

# MULTICAL® 601 & ULTRAFLOW® 14 Cooling

Moisture resistant flowpart

Ultrasonic flow sensor

Large dynamic range

Exceptionally accurate

Longevity

24 VAC, 230 VAC or 10 years' battery supply

Data logging for 460 days, 36 months and 15 years

Room for two extra plug-in modules

- Top module: Clock back-up, CE+CV outputs, PQ-limiter and M-Bus
- Base module: M-Bus, RF/Router, LonWorks, 0/4...20 mA outputs and pulse inputs for electricity and water meters



## Application

MULTICAL® 601 and ULTRAFLOW® 14 are used for measurement of cooling in all water based plants with flow temperatures from 2°C to 50°C and with ULTRAFLOW® 14 between qp 1.5 m³/h and qp 40 m³/h.

The meter is simple to install, read and test. MULTICAL® 601 and ULTRAFLOW® 14 contributes to keeping the annual operating costs at a minimum with its unique combination of high measuring accuracy and long lifetime.

MULTICAL® 601 receives volume pulses from the connected ULTRAFLOW® 14 and calculates the energy for every predetermined water volume. The energy calculation includes temperature measurements in flow and return as well as correction for density and heat content according to EN 1434.

MULTICAL® 601 and ULTRAFLOW® 14 can be supplied by either battery, 230 VAC or 24 VAC.

MULTICAL® 601 can be supplied with two internal modules – a top module with clock backup, pulse outputs, M-Bus or valve control and a base module with M-Bus, radio, LonWorks or 0/4...20 mA outputs. Furthermore, the base module includes two additional pulse inputs for connection of water and electricity meters, making it possible to collect all consumption data with one single automatic data reading.

ULTRAFLOW® 14 is a static flow sensor based on the ultrasonic measuring principle for use in cooling installations where water is used as the energy conveying medium.

The flow is measured using bidirectional ultrasonic technique based on the transit time method, with proven long-term stability and accuracy. Two ultrasonic transducers are used to send the sound signal both against and with the flow direction.

The ultrasonic signal travelling with the flow direction reaches the opposite transducer first. The time difference between the two signals can be converted into a flow velocity and thus a volume.



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# Calculator functions

## Energy calculation

MULTICAL® 601 calculates energy based on the formula in EN 1434-1:2004, in which the international temperature scale from 1990 (ITS-90) and the pressure definition of 16 bar is used.

The energy calculation can in a simplified way be expressed as:

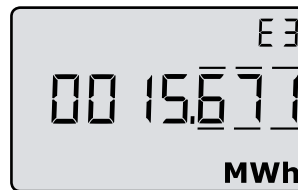
$$\text{Energy} = V \times \Delta\Theta \times k$$

V is the supplied water volume

$\Delta\Theta$  is the temperature difference measured

k is the thermal coefficient of water

The calculator always calculates energy in [Wh], and then it is converted into the selected measuring unit.



|            |                                               |
|------------|-----------------------------------------------|
| E [Wh] =   | $V \times \Delta\Theta \times k \times 1,000$ |
| E [kWh] =  | $E [\text{Wh}] / 1,000$                       |
| E [MWh] =  | $E [\text{Wh}] / 1,000,000$                   |
| E [GJ] =   | $E [\text{Wh}] / 277,780$                     |
| E [Gcal] = | $E [\text{Wh}] / 1,163,100$                   |

## Application

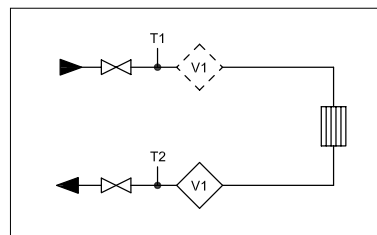
MULTICAL® 601 operates with 9 different energy formulas, E1...E9, that are all calculated in parallel in connection with each integration no matter how the meter is configured.

In connection with cooling the following energy calculations are used:

$$E3 = V1(T2 - T1) \quad \text{Cooling energy (V1 in flow or return)}$$

$$E8 = m^3 \times T1 \quad \text{(Flow pipe)}$$

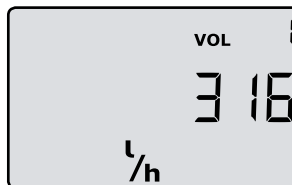
$$E9 = m^3 \times T2 \quad \text{(Return pipe)}$$



Closed thermal system with 1 flow sensor

## Flow measurement

The flow indication is updated every 10 seconds.



## Power measurement

MULTICAL® 601 calculates current power on the basis of current water flow and the temperature difference measured in connection with the latest integration.

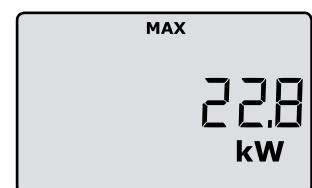
Current power is updated in the display simultaneously with the flow update.



## Min. and max. flow and power

MULTICAL® 601 registers minimum and maximum flow and power on a monthly as well as on a yearly basis. The registrations which appear from the display or can be read via data communication include max. and min. flow and power values, all with date indication.

All max. and min. values are calculated as largest and smallest average respectively of a number of current flow or power measurements. The average period used for all calculations is selected in the interval 1...1440 min.



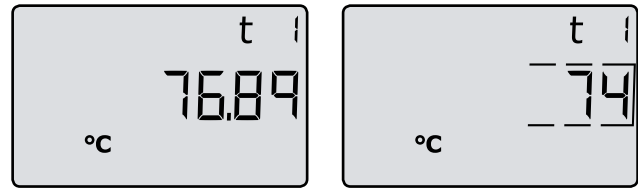
# Calculator functions

## Temperature measurement

MULTICAL® 601 and ULTRAFLOW® 14 is delivered with Pt500 sensors in 2-wire versions.

The measuring circuit includes a high resolution analog/digital converter with a temperature range of 0.00°C...185.00°C.

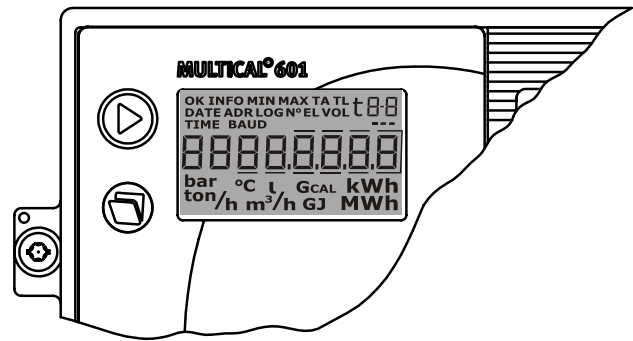
In addition to current temperatures for the energy calculation average temperatures on a yearly and monthly basis can also be displayed.



