

# Flexim FLUXUS G631 Ultrasonic Flowmeter



|                                                          |    |
|----------------------------------------------------------|----|
| <b>Transmitter</b> .....                                 | 3  |
| Technical data .....                                     | 3  |
| Saturated steam pressure curve (steam measurement) ..... | 5  |
| Dimensions .....                                         | 6  |
| Storage .....                                            | 6  |
| Standard scope of supply .....                           | 6  |
| Adapters .....                                           | 7  |
| <b>Transducers</b> .....                                 | 8  |
| Transducer order code .....                              | 8  |
| Transducers (gas measurement) .....                      | 9  |
| Transducers (steam measurement) .....                    | 15 |
| Transducers (high-temperature steam measurement) .....   | 20 |
| <b>Transducer mounting fixture</b> .....                 | 23 |
| Technical data .....                                     | 24 |
| <b>Coupling materials for transducers</b> .....          | 25 |
| <b>Damping material</b> .....                            | 26 |
| Selection .....                                          | 26 |
| Damping mats .....                                       | 26 |
| Damping coat .....                                       | 27 |
| <b>Connection systems</b> .....                          | 28 |
| <b>Clamp-on temperature probe (optional)</b> .....       | 29 |
| Technical data .....                                     | 29 |
| Fixation .....                                           | 30 |
| <b>Wall thickness measurement (optional)</b> .....       | 31 |
| Technical data .....                                     | 31 |

## Transmitter

### Technical data

|                                                              |         | FLUXUS G631,<br>FLUXUS G361ST (gas measurement)                                                                                                                                                                        | FLUXUS G631ST (steam<br>measurement <sup>2</sup> )      | FLUXUS G631ST (high-temperature<br>steam measurement <sup>2</sup> ) |
|--------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------|
|                                                              |         |                                                                                                                                       |                                                         |                                                                     |
| design                                                       |         | portable                                                                                                                                                                                                               |                                                         |                                                                     |
| measurement                                                  |         |                                                                                                                                                                                                                        |                                                         |                                                                     |
| measurement principle                                        |         | transit time difference correlation principle                                                                                                                                                                          |                                                         | cross correlation principle                                         |
| flow direction                                               |         | bidirectional                                                                                                                                                                                                          |                                                         |                                                                     |
| synchronised channel averaging                               |         | x                                                                                                                                                                                                                      |                                                         | -                                                                   |
| flow velocity                                                | m/s     | 0.01...35, depending on pipe diameter                                                                                                                                                                                  | depending on pipe diameter and transducer, see diagrams | depending on the application                                        |
| repeatability                                                |         | 0.15 % MV ±0.005 m/s                                                                                                                                                                                                   |                                                         | ±1 % MV (Re > 60 000)<br>±3 % MV (Re 10 000...60 000)               |
| Reynolds number                                              |         | -                                                                                                                                                                                                                      | -                                                       | Re > 10 000                                                         |
| fluid                                                        |         | all acoustically conductive gases, e.g. nitrogen, air, oxygen, hydrogen, argon, helium, ethylene, propane                                                                                                              | saturated steam, superheated steam                      |                                                                     |
| fluid pressure                                               | bar (a) | see transducers                                                                                                                                                                                                        | 3...15.5                                                | 1...110                                                             |
| fluid temperature                                            | °C      | see transducers                                                                                                                                                                                                        | 135...200                                               | 100...630                                                           |
| temperature compensation                                     |         | corresponding to the recommendations in ANSI/ASME MFC-5.1-2011                                                                                                                                                         |                                                         | -                                                                   |
| measurement uncertainty (volumetric flow rate)               |         |                                                                                                                                                                                                                        |                                                         |                                                                     |
| measurement uncertainty of the measuring system <sup>1</sup> |         | ±0.3 % MV ±0.005 m/s                                                                                                                                                                                                   | ±0.3 % MV ±0.005 m/s                                    | -                                                                   |
| measurement uncertainty at the measuring point               |         | ±1...2 % MV ±0.005 m/s, depending on the application                                                                                                                                                                   | ±1...3 % MV ±0.005 m/s, depending on the application    | ±3 % MV (Re > 60 000)<br>±4 % MV (Re 10 000...60 000)               |
| transmitter                                                  |         |                                                                                                                                                                                                                        |                                                         |                                                                     |
| power supply                                                 |         | • 100...240 V/50...60 Hz (power supply unit (IP40, 0...40 °C))<br>• 10.5...13.5 V DC (socket at transmitter)<br>• integrated battery<br>• USB C                                                                        |                                                         |                                                                     |
| integrated battery<br>• operating time                       | h       | Li-Ion, 7.2 V/10 Ah, 72 Wh<br>without outputs, inputs and backlight, 1 measuring channel, ambient temperature > 10 °C<br>• continuous measurement: > 25 h <sup>(3)</sup><br>• low-power mode: max. 80 d <sup>(3)</sup> |                                                         |                                                                     |
| power consumption                                            | W       | < 8 (with outputs, inputs and backlight), charging: 24                                                                                                                                                                 |                                                         |                                                                     |
| measuring setup                                              |         | -                                                                                                                                                                                                                      | -                                                       | 2 transducer pairs of the same type required                        |
| number of measuring channels                                 |         | 2                                                                                                                                                                                                                      |                                                         | -                                                                   |
| damping                                                      | s       | 0...100 (adjustable)                                                                                                                                                                                                   |                                                         |                                                                     |
| measuring cycle                                              | Hz      | 100...1000 (1 channel)                                                                                                                                                                                                 |                                                         | 0.5...1 (depending on the application)                              |
| response time                                                | s       | 1 (1 channel), option: 0.02                                                                                                                                                                                            |                                                         | 20...50 (depending on the application)                              |
| housing material                                             |         | glass-fiber reinforced polyamide                                                                                                                                                                                       |                                                         |                                                                     |
| degree of protection                                         |         | IP65/IP67                                                                                                                                                                                                              |                                                         |                                                                     |
| dimensions                                                   | mm      | see dimensional drawing                                                                                                                                                                                                |                                                         |                                                                     |
| weight                                                       | kg      | 2.25                                                                                                                                                                                                                   |                                                         |                                                                     |
| ambient temperature                                          | °C      | -20...+60                                                                                                                                                                                                              |                                                         |                                                                     |
| place of installation                                        |         | indoor, outdoor, wet environments                                                                                                                                                                                      |                                                         |                                                                     |
| relative humidity of air                                     |         | max. 95 %                                                                                                                                                                                                              |                                                         |                                                                     |
| height above sea level                                       | m       | max. 2000                                                                                                                                                                                                              |                                                         |                                                                     |
| degree of pollution                                          |         | 3                                                                                                                                                                                                                      |                                                         |                                                                     |
| display                                                      |         | 240 x 128 pixels, backlight                                                                                                                                                                                            |                                                         |                                                                     |
| menu language                                                |         | English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian, Chinese                                                                                                                                    |                                                         |                                                                     |

<sup>1</sup> with aperture calibration of the transducers<sup>2</sup> test measurement to validate the application required in advance<sup>3</sup> operating time extension using the power pack PP0026NN (optional, item number: 612060-6CE)

For the technical data in the flow measurement of liquids mode see Technical specification TSFLUXUS\_F631.

