

# ULTRAFLOW® 54

**Ultrasonic flow sensor**

**Compact design**

**Static meter with no moving parts**

**Large dynamic range**

**No wear**

**Exceptionally accurate**

**Longevity**



MID-2004/22/EC



## Application

ULTRAFLOW® 54 is a static flow sensor based on the ultrasonic measuring principle. The prime area of application is as a volume flow sensor for use with thermal heat meters such as MULTICAL® and MAXICAL. ULTRAFLOW® 54 has been designed for use in heating installations where water is used as the heat-bearing medium.

ULTRAFLOW® 54 employs micro-processor technology and ultrasonic measuring techniques. All circuits for calculating and measuring are collected on a single board, providing compact and rational design in addition to an exceptionally high level of measuring accuracy and reliability.

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 to a flow velocity and thus a volume.

A multiplug, placed beneath the seal, is used during communication and calibration.

A three-wire pulse cable is used to connect ULTRAFLOW® 54 to the calculator. This cable is used to supply the flow sensor from the calculator and also to send the signal to the calculator. The signal corresponds to the flow, or more correctly, a number of pulses proportional to the water volume flowing through the meter is transmitted.

If required a PULSE TRANSMITTER can be used to supply ULTRAFLOW® 54, e.g. if the distance between MULTICAL® and ULTRAFLOW® 54 is 10 m or more.

The PULSE TRANSMITTER has a built-in supply and a galvanically separated pulse outlet.



## Kamstrup

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# Approvals

## Type approval

ULTRAFLOW® 54 approved in accordance with MID-2004/22/EC.

EC-Type Examination certificate: DK-0200-MI004-008.

Please contact Kamstrup A/S for further information relating to type approval and verification.

## CE-marking

ULTRAFLOW® 54 is marked in accordance with:

|               |   |
|---------------|---|
| MID-directive | 2004/22/EC                                      |
| LV-directive  | 73/23/EEC (together with the PULSE TRANSMITTER) |
| PE-directive  | 97/23/EC (DN50...DN80 category I)               |

## MID designation

|                             |  |
|-----------------------------|--|
| Mechanical environment      | Class M1   |
| Electromagnetic environment | Class E1 and E2  |
| Ambient temperature         | 5...55°C, non condensing closed location (indoor installation) |

# Technical data

## Mechanical data

|                         |                                  |
|-------------------------|----------------------------------|
| Metrological class      | 2 and 3                          |
| Environmental class     | Complies with DS/EN 1434 class C |
| Ambient temperature     | 0...55°C                         |
| Protection class        |                                  |
| – Flow sensor           | IP65                             |
| – PULSE TRANSMITTER     | IP54                             |
| Temperature* of medium  | 15...130°C                       |
| Storage temperature     |                                  |
| – meter without battery | -25...70°C                       |
| – meter with battery    | -25...60°C                       |
| Pressure stage          | PN16, PN25 flange                |

\* If the temperature of the medium exceeds 90°C a flange meter should be used. Additionally, MULTICAL® calculator or the PULSE TRANSMITTER should be wall-mounted.

## Electrical data

|                                  |  |
|----------------------------------|--|
| Supply voltage                   | 3.6 V ±0.1 V   |
| Battery (PULSE TRANSMITTER)      | 3.65 VDC, D-Cell lithium   |
| Replacement interval             | 6 years @ t <sub>BAT</sub> <35°C   |
| Power supply (PULSE TRANSMITTER) | 230 VAC +15/-30%, 48...52 Hz<br>24 VAC ±30%  |
| Back-up supply                   | Integral super-cap eliminates operational disturbances due to short-term power-cuts. |
| Cable length, flow sensor        | Max. 10 m  |
| Cable length (PULSE TRANSMITTER) | Depends on calculator  |
| EMC data                         | Complies with DS/EN 1434 class C   |

# Flowdata

| Nom. flow $q_p$<br>[m <sup>3</sup> /h] | Nom. diameter | Meter factor <sup>1)</sup><br>[imp./l] | Dynamic range<br>$q_i:q_p$ | $q_s:q_p$ | Flow @125 Hz <sup>2)</sup><br>[m <sup>3</sup> /h] | $\Delta p@q_p$<br>[bar] | Min. cut off<br>[l/h] |
|--|---------------|--|----------------------------|-----------|---|-------------------------|-----------------------|
| 0.6                                    | DN15 & DN20   | 300                                    | 1:100                      | 2:1       | 1.5   | 0.04                    | 2                     |
| 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>1)</sup> The meter factor can be seen on the label on the side of the meter.