## Display functions

MULTICAL® 601 is equipped with a clear LC display including 8 digits, units of measurement and information panel. In connection with energy and volume readings 7 digits and the units of measurement to match are used, whereas 8 digits are used when e.g. meter number is read.

As a starting point the display shows accumulated energy. When the push buttons are activated the display reacts immediately by calling other readings. The display automatically returns to accumulated energy reading 4 minutes after the latest activation of the push buttons.



The upper push button is used to switch between the primary readings. The consumers typically use the first primary readings in connection with self-reading for billing purposes.

The lower push button is used to show secondary information on the selected primary reading.

## Info codes

MULTICAL® constantly monitors a number of important functions, e.g. power supply and temperature sensors. Should a serious error occur in the measuring system or in the installation, a flashing “info” will appear in the display whilst the error exists. The “Info” panel will automatically disappear when the error has been corrected.

An Info Event Logger indicates how many times the info code has been changed.

The info logger stores the latest 50 changes, of which 36 can be displayed.

| Info code                                        | Description                                                            |
|--------------------------------------------------|------------------------------------------------------------------------|
| 0                                                | No irregularities                                                      |
| 1                                                | Supply voltage connected after cut off                                 |
| 4                                                | T2 sensor outside range, short-circuited or cut off                    |
| 8                                                | T1 sensor outside range, short-circuited or cut off                    |
| <b>ULTRAFLOW® X4 info (if activated CCC=4XX)</b> |                                                                        |
| 16                                               | Flow sensor V1, datacomm error, signal too low or wrong flow direction |
| 2048                                             | Flow sensor V1, wrong meter factor                                     |
| 4096                                             | Flow sensor V1, signal too low (Air)                                   |
| 16384                                            | Flow sensor V1, wrong flow direction                                   |



## Data loggers

MULTICAL® 601 contains a permanent memory (EEPROM), where the results of a number of various data loggers are stored. The meter contains the following data loggers which can be read on the display or via serial data:

| Data logging interval  | Data logging depth | Logged value                     |
|------------------------|--------------------|----------------------------------|
| Yearly logger          | 15 years           | Counter (as seen on the display) |
| Monthly logger         | 36 months          | Counter (as seen on the display) |
| Daily logger           | 460 days           | Consumption (increase)/day       |
| Hourly logger (option) | 1392 hours         | Consumption (increase)/hour      |
| Info logger            | 50 events          | Info code and date               |

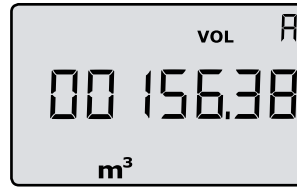
# Calculator functions

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## Pulse inputs VA and VB

MULTICAL® 601 has two extra pulse inputs, VA and VB, to collect and accumulate pulses remotely, e.g from cold-water meters and electricity meters. The pulse inputs are physically placed on the "base modules".

The pulse inputs VA and VB function independently of the other inputs/outputs.



## Voltage supply

MULTICAL® 601 is available with battery supply, 230 VAC mains module, or 24 VAC mains module. The supply modules are exchangeable without breaking the verification seal.

## Plug-in modules

Plug-in modules can be added to MULTICAL® 601 both in the calculator top (top modules) and in the base unit (base modules), in this way the meter can adapt to various applications and data reading methods.

## Programming and testing

METER TOOL for MULTICAL® 601 is a Windows® -based software which includes all facilities for calculator programming. If the software is used together with VERIFICATION EQUIPMENT for MULTICAL® 601, the calculator can be tested.

## Tariff functions

MULTICAL® 601 has 2 extra registers TA2 and TA3 to accumulate energy parallelly to the main register based on a programmed tariff condition. No matter which tariff type you select the tariff registers will be displayed as TA2 and TA3.

The main register is always accumulated, irrespective of the selected tariff function, as it is considered the legal billing register. Tariff conditions TL2 and TL3 are monitored before each integration. If the tariff conditions are fulfilled, the consumed cooling energy is accumulated in either TA2 or TA3, as well as the main register.



# Electrical data

|                        |                                                                                                                                                                                    |                                 |                                                                                            |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------|
| Typical accuracy       |                                                                                                                                                                                    | Energy units                    | MWh – kWh – GJ – Gcal                                                                      |
| – Calculator           | $E_C \pm(0.15 + 2/\Delta\Theta)\%$                                                                                                                                                 | Temperature range               | $\Theta: 2^\circ\text{C} \dots 180^\circ\text{C}$                                          |
| – Sensor set           | $E_T \pm(0.4 + 4/\Delta\Theta)\%$                                                                                                                                                  | Differential range              | $\Delta\Theta: 3\text{K} \dots 170\text{K}$                                                |
| – Flow sensor          | $E_F \pm(1 + 0.01 \times q_p/q)\%$                                                                                                                                                 | Data logger (Eeprom)            |                                                                                            |
| <b>Supply voltage</b>  | 3.6 VDC $\pm 0.1$ V                                                                                                                                                                | – Standard                      | 460 days, 36 months, 15 years,<br>50 info codes                                            |
| <b>Battery</b>         | 3.65 VDC, D-cell lithium                                                                                                                                                           | – Option                        | Data loggers with larger depth and<br>hour interval                                        |
| Stand-by current       | < 85 $\mu\text{A}$                                                                                                                                                                 | Clock/calendar                  |                                                                                            |
| Replacement interval   |                                                                                                                                                                                    | – Standard                      | Clock, calendar, leap-year<br>compensation, target date                                    |
| – Mounted on wall      | 10 years @ $t_{\text{BAT}} < 30^\circ\text{C}$<br>The replacement interval is reduced<br>when using data modules, frequent<br>data communication or high am-<br>bient temperature. | – Option                        | Real time clock with battery<br>back-up                                                    |
| <b>Mains supply</b>    | 230 VAC $\pm 15/-30\%$ , 50/60 Hz<br>24 VAC $\pm 50\%$ , 50/60 Hz                                                                                                                  | Data communication              |                                                                                            |
| Insulation voltage     | 4 kV                                                                                                                                                                               | – Standard                      | KMP protocol with CRC16 used for<br>optical communication and for top<br>and base modules. |
| Power supply           | < 1W                                                                                                                                                                               | – Option                        | MULTICAL® 66-CDE compatible data<br>for base modules.                                      |
| Backup supply          | Integral super-cap eliminates opera-<br>tional stop-down due to short-term<br>power cuts.                                                                                          | Power in temperature<br>sensors | < 10 $\mu\text{W RMS}$                                                                     |
| EMC data               | Domestic and light industrial.                                                                                                                                                     | <b>Temperature measurement</b>  |                                                                                            |
| <b>Calculator data</b> |                                                                                                                                                                                    | Sensor inputs T1, T2            |                                                                                            |
| Display                | LCD – 7 (8) digits with a digit<br>height of 7.6 mm                                                                                                                                | – Measuring range               | 0.00...185.00°C                                                                            |
| Resolution             | 9999.999 – 99999.99 – 999999.9<br>– 9999999                                                                                                                                        | Max. cable lengths              |                                                                                            |
|                        |                                                                                                                                                                                    | – Pt500, 2-wire                 | 2 x 0.25 mm <sup>2</sup> : 10 m<br>2 x 0.50 mm <sup>2</sup> : 20 m                         |