|                                    |       | FLUXUS G631,<br>FLUXUS G361ST (gas measurement)                                                                                                                                                                                                       | FLUXUS G631ST (steam<br>measurement <sup>2</sup> )            | FLUXUS G631ST (high-temperature<br>steam measurement <sup>2</sup> ) |
|------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|
| measuring functions                |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| physical quantities                |       | operating volumetric flow rate, standard<br>volumetric flow rate, mass flow rate, flow<br>velocity                                                                                                                                                    | operating volumetric flow rate, mass flow rate, flow velocity |                                                                     |
| totaliser                          |       | volume, mass                                                                                                                                                                                                                                          |                                                               |                                                                     |
| calculation functions              |       | average, difference, sum                                                                                                                                                                                                                              |                                                               | -                                                                   |
| diagnostic functions               |       | sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and<br>transit times                                                                                                                                                       |                                                               | crest factor, peak width, symmetry of am-<br>plification            |
| communication interfaces           |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| service interfaces                 |       | • measured value transmission, parametrisation of the transmitter: USB C (PC), USB A (USB stick)                                                                                                                                                      |                                                               |                                                                     |
| process interfaces                 |       | • Modbus RTU (optional)                                                                                                                                                                                                                               |                                                               |                                                                     |
| accessories                        |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| data transmission kit              |       | USB cable (USB C - USB A)                                                                                                                                                                                                                             |                                                               |                                                                     |
| software                           |       | • FluxDiag Reader: reading of measured values and parameters, graphical representation<br>• FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrisation of the trans-<br>mitter                    |                                                               |                                                                     |
| adapter                            |       | optional<br>• output adapter AO61, AO62<br>• Modbus adapter AO63<br>• input adapter AI61, AI62                                                                                                                                                        |                                                               |                                                                     |
| transport case                     |       | optional<br>• without wheels<br>dimensions: 538 x 406 x 211 mm<br>• with wheels<br>dimensions: 538 x 406 x 269 mm                                                                                                                                     |                                                               |                                                                     |
| data logger                        |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| loggable values                    |       | all physical quantities, totalised physical quantities and diagnostic values                                                                                                                                                                          |                                                               |                                                                     |
| capacity                           |       | max. 800 000 measured values                                                                                                                                                                                                                          |                                                               |                                                                     |
| outputs                            |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
|                                    |       | The outputs are galvanically isolated from the transmitter.<br>The max. voltage, both between the outputs and against the internal power supply of the transmitter, is 60 V DC (permanent).                                                           |                                                               |                                                                     |
| • switchable current output        |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| number                             |       | 2                                                                                                                                                                                                                                                     |                                                               |                                                                     |
|                                    |       | configurable according to NAMUR NE 43<br>All switchable current outputs are jointly switched to active or passive.                                                                                                                                    |                                                               |                                                                     |
| range                              | mA    | 4...20 (alarm current: 3.2...3.99, 20.01...24, hardware fault current: 3.2)                                                                                                                                                                           |                                                               |                                                                     |
| uncertainty                        |       | 0.04 % of output value ±3 µA                                                                                                                                                                                                                          |                                                               |                                                                     |
| active output                      |       | R <sub>ext</sub> < 530 Ω, U <sub>opencircuit</sub> < 28 V DC                                                                                                                                                                                          |                                                               |                                                                     |
| passive output                     |       | U <sub>ext</sub> = 9...30 V DC, depending on R <sub>ext</sub> (R <sub>ext</sub> < 458 Ω at 20 V)                                                                                                                                                      |                                                               |                                                                     |
| • digital output                   |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| number                             |       | 2                                                                                                                                                                                                                                                     |                                                               |                                                                     |
| functions                          |       | • frequency output<br>• binary output<br>• pulse output                                                                                                                                                                                               |                                                               |                                                                     |
| type                               |       | open collector (passive)                                                                                                                                                                                                                              |                                                               |                                                                     |
| operating param-<br>eters          |       | OC30V/100mA<br>5...30 V, I <sub>max</sub> = 100 mA, R <sub>int</sub> = 20 Ω<br>Low: U < 2 V at I <sub>loop</sub> = 2 mA (R <sub>ext</sub> = 12 kΩ at U <sub>ext</sub> = 24 V)<br>High: U > 15 V (R <sub>ext</sub> = 12 kΩ at U <sub>ext</sub> = 24 V) |                                                               |                                                                     |
| frequency output                   |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| • range                            | kHz   | 0.002...10                                                                                                                                                                                                                                            |                                                               |                                                                     |
| • damping                          | s     | 0...999.9 (adjustable)                                                                                                                                                                                                                                |                                                               |                                                                     |
| • pulse-to-pause ra-<br>tio        |       | 1:1                                                                                                                                                                                                                                                   |                                                               |                                                                     |
| binary output                      |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| • binary output as<br>alarm output |       | limit, change of flow direction or error                                                                                                                                                                                                              |                                                               |                                                                     |
| pulse output                       |       |                                                                                                                                                                                                                                                       |                                                               |                                                                     |
| • pulse value                      | units | 0.01...1000                                                                                                                                                                                                                                           |                                                               |                                                                     |
| • pulse width                      | ms    | 0.05...1000                                                                                                                                                                                                                                           |                                                               |                                                                     |
| • pulse rate                       |       | max. 10 000 pulses                                                                                                                                                                                                                                    |                                                               |                                                                     |

<sup>1</sup> with aperture calibration of the transducers<sup>2</sup> test measurement to validate the application required in advance<sup>3</sup> operating time extension using the power pack PP0026NN (optional, item number: 612060-6CE)

For the technical data in the flow measurement of liquids mode see Technical specification TSFLUXUS\_F631.

|                            |    | FLUXUS G631,<br>FLUXUS G361ST (gas measurement)                                                                                           | FLUXUS G631ST (steam<br>measurement <sup>2</sup> ) | FLUXUS G631ST (high-temperature<br>steam measurement <sup>2</sup> ) |
|----------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------|
| inputs                     |    |                                                                                                                                           |                                                    |                                                                     |
|                            |    | The inputs are galvanically isolated from the transmitter.                                                                                |                                                    |                                                                     |
| number                     |    | • max. 4 temperature inputs or<br>• 2 temperature inputs and 2 current inputs<br>(see also standard scope of supply)                      |                                                    |                                                                     |
| • temperature input        |    |                                                                                                                                           |                                                    |                                                                     |
| type                       |    | Pt100/Pt1000                                                                                                                              |                                                    |                                                                     |
| connection                 |    | 4-wire                                                                                                                                    |                                                    |                                                                     |
| range                      | °C | -150 ... +560                                                                                                                             |                                                    |                                                                     |
| resolution                 | K  | 0.01                                                                                                                                      |                                                    |                                                                     |
| accuracy                   |    | ±0.01 % MV ±0.03 K at 18...28 °C<br>±0.01 % MV ±0.03 K ±0.0005 %/K at <18 °C/>28 °C                                                       |                                                    |                                                                     |
| cable resistance           | Ω  | max. 1000                                                                                                                                 |                                                    |                                                                     |
| • switchable current input |    |                                                                                                                                           |                                                    |                                                                     |
|                            |    | All switchable current inputs are jointly switched to active or passive.                                                                  |                                                    |                                                                     |
| accuracy                   |    | ±0.1 % MV ±0.01 mA at 18...28 °C<br>±0.1 % MV ±0.01 mA ±0.005 %/K at <18 °C/>28 °C                                                        |                                                    |                                                                     |
| resolution                 | µA | 0.1                                                                                                                                       |                                                    |                                                                     |
| active input               |    | R <sub>int</sub> = 75 Ω, I <sub>max</sub> ≤ 30 mA<br>U <sub>opencircuit</sub> = 28 V (open circuit)<br>U <sub>min</sub> = 21.4 V at 20 mA |                                                    |                                                                     |
| • range                    | mA | 0...20                                                                                                                                    |                                                    |                                                                     |
| passive input              |    | U <sub>ext</sub> = 24 V, R <sub>int</sub> = 35 Ω, I <sub>max</sub> ≤ 24 mA                                                                |                                                    |                                                                     |
| • range                    | mA | 0...20                                                                                                                                    |                                                    |                                                                     |

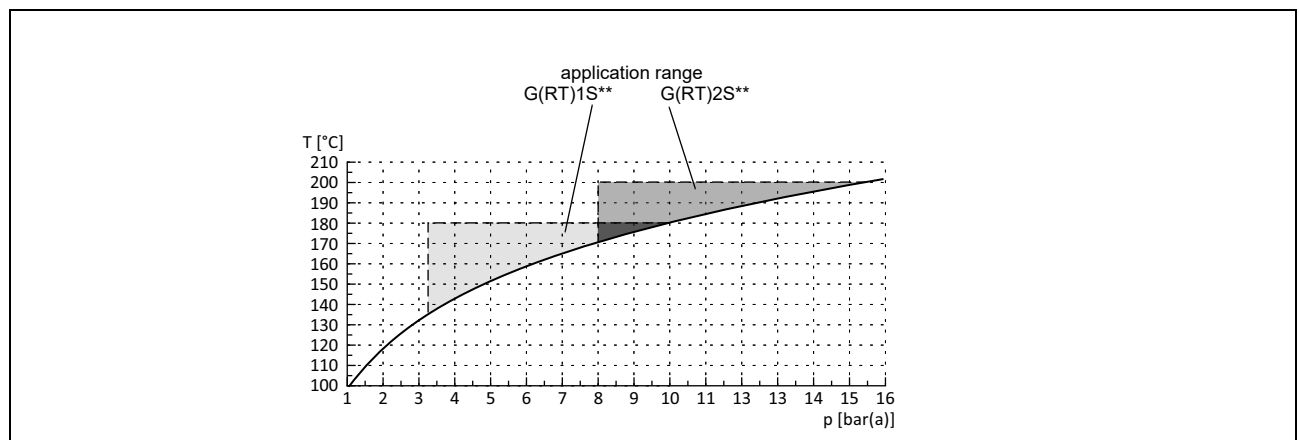
<sup>1</sup> with aperture calibration of the transducers

