltage supply

6.1 Battery supply

MULTICAL® 303 is delivered with battery supply with either 1 or 2 A-cell batteries. Optimal battery lifetime is obtained by keeping the battery temperature below 30 °C, e.g. through wall-mounting. The voltage of a lithium battery is almost constant throughout the battery lifetime (approx. 3.65 V). It is not possible precisely to determine the remaining capacity of the battery by measuring the voltage. However, the "INFO" code "2xxxxxx" shows that the battery level is low.

Note MULTICAL® 303 may not be opened without subsequent reverification at an authorised laboratory why access to the battery is not possible in practice.

The battery cannot and may not be recharged or short-circuited. Used batteries must be handed in for approved destruction, e.g. at Kamstrup A/S. Further details appear from the document on handling and disposal of lithium batteries (5510-408).

7 Testing of function

Carry out a testing of function 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.

8 Communication

MULTICAL® 303 can be delivered with either M-Bus or Wireless M-Bus.

8.1 M-Bus

When the meter has built-in M-Bus, the 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. The connection is independent of polarity and the M-Bus interface is galvanically separated from the rest of the meter.

M-Bus includes primary, secondary and enhanced secondary addressing. The M-Bus address is indicated on placement of order, but can be changed subsequently in "SETUP loop" (see chapter 9, page 15).

8.2 Wireless M-Bus

If the meter has built-in Wireless M-Bus, it is, among other things, 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.

9 Setup

On delivery, the meter is in transport mode and "SETUP loop" is available.



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

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

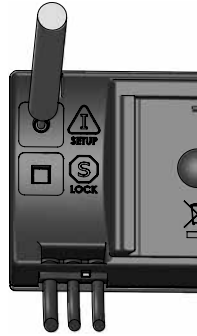
Below, the readings in "SETUP loop" are listed including index numbers:

"SETUP loop"		Index number in display
1	Customer number [N° 1]	3-001
2	Customer number [N° 2]	3-002
3	Date	3-003
4	Time	3-004
5	Yearly target date 1 [MM.DD]	3-005
6	Monthly target date 1 [DD]	3-006
7	Flow sensor position: Inlet or outlet [A code]	3-007
8	Measuring unit and resolution [B and CCC codes] <i>[B and CCC codes are set up to, for example, "0.001 Mwh" and "0.01 m³"]</i>	3-008
9	M-Bus primary address [N° 34]	3-009
10	Average time of min./max P and Q	3-010
11	Heat/cooling shift [θ_{hc}] <i>[Active only when selecting meter type 6]</i>	3-011
12	Temperature sensor offset [t_{r0}]	3-012
13	Radio on/off	3-013
14	EndSetup	3-014

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

The meter leaves the transport mode when it has registered the first integration, either at 0.01 m³ (10 L) or at 0.001 m³ (1 L) – depending on the selected resolution.

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



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

9.1 Changing the installation position

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

You can change the meter configuration from inlet to outlet (and vice versa):

For this purpose, view 3-07 is used:

Inlet

If the meter is set to be an inlet meter, the text "Inlet" is displayed. To change this 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 this 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.





Energy measuring

MULTICAL® 303 functions as follows:

The flow sensor registers the amount of water circulating through the system in m³ (cubic metres).

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

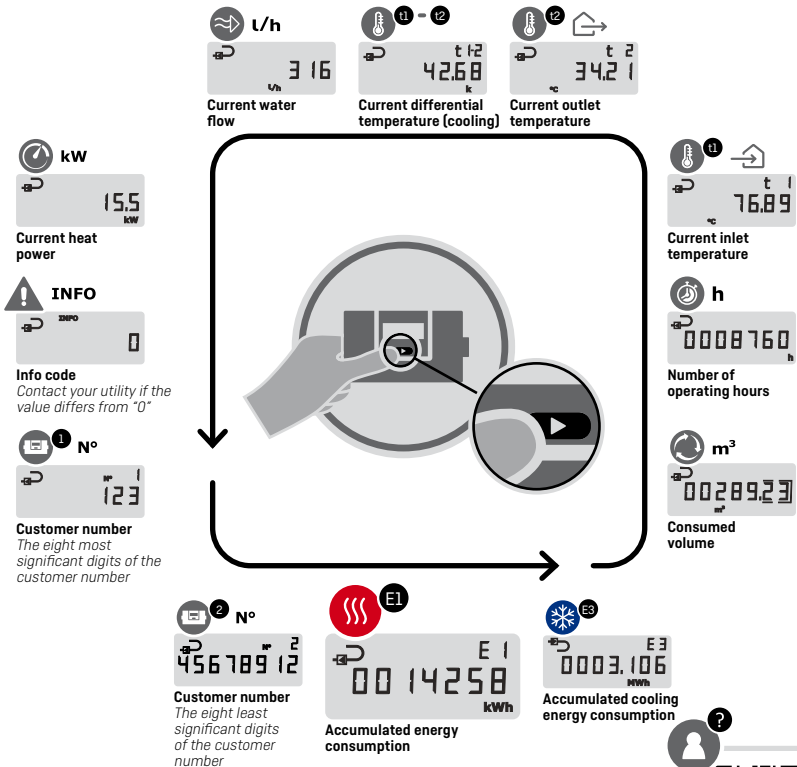
MULTICAL® 303 calculates consumed energy based on the volume of water and the differential temperature.

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 display automatically reverts to consumed energy.

Display readings



DDD=310

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

User guide

MULTICAL® 303



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