| Pulse inputs VA and VB<br>VA: 65-66 og VB: 67-68 | Water meter connection<br>FF(VA) and GG(VB) = 01...40 | Electricity meter connection<br>FF(VA) and GG(VB) = 50...60 |
|--------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|
| Pulse input                                      | 680 k $\Omega$ pull-up to 3.6 V                       | 680 k $\Omega$ pull-up to 3.6 V                             |
| Pulse ON                                         | < 0.4 V for > 0.1 sec.                                | < 0.4 V for > 0.1 sec.                                      |
| Pulse OFF                                        | > 2.5 V for > 0.1 sec.                                | > 2.5 V for > 0.1 sec.                                      |
| Pulse frequency                                  | < 1 Hz                                                | < 3 Hz                                                      |
| Electrical isolation                             | No                                                    | No                                                          |
| Max. cable length                                | 25 m                                                  | 25 m                                                        |

| Pulse outputs CE and CV<br>– via top module |                                                                            |
|---------------------------------------------|----------------------------------------------------------------------------|
| Type                                        | Open collector (OB)                                                        |
| Pulse length                                | Optionally 32 msec. or 100 msec. for top module 67-04 (32 msec. for 67-06) |
| External voltage                            | 5...30 VDC                                                                 |
| Current                                     | 1...10 mA                                                                  |
| Residual voltage                            | $U_{\text{CE}} \approx 1$ V at 10 mA                                       |
| Electrical isolation                        | 2 kV                                                                       |
| Max. cable length                           | 25 m                                                                       |

## Flow data

| Nom. flow $q_p$<br>[m <sup>3</sup> /h] | Nom. diameter | Meter factor <sup>*)</sup><br>[imp./l] | Dynamic range<br>$q_i:q_p$ | $q_s:q_p$ | Flow @125 Hz <sup>**)</sup><br>[m <sup>3</sup> /h] | $\Delta p@q_p$<br>[bar] | Min. cut off<br>[l/h] |
|----------------------------------------|---------------|----------------------------------------|----------------------------|-----------|----------------------------------------------------|-------------------------|-----------------------|
| 1.5                                    | DN15 & DN20   | 100                                    | 1:100                      | 2:1       | 4.5                                                | 0.22                    | 3                     |
| 2.5                                    | DN20          | 60                                     | 1:100                      | 2:1       | 9                                                  | 0.03                    | 5                     |
| 3.5                                    | DN25          | 50                                     | 1:100                      | 2:1       | 9                                                  | 0.07                    | 7                     |
| 6                                      | DN25          | 25                                     | 1:100                      | 2:1       | 18                                                 | 0.20                    | 12                    |
| 10                                     | DN40          | 15                                     | 1:100                      | 2:1       | 30                                                 | 0.06                    | 20                    |
| 15                                     | DN50          | 10                                     | 1:100                      | 2:1       | 45                                                 | 0.14                    | 30                    |
| 25                                     | DN65          | 6                                      | 1:100                      | 2:1       | 75                                                 | 0.06                    | 50                    |
| 40                                     | DN80          | 5                                      | 1:100                      | 2:1       | 90                                                 | 0.05                    | 80                    |

<sup>\*)</sup> The meter factor can be seen on the label on the side of the meter.

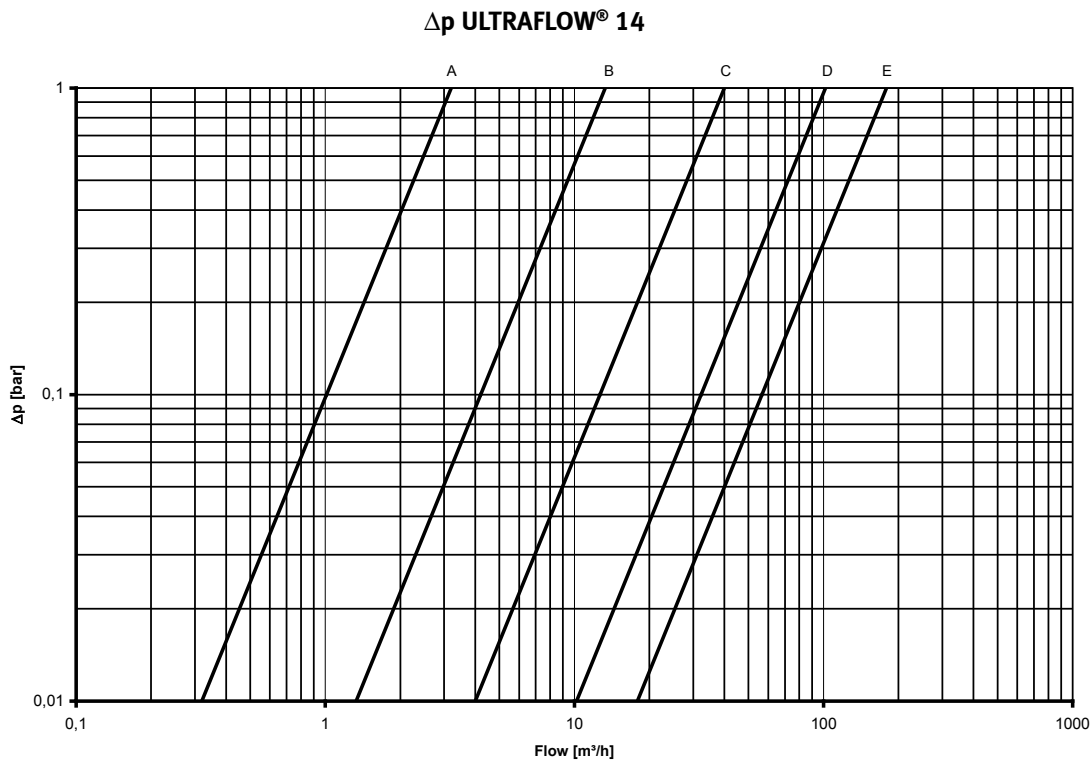
<sup>\*\*)</sup> Saturation flow. Max. pulse frequency 128 Hz is maintained at higher flow rates.