<sup>2</sup> test measurement to validate the application required in advance

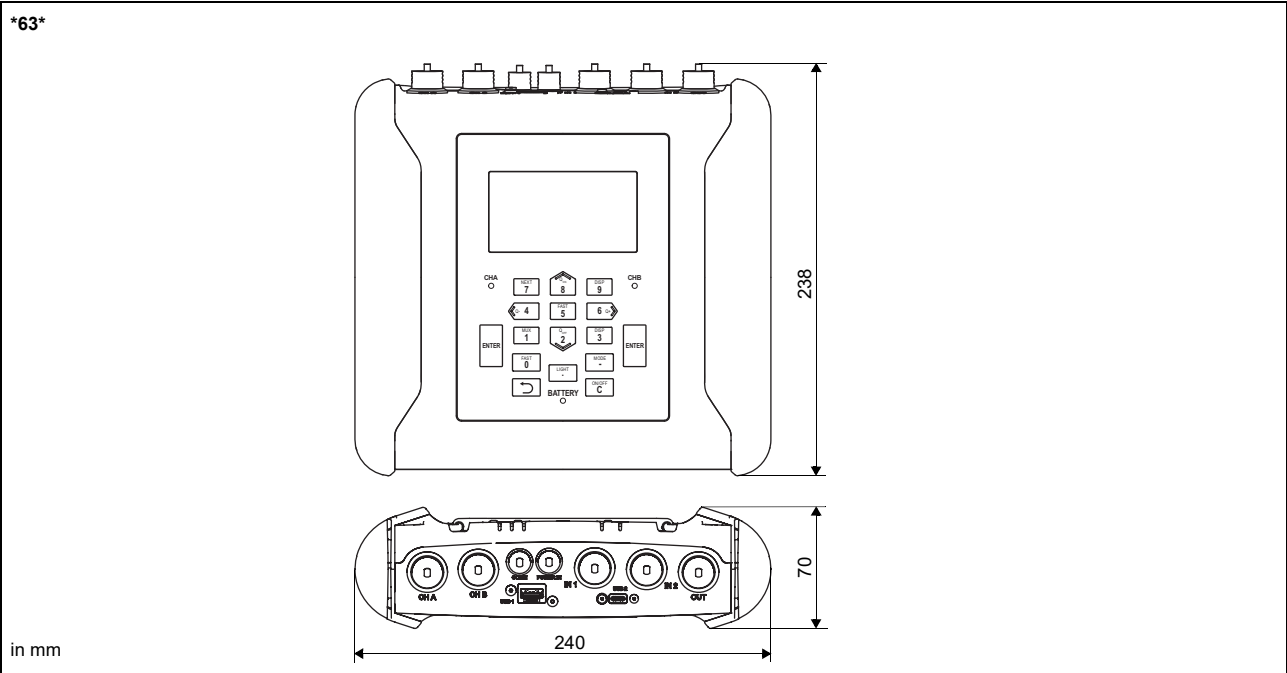
<sup>3</sup> operating time extension using the power pack PP0026NN (optional, item number: 612060-6CE)

For the technical data in the flow measurement of liquids mode see Technical specification TSFLUXUS\_F631.

## Saturated steam pressure curve (steam measurement)



Dimensions



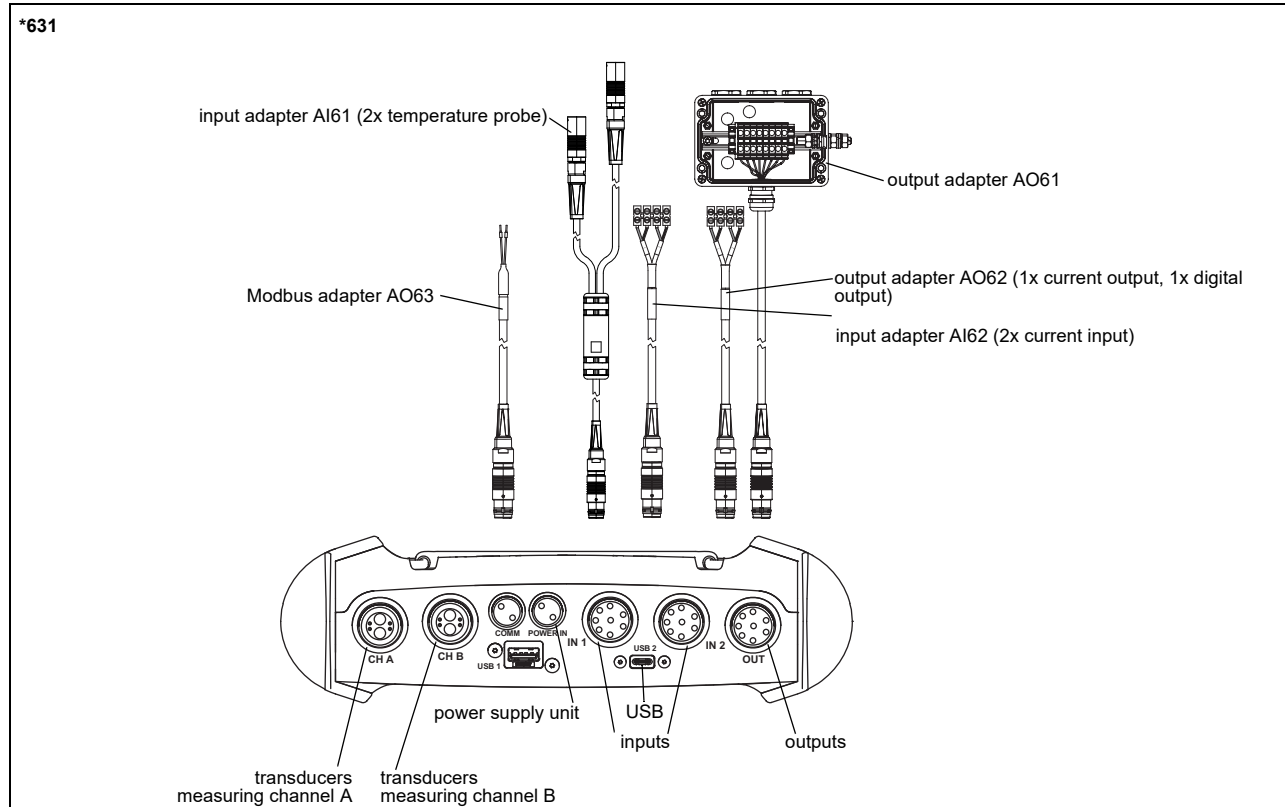
Storage

- do not store outdoors
- store within the original package
- store in a dry and dust-free place
- protect against sunlight
- keep all openings closed
- storing temperature: 0...40 °C

Standard scope of supply

|                                    | G631BA Basic        | G631EE Energy                                   | G631ST Steam                                    |
|------------------------------------|---------------------|-------------------------------------------------|-------------------------------------------------|
| <b>mode</b>                        |                     |                                                 |                                                 |
| measurement of liquids             | x                   | x                                               | x                                               |
| gas measurement                    | x                   | x                                               | x                                               |
| steam measurement                  | -                   | -                                               | x                                               |
| high-temperature steam measurement | -                   | -                                               | x                                               |
| <b>outputs</b>                     |                     |                                                 |                                                 |
| switchable current output          | 2                   | 2                                               | 2                                               |
| digital output                     | 2                   | 2                                               | 2                                               |
| Modbus                             | optional            | optional                                        | optional                                        |
| <b>inputs</b>                      |                     |                                                 |                                                 |
| temperature input                  | -                   | 2                                               | 2                                               |
| switchable current input           | -                   | 2                                               | 2                                               |
| <b>accessories</b>                 |                     |                                                 |                                                 |
| transport case                     | x                   | x                                               | x                                               |
| adapter                            | output adapter AO61 | output adapter AO61<br>input adapter AI61, AI62 | output adapter AO61<br>input adapter AI61, AI62 |

## Adapters



## Technical data

|                          |    | output adapter                                                          | output adapter | Modbus adapter | input adapter | input adapter |
|--------------------------|----|-------------------------------------------------------------------------|----------------|----------------|---------------|---------------|
| technical type           |    | AO61                                                                    | AO62           | AO63           | AI61          | AI62          |
| item number              |    | 63101-1                                                                 | 63101-2        | 63102-1        | 63103-1       | 63103-2       |
| weight                   | kg | 0.565                                                                   | 0.15           | 0.09           | 0.27          | 0.15          |
| <b>material</b>          |    |                                                                         |                |                |               |               |
| housing                  |    | polyester                                                               |                |                |               |               |
| gasket                   |    | silicone                                                                |                |                |               |               |
| degree of protection     |    | IP65                                                                    |                |                | IP65/IP67     |               |
| ambient temperature      | °C | -20...+60                                                               |                |                |               |               |
| place of installation    |    | indoor, outdoor, wet environments                                       |                |                |               |               |
| relative humidity of air |    | max. 80 % (31 °C), decreasing linearly to 50 % (40 °C), no condensation |                |                |               |               |
| height above sea level   | m  | max. 2000                                                               |                |                |               |               |
| degree of pollution      |    | 3                                                                       | 3              | 3              | 3             | 3             |