<sup>2)</sup> Saturation flow. Max. pulse frequency 128 Hz is maintained at higher flow rates.

# Materials

## Wetted parts

### ULTRAFLOW® 54, q<sub>p</sub> 0.6 and 1.5 m<sup>3</sup>/h

|                 |   |
|-----------------|---|
| Housing, gland  | Dezincification resistant brass                             |
| Housing, flange | Red brass, RG5  |
| 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® 54, q<sub>p</sub> 2.5 to 40 m<sup>3</sup>/h

|                 |                                 |
|-----------------|---------------------------------|
| Housing, gland  | Dezincification resistant brass |
| Housing, flange | Red brass, RG5                  |
| 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  |

## Connection cable q<sub>p</sub> 0.6 to 40 m<sup>3</sup>/h

Silicone cable (3 x 0.5<sup>2</sup>)

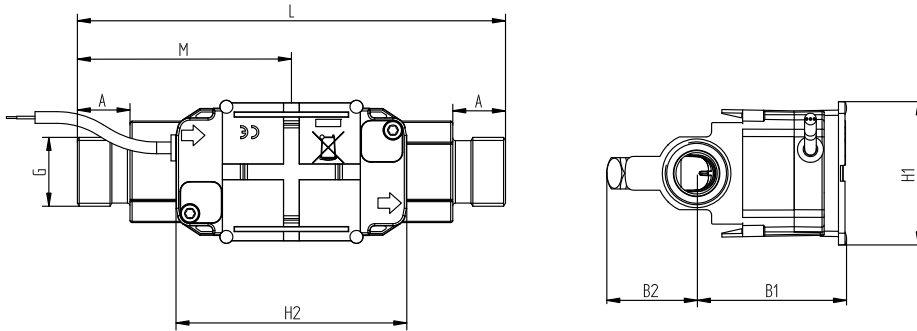
# Type summary

| Nom. flow q <sub>p</sub><br>[m <sup>3</sup> /h] | Size                                   |  |             |             |             |               |
|---|--|--|-------------|-------------|-------------|---------------|
|   |  |  |             |             |             |               |
| 0.6   | G <sup>3</sup> / <sub>4</sub> x 110 mm | G1 x 130 mm                            |             |             |             |               |
| 1.5   | G <sup>3</sup> / <sub>4</sub> x 110 mm | G <sup>3</sup> / <sub>4</sub> x 165 mm | G1 x 130 mm | G1 x 165 mm | G1 x 190 mm | DN20 x 190 mm |
| 2.5   | G1 x 190 mm                            | DN20 x 190 mm                          |             |             |             |               |
| 3.5   | G5/4 x 260 mm                          | DN25 x 260 mm                          |             |             |             |               |
| 6   | G5/4 x 260 mm                          | DN25 x 260 mm                          |             |             |             |               |
| 10  | G2 x 300 mm                            | DN40 x 300 mm                          |             |             |             |               |
| 15  | DN50 x 270 mm                          |  |             |             |             |               |
| 25  | DN65 x 300 mm                          |  |             |             |             |               |
| 40  | DN80 x 300 mm                          |  |             |             |             |               |