## Pressure loss

| Graph | $q_p$<br>[m <sup>3</sup> /h] | Nom. diameter | $k_v$ <sup>*)</sup> | Q@0.25 bar<br>[m <sup>3</sup> /h] |
|-------|------------------------------|---------------|---------------------|-----------------------------------|
| A     | 1.5                          | DN15 & DN20   | 3.2                 | 1.6                               |
| B     | 2.5 & 3.5 & 6                | DN20 & DN25   | 13.4                | 6.7                               |
| C     | 10 & 15                      | DN40 & DN50   | 40                  | 20                                |
| D     | 25                           | DN65          | 102                 | 51                                |
| E     | 40                           | DN80          | 179                 | 90                                |

$$*) q = k_v \times \sqrt{\Delta p}$$

## Pressure loss chart



## Mechanical data

|                     |                                                                |                                                     |                                          |
|---------------------|----------------------------------------------------------------|-----------------------------------------------------|------------------------------------------|
| Environmental class | Meets EN 1434<br>Class A                                       | Weight                                              |                                          |
| Ambient temperature | 5...55°C non condensing, closed location (indoor installation) | – MULTICAL® 601                                     | 0.4 kg excluding sensors and flow sensor |
| Protection class    |                                                                | – ULTRAFLOW® 14                                     | see Dimension sketches on page 9-10      |
| – calculator        | IP54                                                           | Flow sensor cable (between flowpart and calculator) | 2.5 m<br>Must not be removed/changed     |
| – flow sensor       | IP65                                                           | Connection cables                                   | ø3.5...6 mm                              |
| Storage temperature | -20...60°C (drained flow meter)                                | Supply cable                                        | ø5...10 mm                               |

## Materials

### MULTICAL® 601

|              |                                                            |
|--------------|------------------------------------------------------------|
| Top cover    | Thermoplastic, PC                                          |
| Base unit    | Thermoplastic, PP with thermoplastic elastomer TPE gaskets |
| Print box    | Thermoplastic, ABS                                         |
| Wall bracket | Thermoplastic, PC 30% GF                                   |

### ULTRAFLOW® 14

#### Wetted parts

#### ULTRAFLOW® 14, q<sub>p</sub> 0.6 and 1.5 m<sup>3</sup>/h

|                |                                                             |
|----------------|-------------------------------------------------------------|
| Housing, gland | Dezincification resistant brass                             |
| Transducers    | Stainless steel, W.no. 1.4401                               |
| Gaskets        | EPDM                                                        |
| Reflectors     | Thermoplastic, PES 30% GF and stainless steel, W.no. 1.4301 |
| Measuring pipe | Thermoplastic, PES 30% GF                                   |

### ULTRAFLOW® 14, q<sub>p</sub> 2.5 to 40 m<sup>3</sup>/h

|                 |                                                                                |
|-----------------|--------------------------------------------------------------------------------|
| Housing, gland  | Dezincification resistant brass                                                |
| Housing, flange | Red brass, RG5 or stainless steel<br>W.no. 1.4308<br>(see Order specification) |
| Transducers     | Stainless steel, W.no. 1.4401                                                  |
| Gaskets         | EPDM                                                                           |
| Measuring pipe  | Thermoplastic, PES 30% GF                                                      |
| Reflectors      | Stainless steel, W.no. 1.4301                                                  |

#### Electronic housing

|      |                           |
|------|---------------------------|
| Base | Thermoplastic, PBT 30% GF |
| Lid  | Thermoplastic, PC 10% GF  |

# Order specifications

|                                                                |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
|----------------------------------------------------------------|-----------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <b>MULTICAL® 601</b>                                           | Type 67-              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>Sensor connection</b>                                       |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Pt500 2-wire (T1-T2)                                           | C                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Top module</b>                                              |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| No module                                                      | 0                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| RTC (Real Time Clock)                                          | 1                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| RTC + PQ or $\Delta t$ -limiter + hourly data logger           | 3                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| RTC + data output + hourly data logger                         | 5                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| RTC + M-Bus                                                    | 7                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| RTC + 2 pulse outputs for energy + volume + hourly data logger | 8                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| RTC + 2 pulse outputs for CE and CV + program data logger      | B                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Base module</b>                                             |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| No module                                                      | 00                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Data + pulse inputs                                            | 10                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| M-Bus + pulse inputs                                           | 20                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| RadioRouter + pulse inputs                                     | 21                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| 0/4...20 mA outputs                                            | 23                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| LonWorks, FT1-10A + pulse inputs                               | 24                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Radio + pulse inputs (internal antenna)                        | 25                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Radio + pulse inputs (external antenna connection)             | 26                    |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Supply</b>                                                  |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| No supply                                                      | 0                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Battery, D-cell                                                | 2                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| 230 VAC supply module w/transformer                            | 7                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| 24 VAC supply module w/transformer                             | 8                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Pt500 sensor set</b>                                        |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| No sensor set                                                  | 0                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Pocket sensor set w/1.5 m cable                                | A                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Pocket sensor set w/3.0 m cable                                | B                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Pocket sensor set w/5 m cable                                  | C                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Pocket sensor set w/10 m cable                                 | D                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Short direct sensor set w/1.5 m cable                          | F                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Short direct sensor set w/3.0 m cable                          | G                     |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Flow sensor/pick-up unit</b>                                |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Supplied w/1 ULTRAFLOW®                                        | (Please specify type) |                          |                          |                          |                          |                          | 1                        |                          |                          |                          |
| <b>Meter type</b>                                              |                       |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Cooling meter                                                  |                       |                          |                          |                          |                          |                          |                          | 5                        |                          |                          |
| <b>Country code (language on label etc.)</b>                   |                       |                          |                          |                          |                          |                          |                          |                          |                          | XX                       |

When placing orders please state ULTRAFLOW® type numbers separately.