## Transducers

### Transducer order code

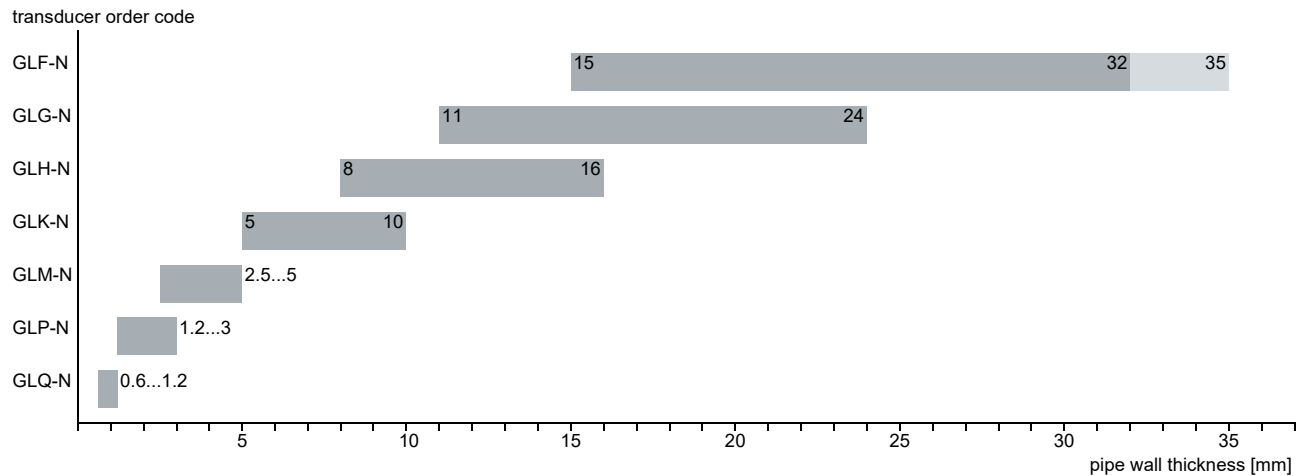
| 1, 2       | 3                    | 4 | 5...7               | 8, 9                 | 10, 11 | 12...14       | no. of character  |   |              |                                                                    |
|------------|----------------------|---|---------------------|----------------------|--------|---------------|-------------------|---|--------------|--------------------------------------------------------------------|
| transducer | transducer frequency | - | ambient temperature | explosion protection | -      | certification | connection system | - | cable length | description                                                        |
| GS         |                      |   |                     |                      |        |               |                   |   |              | set of ultrasonic flow transducers for Gas Measurement, shear wave |
| GL         |                      |   |                     |                      |        |               |                   |   |              | set of ultrasonic flow transducers for Gas Measurement, Lamb wave  |
|            | F                    |   |                     |                      |        |               |                   |   |              | 0.15 MHz                                                           |
|            | G                    |   |                     |                      |        |               |                   |   |              | 0.2 MHz                                                            |
|            | H                    |   |                     |                      |        |               |                   |   |              | 0.3 MHz                                                            |
|            | K                    |   |                     |                      |        |               |                   |   |              | 0.5 MHz                                                            |
|            | M                    |   |                     |                      |        |               |                   |   |              | 1 MHz                                                              |
|            | P                    |   |                     |                      |        |               |                   |   |              | 2 MHz                                                              |
|            | Q                    |   |                     |                      |        |               |                   |   |              | 4 MHz                                                              |
|            |                      | N |                     |                      |        |               |                   |   |              | normal temperature range                                           |
|            |                      | E |                     |                      |        |               |                   |   |              | extended temperature range                                         |
|            |                      | S |                     |                      |        |               |                   |   |              | steam measurement                                                  |
|            |                      |   | NNN                 |                      |        |               |                   |   |              | not explosion-proof                                                |
|            |                      |   |                     | **                   |        |               |                   |   |              |                                                                    |
|            |                      |   |                     |                      | NY     |               |                   |   |              | with connector                                                     |
|            |                      |   |                     |                      |        | ***           |                   |   |              | in m                                                               |

## Transducers (gas measurement)

### Transducer selection

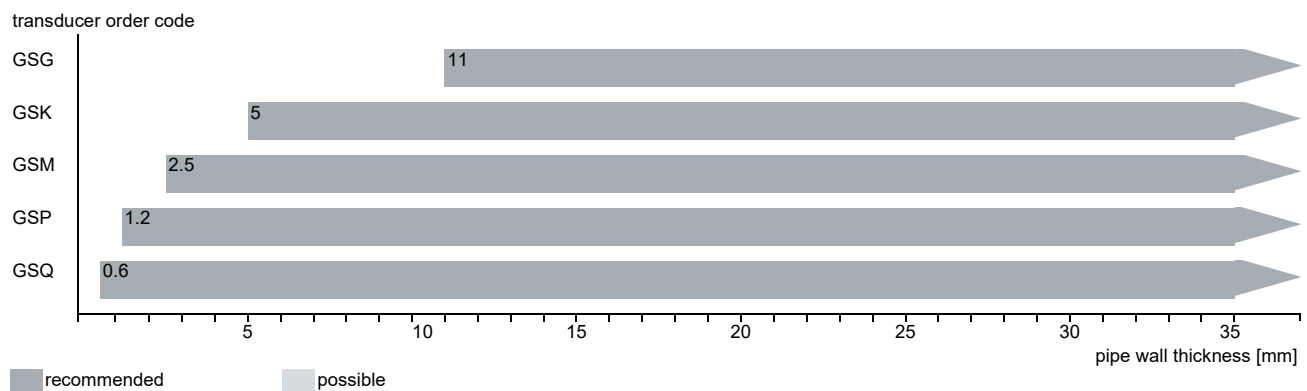
#### Step 1a

Select Lamb wave transducers:



#### Step 1b

If the pipe wall thickness is not in the range of the Lamb wave transducers, select a shear wave transducer:

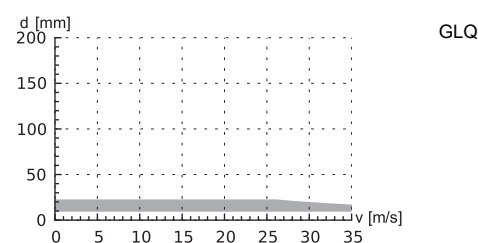
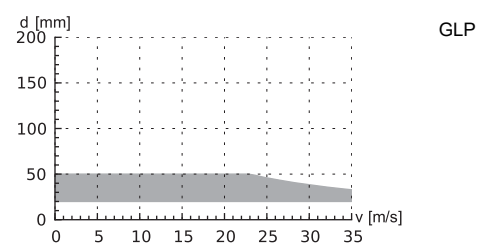
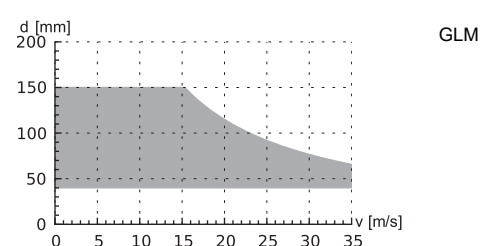
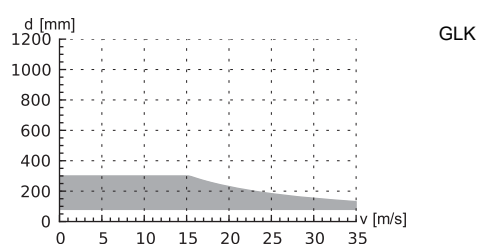
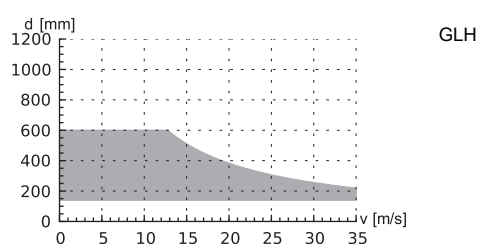
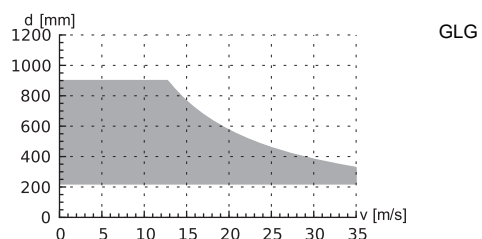
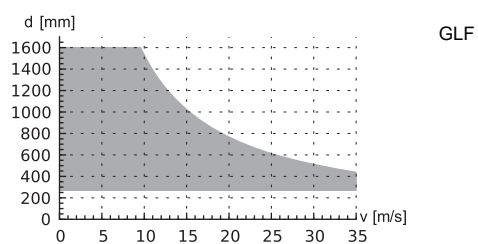
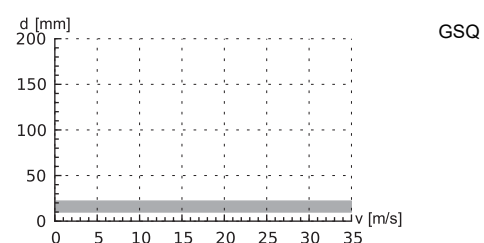
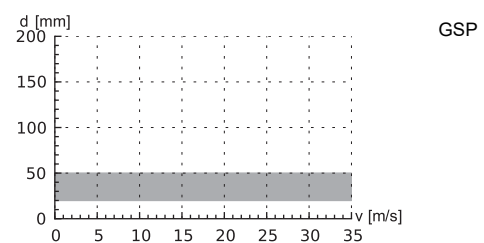
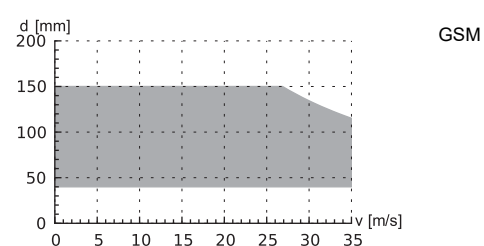
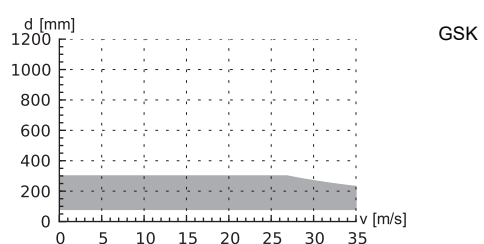
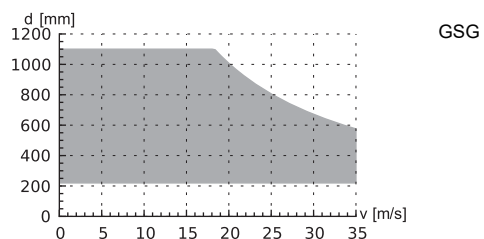