Thread ISO 228-1  
Flange EN 1092-3, PN25

# Dimension sketches

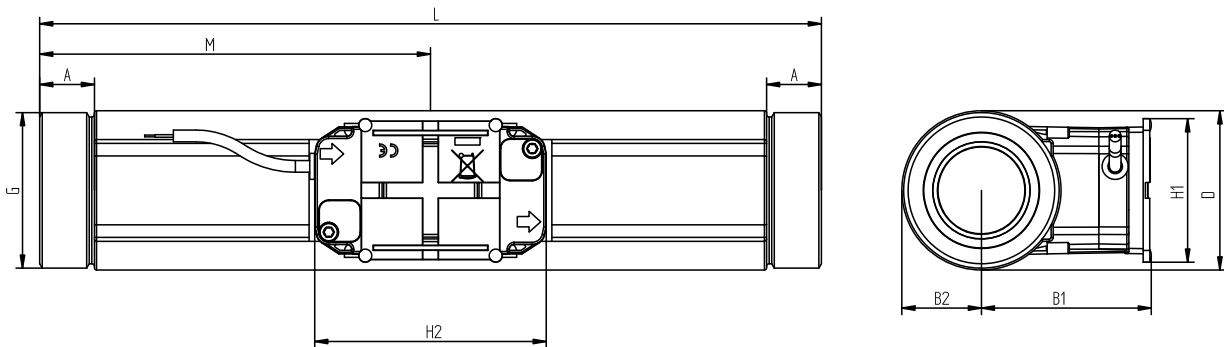
## ULTRAFLOW® 54, G<sup>3</sup>/<sub>4</sub> and G1



### 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              |
| G <sup>3</sup> / <sub>4</sub> | 165 | L/2 | 89 | 20.5 | 58 | 35 | 55 | 1.2              |
| G1                            | 165 | L/2 | 89 | 20.5 | 58 | 35 | 55 | 1.2              |
| 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® 54, G<sup>5</sup>/<sub>4</sub> and G2