The list below shows type numbers for ULTRAFLOW® 14

| Type number <sup>1)</sup> | q <sub>p</sub><br>[m <sup>3</sup> /h] | q <sub>i</sub><br>[m <sup>3</sup> /h] | q <sub>s</sub><br>[m <sup>3</sup> /h] | Connection                                                       | Length<br>[mm] | Meter factor<br>[pulses/l] | CCC<br>(high res.) | Material        |
|---------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------------------------------------------------------------|----------------|----------------------------|--------------------|-----------------|
| 65-1-CDAA-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | G <sup>3</sup> / <sub>4</sub> B (R <sup>1</sup> / <sub>2</sub> ) | 110            | 100                        | 419 (407)          | Brass           |
| 65-1-CDAD-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 130            | 100                        | 419 (407)          | Brass           |
| 65-1-CDAF-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 190            | 100                        | 419 (407)          | Brass           |
| 65-1-CEAF-XXX             | 2.5                                   | 0.025                                 | 5.0                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 190            | 60                         | 498                | Brass           |
| 65-1-CGAG-XXX             | 3.5                                   | 0.035                                 | 7.0                                   | G5/4B (R1)                                                       | 260            | 50                         | 451 (436)          | Brass           |
| 65-1-CHAG-XXX             | 6.0                                   | 0.06                                  | 12                                    | G5/4B (R1)                                                       | 260            | 25                         | 437 (438)          | Brass           |
| 65-1-CHBB-XXX             | 6.0                                   | 0.06                                  | 12                                    | DN25                                                             | 260            | 25                         | 437 (438)          | Red brass       |
| 65-1-CJAJ-XXX             | 10                                    | 0.1                                   | 20                                    | G2B (R1 <sup>1</sup> / <sub>2</sub> )                            | 300            | 15                         | 478 (483)          | Brass           |
| 65-1-CJBD-XXX             | 10                                    | 0.1                                   | 20                                    | DN40                                                             | 300            | 15                         | 478 (483)          | Red brass       |
| 65-1-CKBE-XXX             | 15                                    | 0.15                                  | 30                                    | DN50                                                             | 270            | 10                         | 420 (485)          | Red brass       |
| 65-1-CLBG-XXX             | 25                                    | 0.25                                  | 50                                    | DN65                                                             | 300            | 6                          | 479                | Red brass       |
| 65-1-CMBH-XXX             | 40                                    | 0.4                                   | 80                                    | DN80                                                             | 300            | 5                          | 458 (486)          | Red brass       |
| 65-1-CMCH-XXX             | 40                                    | 0.4                                   | 80                                    | DN80                                                             | 300            | 5                          | 458 (486)          | Stainless steel |

<sup>1)</sup> XXX-code pertaining to final assembly, approvals etc. is determined by Kamstrup A/S. Some variants may not be included in national versions.

# Accessories

## Calculator

### Description

D-cell battery

Data cable w/USB plug

Infrared optical reading head w/USB plug

Infrared optical reading head w/D-sub 9F

Data cable RS 232, D-sub 9F

Verification unit (used with METERTOOL)

USB to serial converter

METERTOOL for MULTICAL® 601

METERTOOL LogView for MULTICAL® 601

### Type No.

66-00-200-100

66-99-098

66-99-099

66-99-102

66-99-106

66-99-397/-398/-399

59-20-147

66-99-704

66-99-705

## Temperatur sensors

### Description

Change-over nipple M10 - R $\frac{1}{2}$   
for direct short temperature sensor

Change-over nipple M10 - R $\frac{3}{4}$   
for direct short temperature sensor

Sensor pocket, length = 65 mm

Sensor pocket, length = 90 mm

Sensor pocket, length = 140 mm

### Type No.

65-56-491

65-56-492

65-57-324

65-57-327

65-57-314

## Flow sensors

### Glands including gaskets (PN16)

| Size | Nipple          | Union           | Type No.  | 2 pcs.    |
|------|-----------------|-----------------|-----------|-----------|
| DN15 | R $\frac{1}{2}$ | G $\frac{3}{4}$ | 65-61-311 | 65-61-321 |
| DN20 | R $\frac{3}{4}$ | G1              | 65-61-312 | 65-61-322 |
| DN25 | R1              | G $\frac{5}{4}$ | 65-61-313 |           |
| DN40 | R $\frac{1}{2}$ | G2              | 65-61-315 |           |

### Gaskets for flange meters

| Size | Type No.. |
|------|-----------|
| DN20 | 2210-147  |
| DN25 | 2210-133  |
| DN40 | 2210-132  |
| DN50 | 2210-099  |
| DN65 | 2210-141  |
| DN80 | 2210-140  |

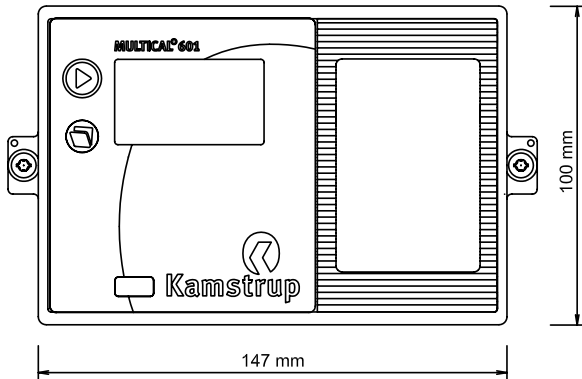
### Gaskets for glands

| Size (union)    | Type No. |
|-----------------|----------|
| G $\frac{3}{4}$ | 2210-061 |
| G1              | 2210-062 |
| G $\frac{5}{4}$ | 2210-063 |
| G2              | 2210-065 |

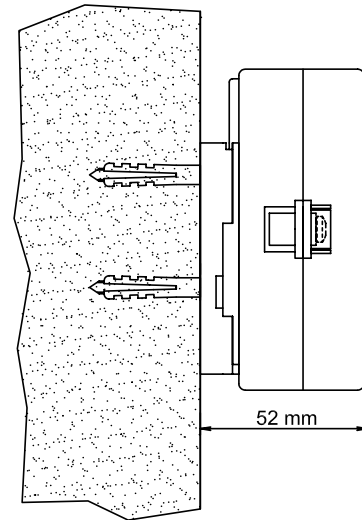
Please contact Kamstrup A/S for questions concerning further accessories.