#### Step 2

inner pipe diameter  $d$  dependent on the flow velocity  $v$  of the fluid in the pipe

The transducers are selected from the characteristics (see next page). Lamb wave transducers are selected from the left column, shear wave transducers from the right column.

Lamb wave transducers: If the values  $d$  and  $v$  are not in the range, the diagonal arrangement with 1 sound path may be used, i.e. the same characteristics can be used with doubling the inner pipe diameter. If the values are still not in the range, shear waves transducers regarding the pipe wall thickness have to be selected in step 1b.

**Lamb wave transducer<sup>1</sup>****shear wave transducer<sup>1</sup>**

<sup>1</sup> inner pipe diameter and max. flow velocity for a typical application with natural gas, nitrogen, oxygen in reflection arrangement with 2 sound paths (Lamb wave transducers)/1 sound path (shear wave transducers)

### Step 3

min. fluid pressure

| Lamb wave transducer       |                                    |                                   |      |
|----------------------------|------------------------------------|-----------------------------------|------|
| transducer or-<br>der code | fluid pressure <sup>1</sup> [bar]  |                                   |      |
|                            | metal pipe                         | plastic pipe                      |      |
|                            | min.                               | min. extended                     | min. |
| GLF                        | 15                                 | 10                                | 1    |
| GLG                        | 15                                 | 10                                | 1    |
| GLH                        | 15                                 | 10                                | 1    |
| GLK                        | 15 (d > 120 mm)<br>10 (d < 120 mm) | 10 (d > 120 mm)<br>3 (d < 120 mm) | 1    |
| GLM                        | 10 (d > 60 mm)<br>5 (d < 60 mm)    | 3 (d < 60 mm)                     | 1    |
| GLP                        | 10 (d > 35 mm)<br>5 (d < 35 mm)    | 3 (d < 35 mm)                     | 1    |
| GLQ                        | 10 (d > 15 mm)<br>5 (d < 15 mm)    | 3 (d < 15 mm)                     | 1    |

| shear wave transducer      |                                   |               |      |
|----------------------------|-----------------------------------|---------------|------|
| transducer or-<br>der code | fluid pressure <sup>1</sup> [bar] |               |      |
|                            | metal pipe                        | plastic pipe  |      |
|                            | min.                              | min. extended | min. |
| GSG                        | 30                                | 20            | 1    |
| GSK                        | 30                                | 20            | 1    |
| GSM                        | 30                                | 20            | 1    |
| GSP                        | 30                                | 20            | 1    |
| GSQ                        | 30                                | 20            | 1    |

<sup>1</sup> depending on the application, typical absolute value for natural gas, nitrogen, compressed air

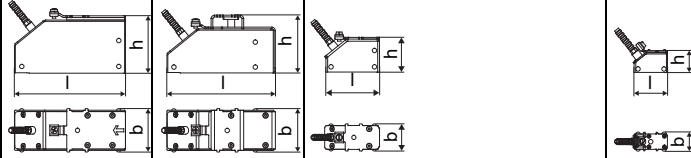
d - inner pipe diameter

### Example

| step |                     |     |            |            |     |
|------|---------------------|-----|------------|------------|-----|
| 1    | pipe wall thickness | mm  | 14.3       | 8.6        | 38  |
|      | selected transducer |     | GLG or GLH | GLH or GLK | GS  |
| 2    | inner pipe diameter | mm  | 581        | 96.8       | 143 |
|      | max. flow velocity  | m/s | 15         | 30         | 30  |
|      | selected transducer |     | GLG        | GLK        | GSK |
| 3    | min. fluid pressure | bar | 20         | 15         | 40  |
|      | selected transducer |     | GLG        | GLK        | GSK |

## Technical data

### Shear wave transducers (nonEx, NY)

| order code                         |     | GSG-NNNN-<br>**NY                                                                   | GSK-NNNN-<br>**NY | GSM-NNNN-<br>**NY                                        | GSP-NNNN-<br>**NY | GSQ-NNNN-<br>**NY |
|------------------------------------|-----|-------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------|-------------------|-------------------|
| technical type                     |     | G(DL)G1NZ4                                                                          | G(DL)K1NZ4        | GDM2NZ4                                                  | GDP2NZ4           | GDQ2NZ4           |
| transducer frequency               | MHz | 0.2                                                                                 | 0.5               | 1                                                        | 2                 | 4                 |
| fluid pressure <sup>1</sup>        |     |                                                                                     |                   |                                                          |                   |                   |
| min. extended                      | bar | metal pipe: 20                                                                      |                   |                                                          |                   |                   |
| min.                               | bar | metal pipe: 30, plastic pipe: 1                                                     |                   |                                                          |                   |                   |
| inner pipe diameter d <sup>2</sup> |     |                                                                                     |                   |                                                          |                   |                   |
| min. extended                      | mm  | 180                                                                                 | 60                | 30                                                       | 15                | 7                 |
| min. recommended                   | mm  | 220                                                                                 | 80                | 40                                                       | 20                | 10                |
| max. recommended                   | mm  | 900                                                                                 | 300               | 150                                                      | 50                | 22                |
| max. extended                      | mm  | 1100                                                                                | 360               | 180                                                      | 60                | 30                |
| pipe wall thickness                |     |                                                                                     |                   |                                                          |                   |                   |
| min.                               | mm  | 11                                                                                  | 5                 | 2.5                                                      | 1.2               | 0.6               |
| material                           |     |                                                                                     |                   |                                                          |                   |                   |
| housing                            |     | PEEK with stainless steel cover 304 (1.4301)                                        |                   |                                                          |                   |                   |
| contact surface                    |     | PEEK                                                                                |                   |                                                          |                   |                   |
| degree of protection               |     | IP66 (transducer)<br>IP65/IP67 (on the transmitter side)                            |                   | IP66 (transducer)<br>IP65/IP67 (on the transmitter side) |                   |                   |
| transducer cable                   |     |                                                                                     |                   |                                                          |                   |                   |
| type                               |     | 1699                                                                                |                   |                                                          |                   |                   |
| length                             | m   | 5                                                                                   |                   | 4                                                        |                   | 3                 |
| dimensions                         |     |                                                                                     |                   |                                                          |                   |                   |
| length l                           | mm  | 129.5                                                                               | 126.5             | 64                                                       | 40                |                   |
| width b                            | mm  | 51                                                                                  | 51                | 32                                                       | 22                |                   |
| height h                           | mm  | 67                                                                                  | 67.5              | 40.5                                                     | 25.5              |                   |
| dimensional drawing                |     |  |                   |                                                          |                   |                   |
| weight (without cable)             | kg  | 0.47                                                                                | 0.36              | 0.066                                                    | 0.016             |                   |
| pipe surface temperature           | °C  | -40...+130                                                                          |                   |                                                          |                   |                   |
| ambient temperature                | °C  | -40...+130<br>connector: -20...+60                                                  |                   |                                                          |                   |                   |
| temperature compensation           |     | x                                                                                   |                   |                                                          |                   |                   |

<sup>1</sup> depending on the application, typical absolute value for natural gas, nitrogen, compressed air

<sup>2</sup> shear wave transducer:  
typical values for natural gas, nitrogen, oxygen; pipe diameters for other fluids on request  
inner pipe diameter max. recommended/max. extended: in reflection arrangement and for a flow velocity of 15 m/s