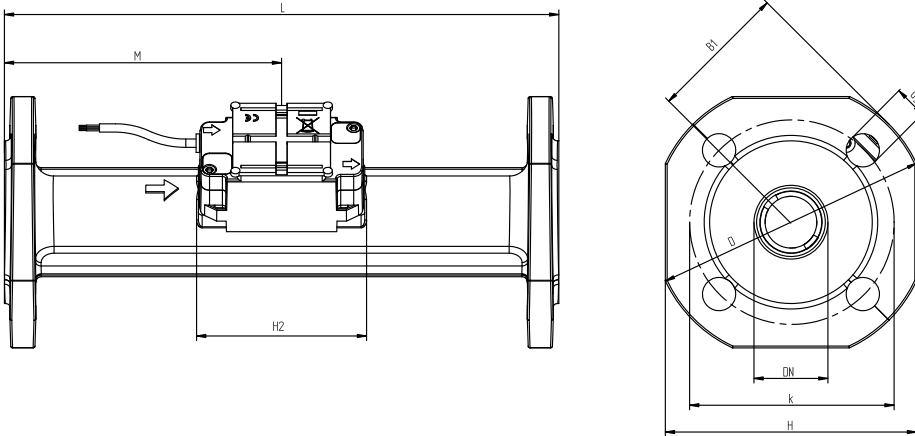
### Thread ISO 228-1

| 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              |

5810-589 GB / 12.2007 / B1

# Dimension sketches

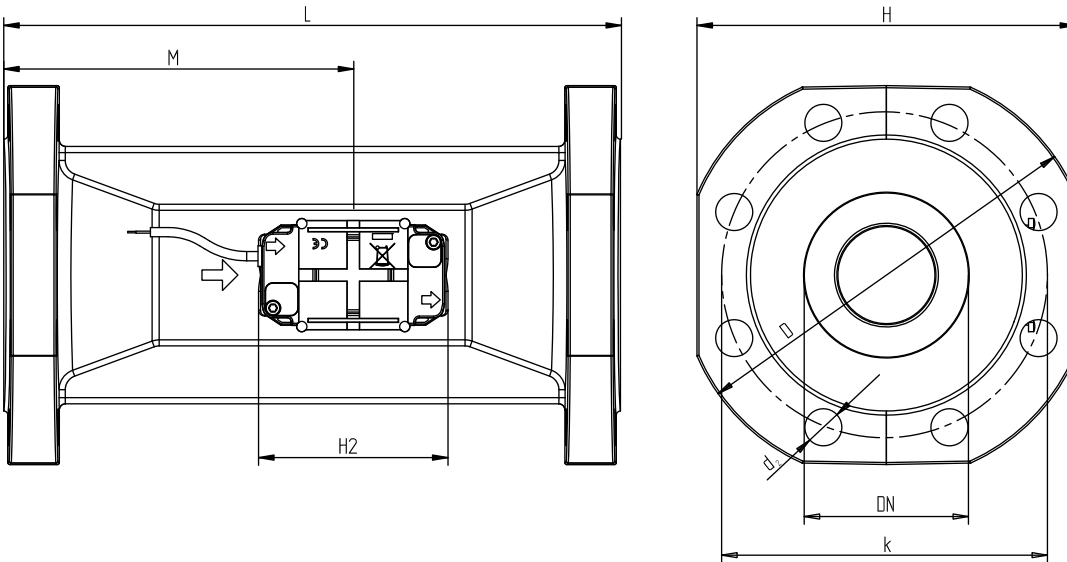
## ULTRAFLOW® 54, DN20 to DN50



### 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> |                  |
| DN20      | 190 | L/2 | 89 | 58   | 105 | 95  | 75  | 4     | M12    | 14             | 2.9              |
| 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             |