# Dimensional sketches calculator

Front dimensions of MULTICAL® 601

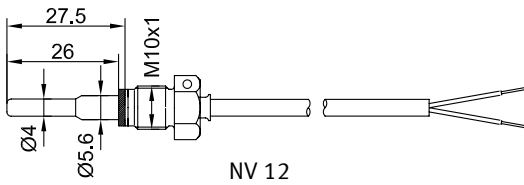


Wall-mounted MULTICAL® 601 seen from the side

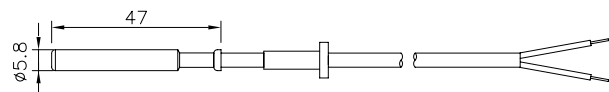


# Dimensional sketches temperature sensors

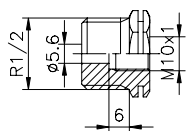
Direct short sensor



Pocket sensor

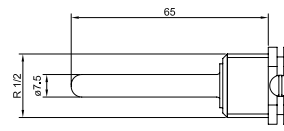


Change-over nipples for direct short sensor

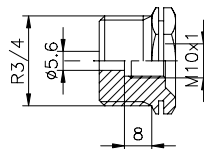


NV 22

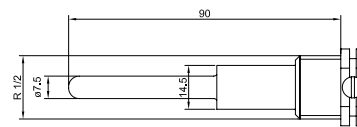
Sensor pocket



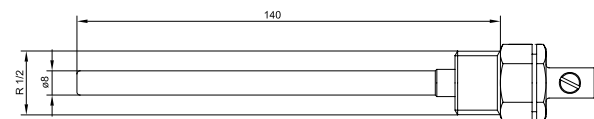
NV 22  
65 mm



NV 27



NV 22  
90 mm

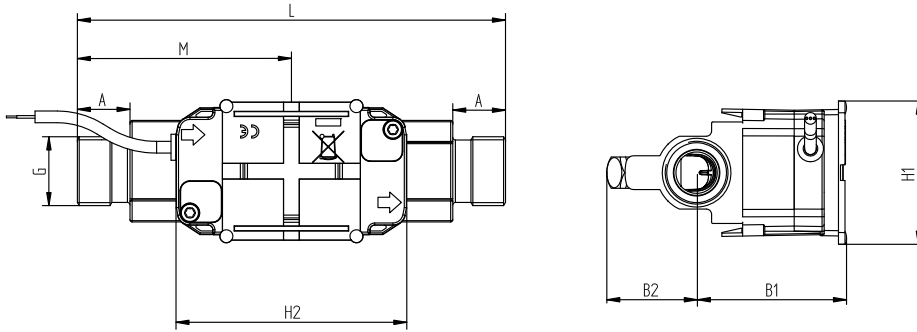


NV 22  
140 mm

R<sup>1</sup>/<sub>2</sub> and R<sup>3</sup>/<sub>4</sub> thread according to ISO 7.1.

# Dimension sketches flow sensors

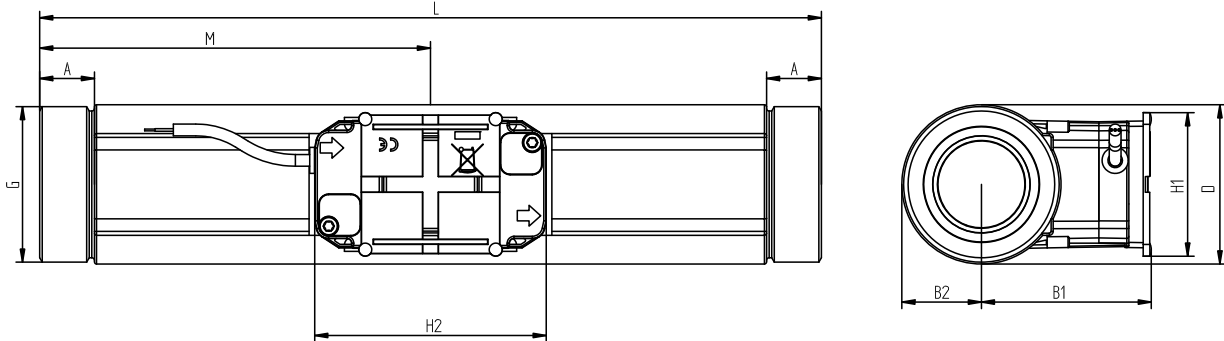
## ULTRAFLOW® 14, G<sup>3</sup>/<sub>4</sub> and G1



### Thread ISO 228-1

| Thread                        | L   | M   | H2 | A    | B1 | B2 | H1 | App. weight [kg] |
|-------------------------------|-----|-----|----|------|----|----|----|------------------|
| G <sup>3</sup> / <sub>4</sub> | 110 | L/2 | 89 | 10.5 | 58 | 35 | 55 | 0.8              |
| G1                            | 130 | L/2 | 89 | 20.5 | 58 | 35 | 55 | 0.9              |
| G1(q <sub>p</sub> 1.5)        | 190 | L/2 | 89 | 20.5 | 58 | 35 | 55 | 1.4              |
| G1(q <sub>p</sub> 2.5)        | 190 | L/2 | 89 | 20.5 | 58 | 36 | 55 | 1.3              |

## ULTRAFLOW® 14, G<sup>5</sup>/<sub>4</sub> and G2

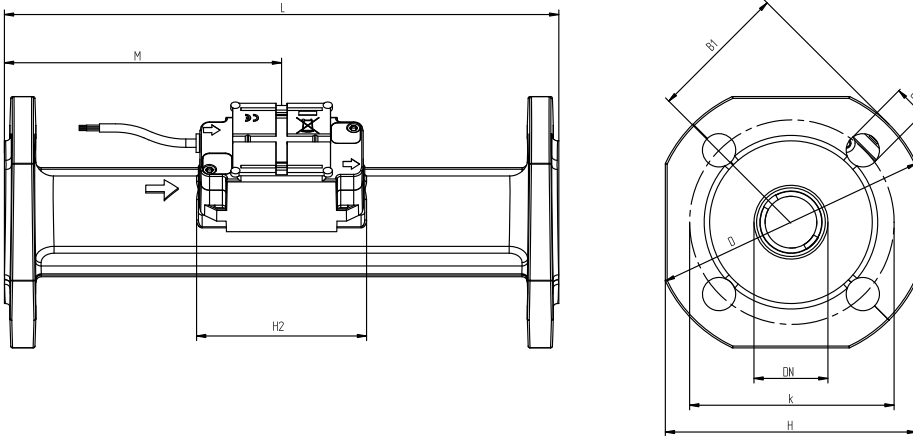


### Thread ISO 228-1

| Thread                        | L   | M   | H2 | A  | B1 | B2 | H1 | App. weight [kg] |
|-------------------------------|-----|-----|----|----|----|----|----|------------------|
| G <sup>5</sup> / <sub>4</sub> | 260 | L/2 | 89 | 17 | 58 | 22 | 55 | 2.3              |
| G2                            | 300 | L/2 | 89 | 21 | 65 | 31 | 55 | 4.5              |