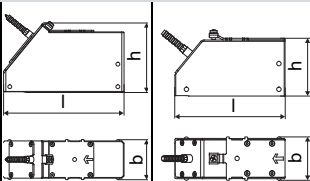
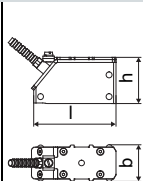
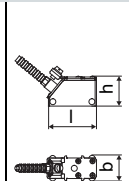
**Shear wave transducers (nonEx, NY, extended temperature range)**

|                                    |     |                                                                                    |                   |                   |
|------------------------------------|-----|------------------------------------------------------------------------------------|-------------------|-------------------|
| order code                         |     | GSM-ENNN-<br>**NY                                                                  | GSP-ENNN-<br>**NY | GSQ-ENNN-<br>**NY |
| technical type                     |     | GDM2EZ4                                                                            | GDP2EZ4           | GDQ2EZ4           |
| transducer frequency               | MHz | 1                                                                                  | 2                 | 4                 |
| fluid pressure <sup>1</sup>        |     |                                                                                    |                   |                   |
| min. extended                      | bar | metal pipe: 20                                                                     |                   |                   |
| min.                               | bar | metal pipe: 30, plastic pipe: 1                                                    |                   |                   |
| inner pipe diameter d <sup>2</sup> |     |                                                                                    |                   |                   |
| min. extended                      | mm  | 30                                                                                 | 15                | 7                 |
| min. recommended                   | mm  | 40                                                                                 | 20                | 10                |
| max. recommended                   | mm  | 150                                                                                | 50                | 22                |
| max. extended                      | mm  | 180                                                                                | 60                | 30                |
| pipe wall thickness                |     |                                                                                    |                   |                   |
| min.                               | mm  | 2.5                                                                                | 1.2               | 0.6               |
| material                           |     |                                                                                    |                   |                   |
| housing                            |     | PI with stainless steel cover 316L (1.4301)                                        |                   |                   |
| contact surface                    |     | PI                                                                                 |                   |                   |
| degree of protection               |     | IP66 (transducer)<br>IP65/IP67 (on the transmitter side)                           |                   |                   |
| transducer cable                   |     |                                                                                    |                   |                   |
| type                               |     | 6111                                                                               |                   |                   |
| length                             | m   | 4                                                                                  |                   | 3                 |
| dimensions                         |     |                                                                                    |                   |                   |
| length l                           | mm  | 64                                                                                 |                   | 40                |
| width b                            | mm  | 32                                                                                 |                   | 22                |
| height h                           | mm  | 40.5                                                                               |                   | 25.5              |
| dimensional drawing                |     |  |                   |                   |
| weight (without cable)             | kg  | 0.066                                                                              |                   | 0.017             |
| pipe surface temperature           | °C  | -30...+200                                                                         |                   |                   |
| ambient temperature                | °C  | -30...+200<br>connector: -20...+60                                                 |                   |                   |
| temperature compensation           |     | x                                                                                  |                   |                   |

<sup>1</sup> depending on the application, typical absolute value for natural gas, nitrogen, compressed air

<sup>2</sup> shear wave transducer:  
typical values for natural gas, nitrogen, oxygen; pipe diameters for other fluids on request  
inner pipe diameter max. recommended/max. extended: in reflection arrangement and for a flow velocity of 15 m/s

**Lamb wave transducers (nonEx, NY)**

| order code                         |     | GLF-NNNN- <b>**NY</b>                                                               | GLG-NNNN- <b>**NY</b>                                    | GLH-NNNN- <b>**NY</b> | GLK-NNNN- <b>**NY</b>                                                                | GLM-NNNN- <b>**NY</b>                                             | GLP-NNNN- <b>**NY</b>                                                                 | GLQ-NNNN- <b>**NY</b>                                             |
|------------------------------------|-----|-------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| technical type                     |     | G(RT)F1NC4                                                                          | G(RT)G1NC4                                               | G(RT)H1NC4            | G(RT)K1NC4                                                                           | GRM1NC4                                                           | GRP1NC4                                                                               | GRQ1NC4                                                           |
| transducer frequency               | MHz | 0.15                                                                                | 0.2                                                      | 0.3                   | 0.5                                                                                  | 1                                                                 | 2                                                                                     | 4                                                                 |
| fluid pressure <sup>1</sup>        |     |                                                                                     |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| min. extended                      | bar | metal pipe: 10                                                                      |                                                          |                       | metal pipe:<br>10 (d > 120 mm)<br>3 (d < 120 mm)                                     | metal pipe:<br>3 (d < 60 mm)                                      | metal pipe:<br>3 (d < 35 mm)                                                          | metal pipe:<br>3 (d < 15 mm)                                      |
| min.                               | bar | metal pipe: 15<br>plastic pipe: 1                                                   |                                                          |                       | metal pipe:<br>15 (d > 120 mm)<br>10 (d < 120 mm)<br>plastic pipe: 1                 | metal pipe:<br>10 (d > 60 mm)<br>5 (d < 60 mm)<br>plastic pipe: 1 | metal pipe:<br>10 (d > 35 mm)<br>5 (d < 35 mm)<br>plastic pipe: 1                     | metal pipe:<br>10 (d > 15 mm)<br>5 (d < 15 mm)<br>plastic pipe: 1 |
| inner pipe diameter d <sup>2</sup> |     |                                                                                     |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| min. extended                      | mm  | 220                                                                                 | 180                                                      | 110                   | 60                                                                                   | 30                                                                | 15                                                                                    | 7                                                                 |
| min. recommended                   | mm  | 270                                                                                 | 220                                                      | 140                   | 80                                                                                   | 40                                                                | 20                                                                                    | 10                                                                |
| max. recommended                   | mm  | 1200                                                                                | 900                                                      | 600                   | 300                                                                                  | 150                                                               | 50                                                                                    | 22                                                                |
| max. extended                      | mm  | 1600                                                                                | 1400                                                     | 1000                  | 360                                                                                  | 180                                                               | 60                                                                                    | 30                                                                |
| pipe wall thickness                |     |                                                                                     |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| min.                               | mm  | 15                                                                                  | 11                                                       | 8                     | 5                                                                                    | 2.5                                                               | 1.2                                                                                   | 0.6                                                               |
| max.                               | mm  | 32                                                                                  | 24                                                       | 16                    | 10                                                                                   | 5                                                                 | 3                                                                                     | 1.2                                                               |
| max. extended                      | mm  | 35                                                                                  | -                                                        | -                     | -                                                                                    | -                                                                 | -                                                                                     | -                                                                 |
| material                           |     |                                                                                     |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| housing                            |     | PPSU with stainless steel cover 316Ti (1.4571)                                      | PPSU with stainless steel cover 304 (1.4301)             |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| contact surface                    |     | PPSU                                                                                |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| degree of protection               |     | IP66/IP67 (transducer)<br>IP65/IP67 (on the transmitter side)                       | IP66 (transducer)<br>IP65/IP67 (on the transmitter side) |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| transducer cable                   |     |                                                                                     |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| type                               |     | 1699                                                                                |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| length                             | m   | 5                                                                                   |                                                          |                       |                                                                                      | 4                                                                 |                                                                                       | 3                                                                 |
| dimensions                         |     |                                                                                     |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| length l                           | mm  | 163                                                                                 | 128.5                                                    |                       |                                                                                      | 74                                                                |                                                                                       | 42                                                                |
| width b                            | mm  | 54                                                                                  | 51                                                       |                       |                                                                                      | 32                                                                |                                                                                       | 22                                                                |
| height h                           | mm  | 91.3                                                                                | 67.5                                                     |                       |                                                                                      | 40.5                                                              |                                                                                       | 25.5                                                              |
| dimensional drawing                |     |  |                                                          |                       |  |                                                                   |  |                                                                   |
| weight (without cable)             | kg  | 0.935                                                                               | 0.471                                                    |                       |                                                                                      | 0.077                                                             |                                                                                       | 0.019                                                             |
| pipe surface temperature           | °C  | -40...+130                                                                          |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| ambient temperature                | °C  | -40...+130<br>connector: -20...+60                                                  |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |
| temperature compensation           |     | x                                                                                   |                                                          |                       |                                                                                      |                                                                   |                                                                                       |                                                                   |

<sup>1</sup> depending on the application, typical absolute value for natural gas, nitrogen, compressed air

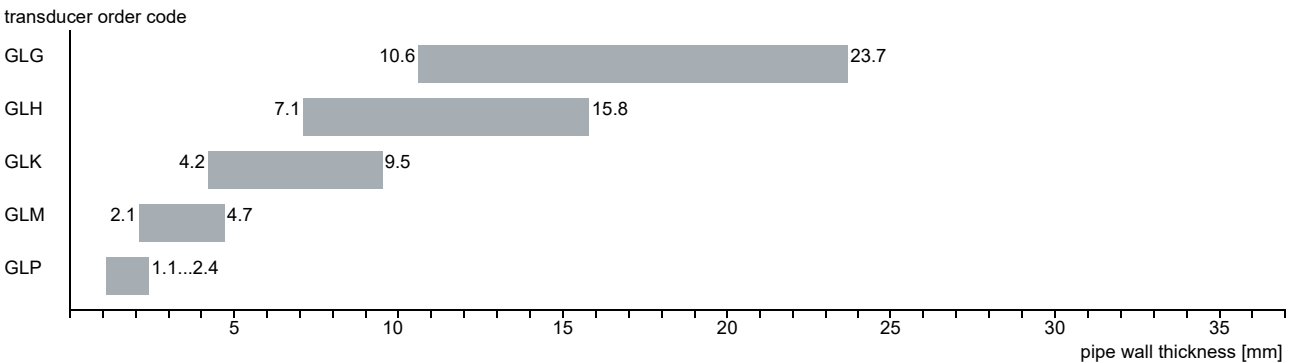
<sup>2</sup> Lamb wave transducer:  
typical values for natural gas, nitrogen, oxygen; pipe diameters for other fluids on request  
inner pipe diameter max. recommended: in reflection arrangement (diagonal arrangement) and for a flow velocity of 15 m/s (30 m/s)  
inner pipe diameter max. extended: in reflection arrangement (diagonal arrangement) and for a flow velocity of 12 m/s (25 m/s)