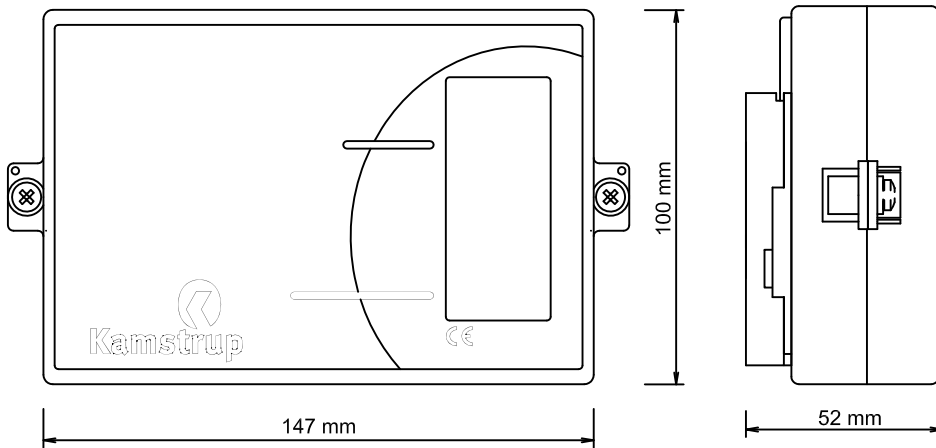
## ULTRAFLOW® 54, DN65 and DN80



### 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             |

# PULSE TRANSMITTER

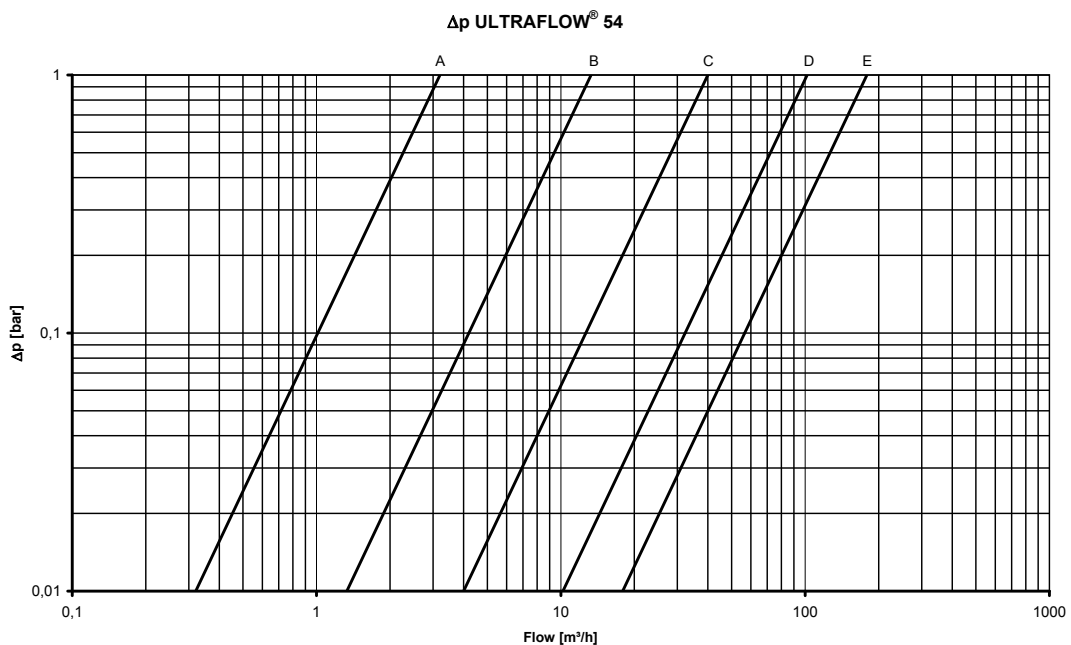


## Pressure loss

| Graph | $q_p$<br>[m <sup>3</sup> /h] | Nom. diameter | $k_v$ <sup>3)</sup> | Q@0.25 bar<br>[m <sup>3</sup> /h] |
|-------|------------------------------|---------------|---------------------|-----------------------------------|
| A     | 0.6 & 1.5                    | DN15 & DN20   | 3.2                 | 1.6                               |
| B     | 2.5 & 3.5<br>& 6             | DN20 & DN25   | 13.4                | 6.7                               |
| C     | 10 & 15                      | DN40 & DN50   | 40                  | 20                                |
| D     | 25                           | DN65          | 102                 | 51                                |
| E     | 40                           | DN80          | 179                 | 90                                |

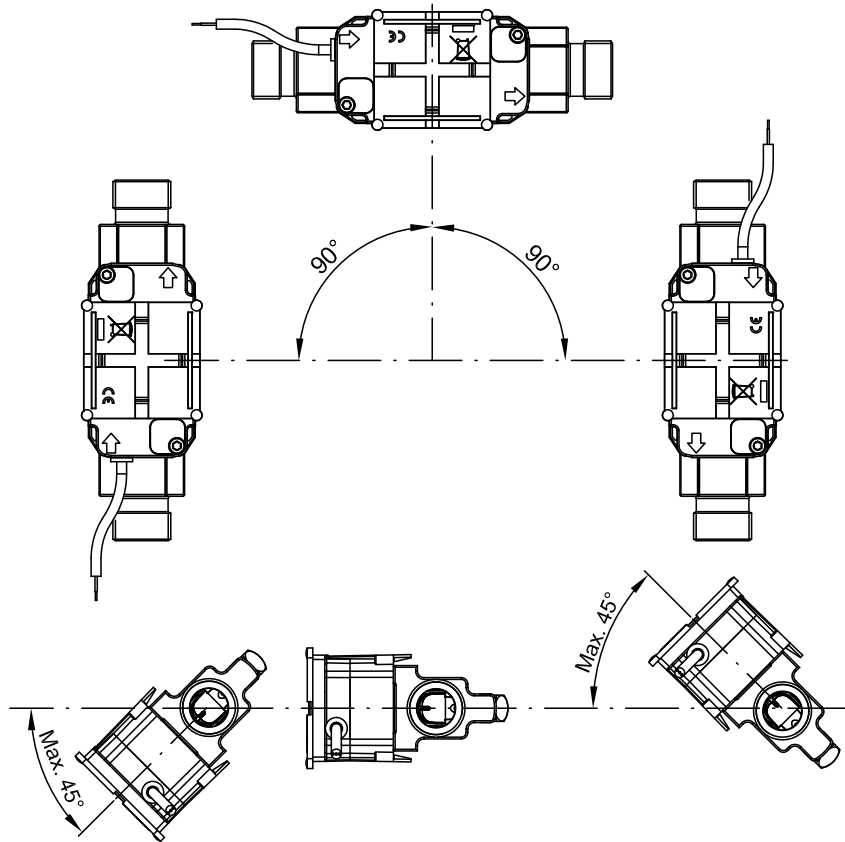
<sup>3)</sup>  $q = k_v \times \sqrt{\Delta p}$

## Pressure loss graphs



# Installation

## Installation angle for ULTRAFLOW® 54 ≤DN80



ULTRAFLOW® 54 may be installed horizontally, vertically or at an angle.

### **IMPORTANT!**

With ULTRAFLOW® 54 ≤DN80 (40 m<sup>3</sup>/h), the electronics/plastic case must be placed to the side (with horizontal installation).

ULTRAFLOW® 54 may be turned up to ±45° in relation to the pipe axis.

### **Straight inlet**

ULTRAFLOW® 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.