# Dimension sketches flow sensors

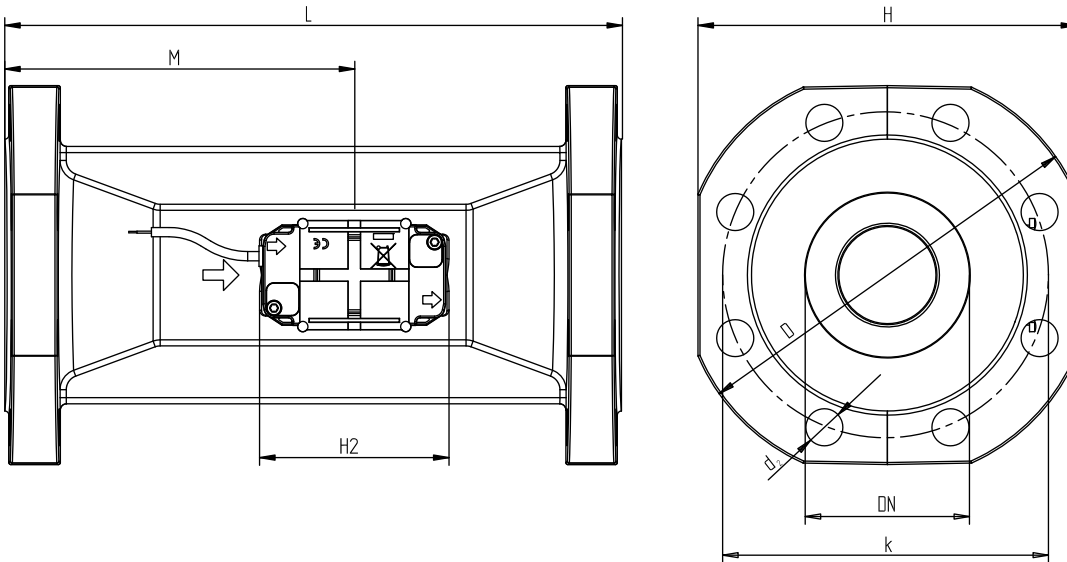
## ULTRAFLOW® 14, DN20 to DN50



### Flange EN 1092-3, type B, PN25

| Nom. dia. | L   | M   | H2 | B1   | D   | H   | k   | Bolts |        |                | App. weight [kg] |
|-----------|-----|-----|----|------|-----|-----|-----|-------|--------|----------------|------------------|
|           |     |     |    |      |     |     |     | No.   | Thread | d <sub>2</sub> |                  |
| DN25      | 260 | L/2 | 89 | 58   | 115 | 106 | 85  | 4     | M12    | 14             | 5.0              |
| DN40      | 300 | L/2 | 89 | <D/2 | 150 | 136 | 110 | 4     | M16    | 18             | 8.3              |
| DN50      | 270 | 155 | 89 | <D/2 | 165 | 145 | 125 | 4     | M16    | 18             | 10.1             |

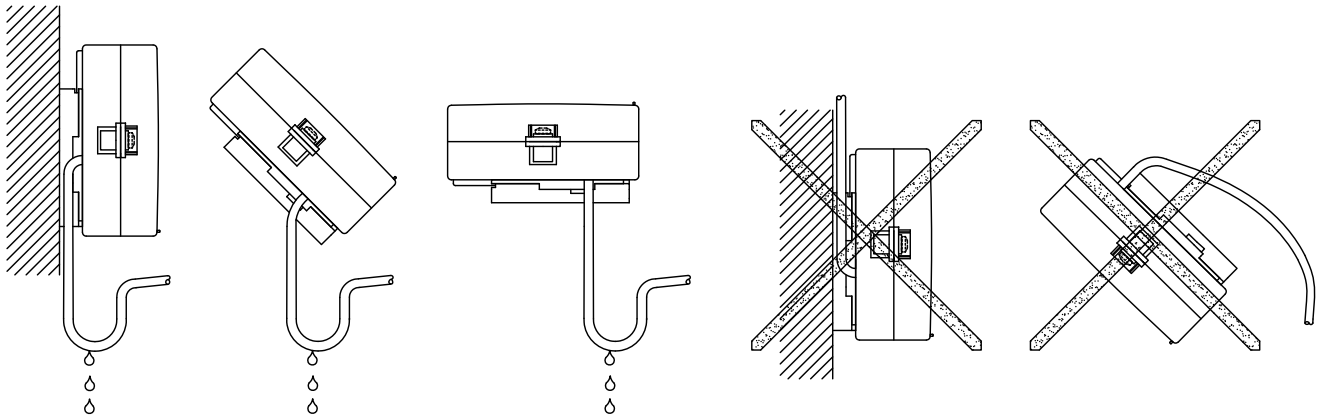
## ULTRAFLOW® 14, DN65 and DN80



### Flange EN 1092-3, type B, PN25

| Nom. dia. | L   | M   | H2 | B1   | D   | H   | k   | Bolts |        |                | App. weight [kg] |
|-----------|-----|-----|----|------|-----|-----|-----|-------|--------|----------------|------------------|
|           |     |     |    |      |     |     |     | No.   | Thread | d <sub>2</sub> |                  |
| DN65      | 300 | 170 | 89 | <H/2 | 185 | 168 | 145 | 8     | M16    | 18             | 13.2             |
| DN80      | 300 | 170 | 89 | <H/2 | 200 | 184 | 160 | 8     | M16    | 18             | 16.8             |