Transducers (steam measurement)

Transducer selection

Step 1

pipe wall thickness

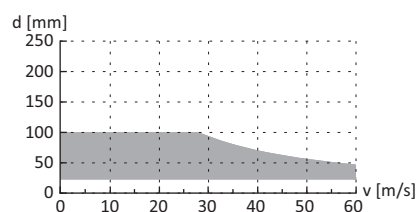
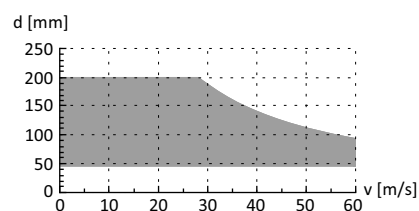
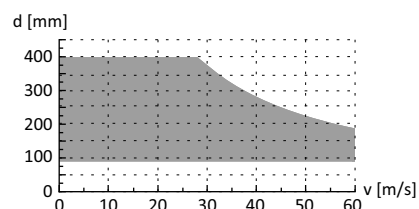
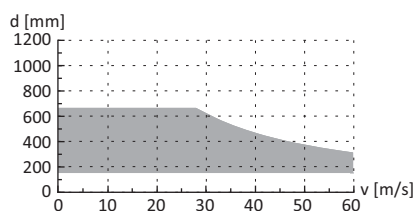
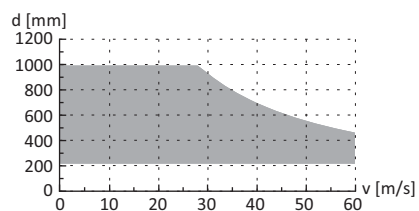


Step 2

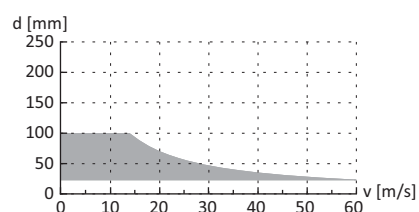
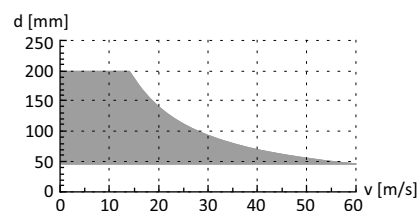
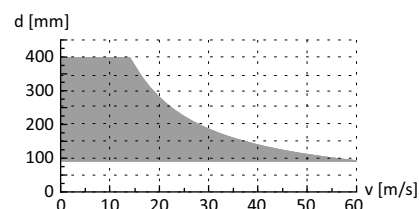
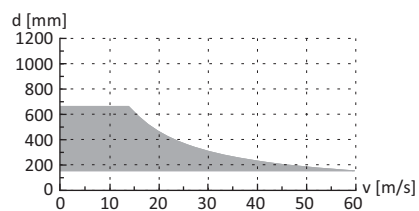
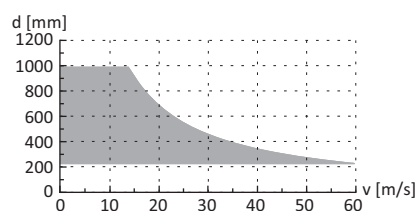
inner pipe diameter d dependent on the flow velocity v of the fluid in the pipe

**GL\*-S**

Diagonal arrangement, number of sound paths: 1



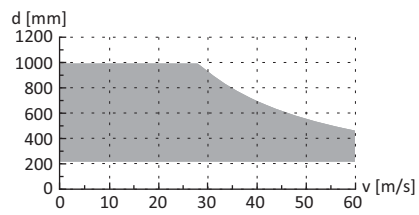
Reflection arrangement, number of sound paths: 2



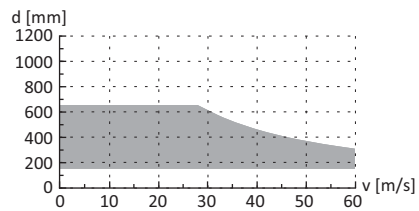
inner pipe diameter and max. flow velocity for a steam application

**GL\*-T**

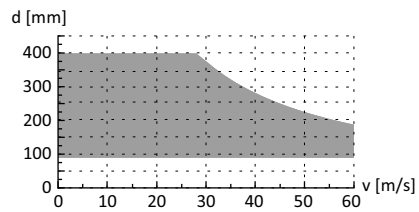
Diagonal arrangement, number of sound paths: 1



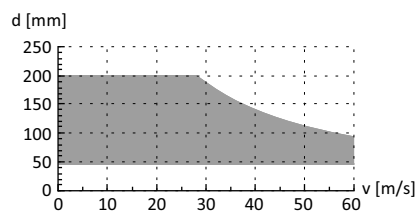
GLG-T



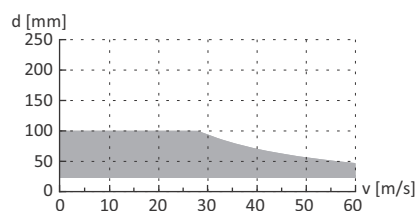
GLH-T



GLK-T

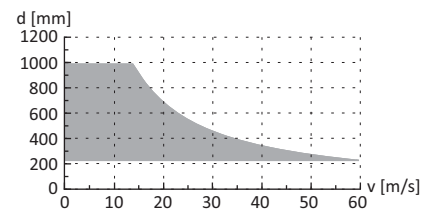


GLM-T

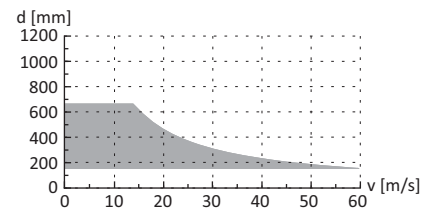


GLP-T

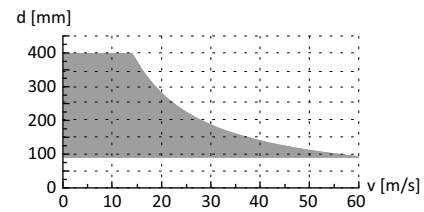
Reflection arrangement, number of sound paths: 2



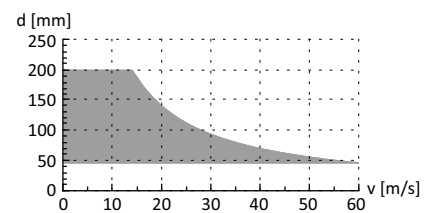
GLG-T



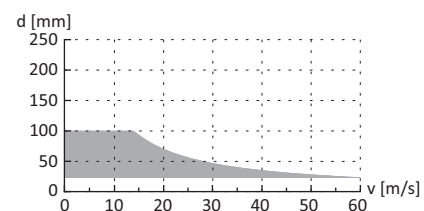
GLH-T



GLK-T



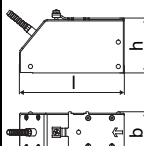
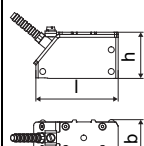
GLM-T



GLP-T

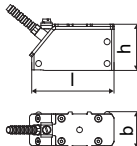
inner pipe diameter and max. flow velocity for a steam application