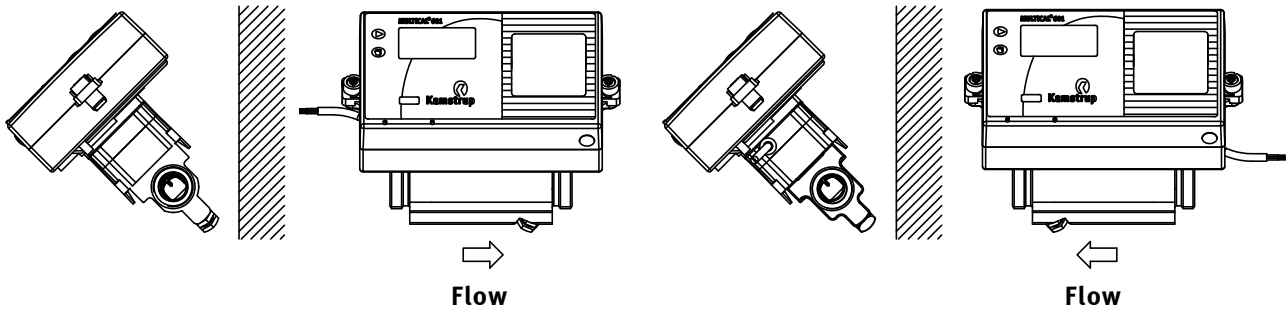
### **Working Pressure**

In order to prevent cavitation the back pressure at ULTRAFLOW® 54 must be min. 1.5 bar at  $q_p$  and min. 2.5 bar at  $q_s$  (4.5 bar for DN80 x 350). This applies to temperatures up to approx. 80°C.

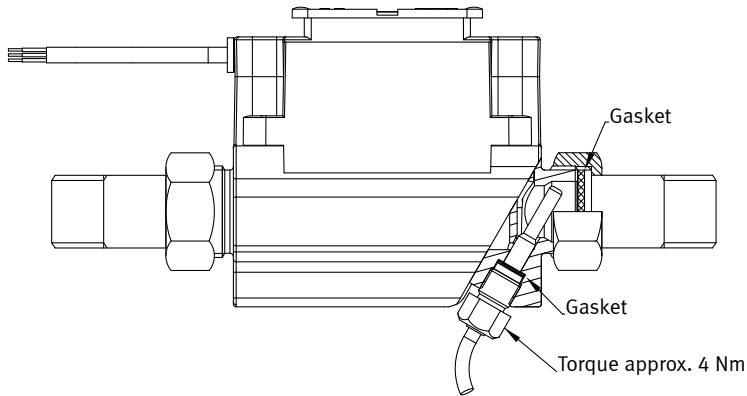
ULTRAFLOW® 54 must not be exposed to lower pressure than the ambient pressure (vacuum).

# Examples of installation

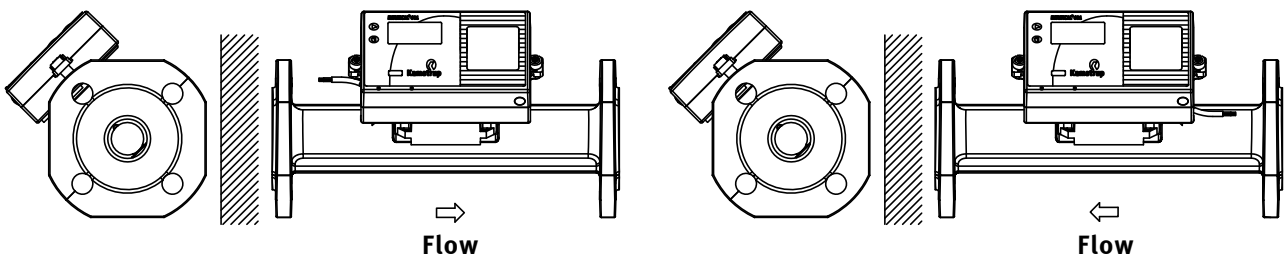
Gland meter with MULTICAL®/PULSE TRANSMITTER fitted directly on ULTRAFLOW® 54.



Glands and short direct sensor fitted in ULTRAFLOW® 54 (G<sup>3</sup>/<sub>4</sub> (R<sup>1</sup>/<sub>2</sub>) and G1 (R<sup>3</sup>/<sub>4</sub>) only).



Flange meter with MULTICAL®/PULSE TRANSMITTER fitted directly on ULTRAFLOW® 54.