## Installation of calculator



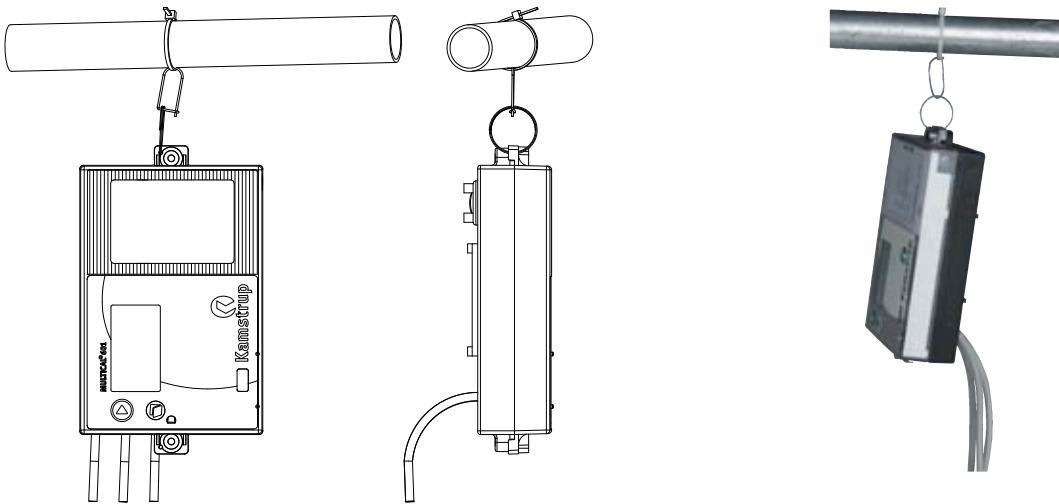
Front, vertical

Front, at an angle  
between horizontal and  
vertical

Front, horizontal

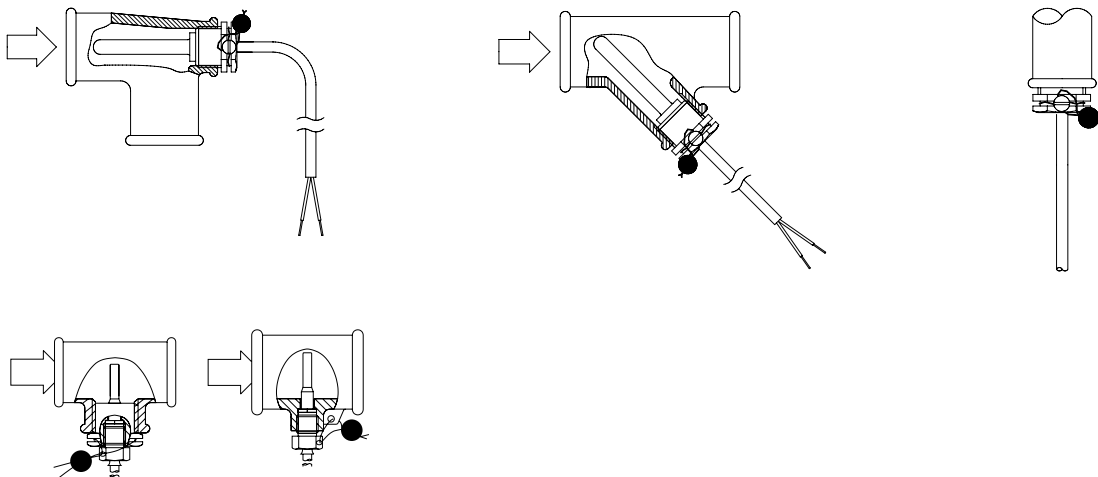
**Note!** Cables **must** be installed from below.

## Installation example with suspension



**Note:** The suspension **must** not be used on condensing pipes.  
Suspension kit item no. 5915-114. Not included

## Installation of temperature sensors



Temperature sensors must be mounted from below

## Mounting of flow sensors

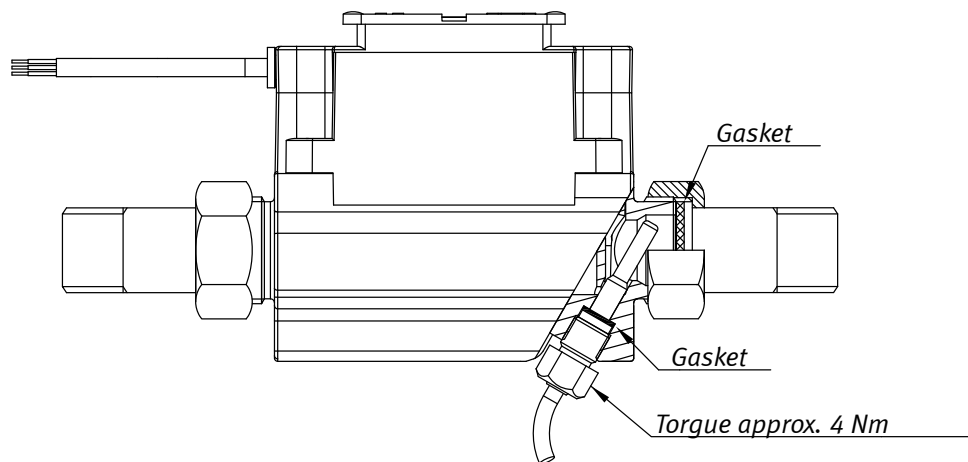
Before mounting the flow sensor, flush the system thoroughly and remove protection plugs/plastic membranes from the flow sensor. Correct flow sensor position (flow or return pipe) appears from the front label placed on the MULTICAL® 601. The flow direction is indicated by an arrow on the side of the flow sensor.

Glands and gaskets must be mounted as shown on the drawing below.

Straight inlet: ULTRAFLOW® 14 requires neither straight inlet nor outlet to meet the Measuring Instruments Directive (MID) 2004/22/EC, OIML R75:2002 and EN 1434:2007. Only in case of heavy flow disturbances before the meter will a straight inlet section be necessary. We recommend to follow the guidelines in CEN CR 13582.

To prevent cavitation, the operating pressure at the ULTRAFLOW® 14 must be min. 1.5 bar at  $q_p$  and min. 2.5 bar at  $q_s$ .

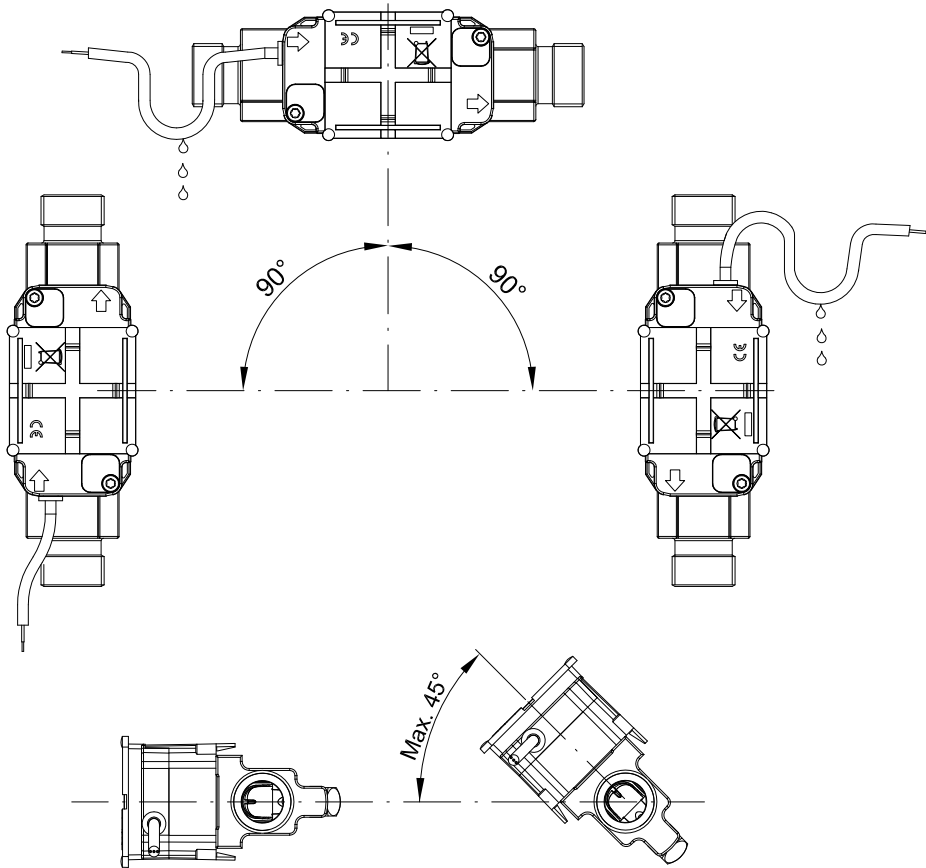
ULTRAFLOW® 14 must not be exposed to pressures below ambient pressure (vacuum).



# Mounting of ULTRAFLOW® 14

ULTRAFLOW® 14 must be mounted vertically, horizontally or at any angle in between.

ULTRAFLOW® 14 may be turned up to 45° in relation to horizontal.



The ULTRAFLOW® 14 housing must **not** be mounted facing upwards or downwards.