NB: For meters  $\geq$ DN100 MULTICAL® or the PULSE TRANSMITTER **cannot** be fitted directly on the flow part.

# Electrical connection

## Connecting MULTICAL®/MAXICAL III & ULTRAFLOW® 54

| ULTRAFLOW® 54       | -> | MULTICAL®, MAXICAL III |
|---------------------|----|------------------------|
| Blue (GND)/11A      | -> | 11                     |
| Red (supply)/9A     | -> | 9                      |
| Yellow (signal)/10A | -> | 10                     |

| ULTRAFLOW® 54       | -> | PULSE TRANSMITTER |     | -> | MULTICAL® |
|---------------------|----|-------------------|-----|----|-----------|
|                     |    | In                | Out |    |           |
| Blue (GND)/11A      | -> | 11                | 11A | -> | 11        |
| Red (supply)/9A     | -> | 9                 | 9A  | -> | 9         |
| Yellow (signal)/10A | -> | 10                | 10A | -> | 10        |

## Connecting via PULSE TRANSMITTER

| 3.65 VDC supply <sup>4)</sup> | -> | PULSE TRANSMITTER |
|-------------------------------|----|-------------------|
| Red (+)                       | -> | 60                |
| Black (-)                     | -> | 61                |

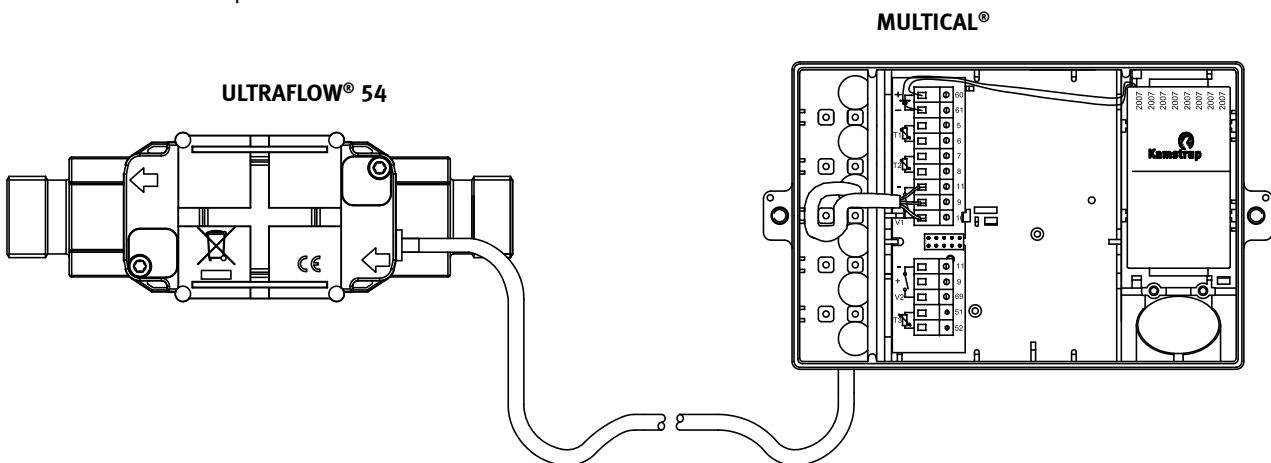
| ULTRAFLOW® 54       | -> | PULSE TRANSMITTER |     | -> | MAXICAL III |
|---------------------|----|-------------------|-----|----|-------------|
|                     |    | In                | Out |    |             |
| Blue (GND)/11A      | -> | 11                | 11A | -> | 11          |
| Red (supply)/9A     | -> | 9                 |     |    |             |
| Yellow (signal)/10A | -> | 10                | 10A | -> | 10          |

<sup>4)</sup> from battery or supply module.

If long signal cables are used, please consider the installation carefully. There must be **at least 25 cm** between the signal cable and all other cables due to EMC.

## Example of connecting ULTRAFLOW® 54 and MULTICAL®

ULTRAFLOW® 54,  $q_p \leq 40 \text{ m}^3/\text{h}$



# Order specification

The list below shows type numbers for ULTRAFLOW® 54

| Type number <sup>5)</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.) |
|---------------------------|---------------------------------------|---------------------------------------|---------------------------------------|--|----------------|----------------------------|--------------------|
| 65-5-CAAA-XXX             | 0.6                                   | 0.006                                 | 1.2                                   | G <sup>3</sup> / <sub>4</sub> B (R <sup>1</sup> / <sub>2</sub> ) | 110            | 300                        | 116 (184)          |
| 65-5-CAAD-XXX             | 0.6                                   | 0.006                                 | 1.2                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 130            | 300                        | 116 (184)          |
| 65-5-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                        | 119 (107)          |
| 65-5-CDAC-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | G <sup>3</sup> / <sub>4</sub> B (R <sup>1</sup> / <sub>2</sub> ) | 165            | 100                        | 119 (107)          |
| 65-5-CDAD-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 130            | 100                        | 119 (107)          |
| 65-5-CDAE-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 165            | 100                        | 119 (107)          |
| 65-5-CDAF-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 190            | 100                        | 119 (107)          |
| 65-5-CDBA-XXX             | 1.5                                   | 0.015                                 | 3.0                                   | DN20   | 190            | 100                        | 119 (107)          |
| 65-5-CEAF-XXX             | 2.5                                   | 0.025                                 | 5.0                                   | G1B (R <sup>3</sup> / <sub>4</sub> )                             | 190            | 60                         | 198                |
| 65-5-CEBA-XXX             | 2.5                                   | 0.025                                 | 5.0                                   | DN20   | 190            | 60                         | 198                |
| 65-5-CGAG-XXX             | 3.5                                   | 0.035                                 | 7.0                                   | G5/4B (R1)   | 260            | 50                         | 151 (136)          |
| 65-5-CGBB-XXX             | 3.5                                   | 0.035                                 | 7.0                                   | DN25   | 260            | 50                         | 151 (136)          |
| 65-5-CHAG-XXX             | 6.0                                   | 0.06                                  | 12                                    | G5/4B (R1)   | 260            | 25                         | 137 (138)          |
| 65-5-CHBB-XXX             | 6.0                                   | 0.06                                  | 12                                    | DN25   | 260            | 25                         | 137 (138)          |
| 65-5-CJAJ-XXX             | 10                                    | 0.1                                   | 20                                    | G2B (R1 <sup>1</sup> / <sub>2</sub> )                            | 300            | 15                         | 178 (183)          |
| 65-5-CJBD-XXX             | 10                                    | 0.1                                   | 20                                    | DN40   | 300            | 15                         | 178 (183)          |
| 65-5-CKBE-XXX             | 15                                    | 0.15                                  | 30                                    | DN50   | 270            | 10                         | 120 (185)          |
| 65-5-CLBG-XXX             | 25                                    | 0.25                                  | 50                                    | DN65   | 300            | 6                          | 179                |
| 65-5-CMBH-XXX             | 40                                    | 0.4                                   | 80                                    | DN80   | 300            | 5                          | 158 (186)          |

<sup>5)</sup> XXX-code pertaining to final assembly, approvals etc. is determined by Kamstrup A/S. Some variants may not be included in national approvals.

ULTRAFLOW® 54 is as standard supplied with 2.5 m cable, but can also be supplied with 5 or 10 m cable.

## PULSE TRANSMITTER – type No. 66-99-603

The PULSE TRANSMITTER is supplied with built-in supply for ULTRAFLOW® 54. Battery, 24 VAC and 230 VAC supply are available. Please state the required supply type when ordering.

## Accessories

### Glands including gaskets (PN16)

| Size | Nipple                         | Union                         | Type No.  | 2 pcs.    |
|------|--------------------------------|-------------------------------|-----------|-----------|
| DN15 | R <sup>1</sup> / <sub>2</sub>  | G <sup>3</sup> / <sub>4</sub> | 65-61-311 | 65-61-321 |
| DN20 | R <sup>3</sup> / <sub>4</sub>  | G1                            | 65-61-312 | 65-61-322 |
| DN25 | R1                             | G5/4                          | 65-61-313 |           |
| DN40 | R1 <sup>1</sup> / <sub>2</sub> | 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 <sup>3</sup> / <sub>4</sub> | 2210-061 |
| G1                            | 2210-062 |
| G5/4                          | 2210-063 |
| G2                            | 2210-065 |