**Lamb wave transducers (nonEx, NY, steam measurement - max. 180 °C)**

|                          |     |                                                                                   |                |                |                                                                                   |                |
|--------------------------|-----|-----------------------------------------------------------------------------------|----------------|----------------|-----------------------------------------------------------------------------------|----------------|
| order code               |     | GLG-SNNN-**-NY                                                                    | GLH-SNNN-**-NY | GLK-SNNN-**-NY | GLM-SNNN-**-NY                                                                    | GLP-SNNN-**-NY |
| technical type           |     | G(RT)G1SC4                                                                        | G(RT)H1SC4     | G(RT)K1SC4     | GRM1SC4                                                                           | GRP1SC4        |
| transducer frequency     | MHz | 0.2                                                                               | 0.3            | 0.5            | 1                                                                                 | 2              |
| fluid pressure           |     | see saturated steam pressure curve                                                |                |                |                                                                                   |                |
| inner pipe diameter d    |     |                                                                                   |                |                |                                                                                   |                |
| min.                     | mm  | 225                                                                               | 150            | 90             | 45                                                                                | 23             |
| max.                     | mm  | 1000                                                                              | 667            | 400            | 200                                                                               | 100            |
| pipe wall thickness      |     |                                                                                   |                |                |                                                                                   |                |
| min.                     | mm  | 10.6                                                                              | 7.1            | 4.2            | 2.1                                                                               | 1.1            |
| max.                     | mm  | 23.7                                                                              | 15.8           | 9.5            | 4.7                                                                               | 2.4            |
| material                 |     |                                                                                   |                |                |                                                                                   |                |
| housing                  |     | PPSU with stainless steel cover 316Ti (1.4571)                                    |                |                |                                                                                   |                |
| contact surface          |     | PPSU                                                                              |                |                |                                                                                   |                |
| degree of protection     |     | IP66 (transducer)<br>IP65/IP67 (on the transmitter side)                          |                |                |                                                                                   |                |
| transducer cable         |     |                                                                                   |                |                |                                                                                   |                |
| type                     |     | 1699                                                                              |                |                |                                                                                   |                |
| length                   | m   | 5                                                                                 |                |                | 4                                                                                 |                |
| dimensions               |     |                                                                                   |                |                |                                                                                   |                |
| length l                 | mm  | 128.5                                                                             |                |                | 74                                                                                |                |
| width b                  | mm  | 51                                                                                |                |                | 32                                                                                |                |
| height h                 | mm  | 67.5                                                                              |                |                | 40.5                                                                              |                |
| dimensional drawing      |     |  |                |                |  |                |
| weight (without cable)   | kg  | 0.8                                                                               |                |                | 0.16                                                                              |                |
| storing temperature      | °C  | -20...+60                                                                         |                |                |                                                                                   |                |
| operating temperature    | °C  | 135...180<br>connector: -20...+60                                                 |                |                |                                                                                   |                |
| warm-up time             | h   | 3                                                                                 |                |                | 1                                                                                 |                |
| temperature compensation |     | x                                                                                 |                |                |                                                                                   |                |

completely thermally insulated transducer installation necessary

**Lamb wave transducers (nonEx, NY, steam measurement - max. 200 °C)**

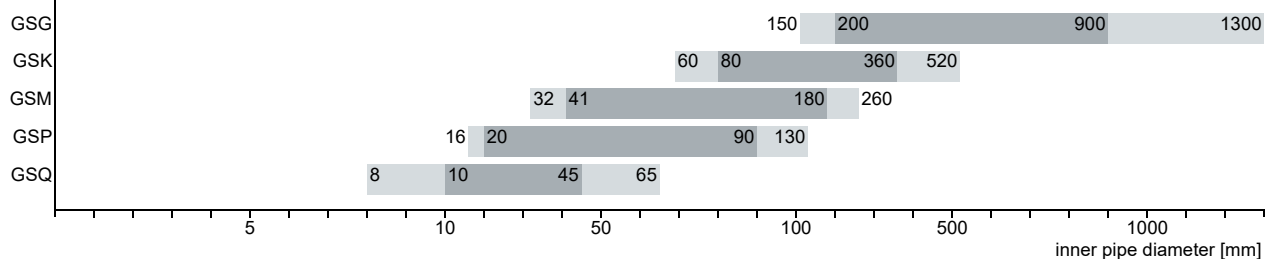
|                          |     |                                                                                   |               |
|--------------------------|-----|-----------------------------------------------------------------------------------|---------------|
| order code               |     | GLM-TNNN-**NY                                                                     | GLP-TNNN-**NY |
| technical type           |     | GRM2SC4                                                                           | GRP2SC4       |
| transducer frequency     | MHz | 1                                                                                 | 2             |
| fluid pressure           |     | see saturated steam pressure curve                                                |               |
| inner pipe diameter d    |     |                                                                                   |               |
| min.                     | mm  | 45                                                                                | 23            |
| max.                     | mm  | 200                                                                               | 100           |
| pipe wall thickness      |     |                                                                                   |               |
| min.                     | mm  | 2.1                                                                               | 1.1           |
| max.                     | mm  | 4.7                                                                               | 2.4           |
| material                 |     |                                                                                   |               |
| housing                  |     | PI with stainless steel cover 316Ti (1.4571)                                      |               |
| contact surface          |     | PI                                                                                |               |
| degree of protection     |     | IP66 (transducer)<br>IP65/IP67 (on the transmitter side)                          |               |
| transducer cable         |     |                                                                                   |               |
| type                     |     | 6111                                                                              |               |
| length                   | m   | 4                                                                                 |               |
| dimensions               |     |                                                                                   |               |
| length l                 | mm  | 74                                                                                |               |
| width b                  | mm  | 32                                                                                |               |
| height h                 | mm  | 40.5                                                                              |               |
| dimensional drawing      |     |  |               |
| weight (without cable)   | kg  | 0.18                                                                              |               |
| storing temperature      | °C  | -20...+60                                                                         |               |
| operating temperature    | °C  | 170...200<br>connector: -20...+60                                                 |               |
| warm-up time             | h   | 1                                                                                 |               |
| temperature compensation |     | x                                                                                 |               |

completely thermally insulated transducer installation necessary

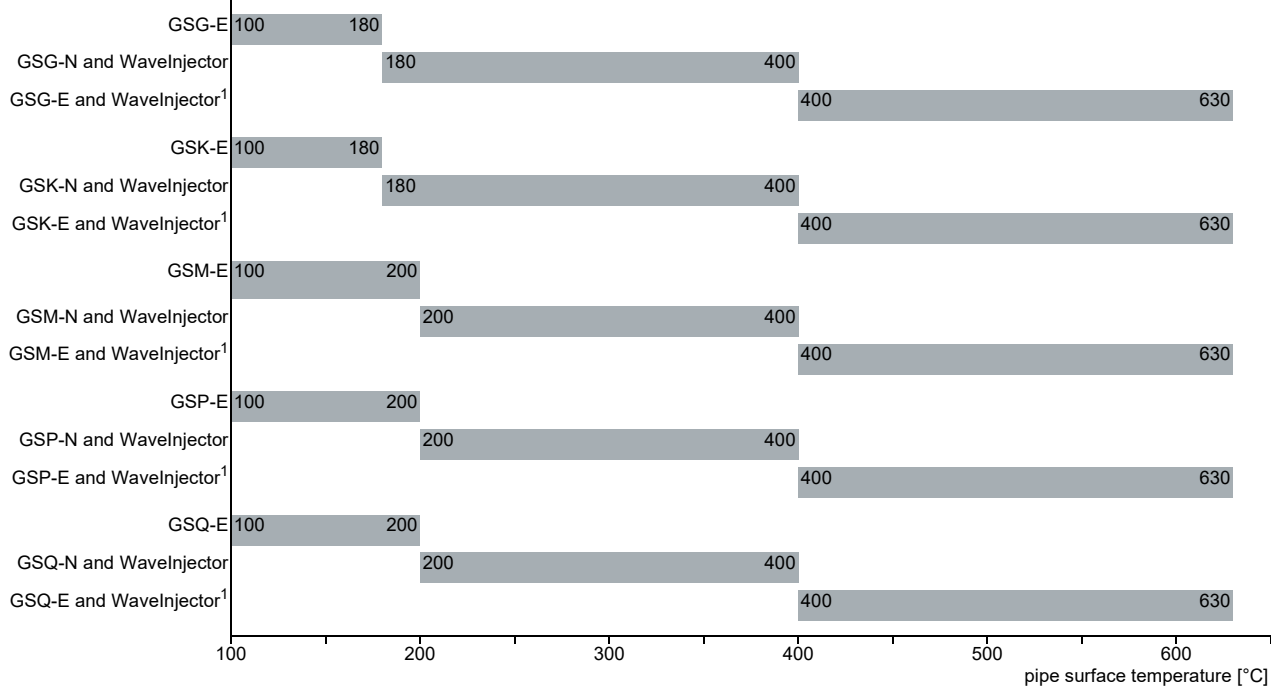
## Transducers (high-temperature steam measurement)

### Transducer selection

transducer order code



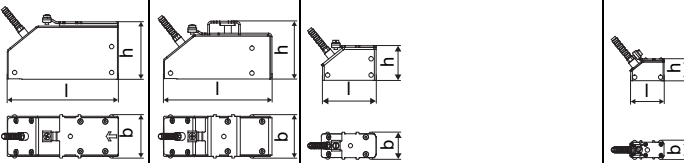
transducer order code



<sup>1</sup> technical verification to validate the application required in advance

recommended possible

**Shear wave transducers (nonEx, NY, high-temperature steam measurement)**

|                          |     |                                                                                    |               |                                                               |               |               |
|--------------------------|-----|------------------------------------------------------------------------------------|---------------|---------------------------------------------------------------|---------------|---------------|
| order code               |     | GSG-N***-**NY                                                                      | GSK-N***-**NY | GSM-N***-**NY                                                 | GSP-N***-**NY | GSQ-N***-**NY |
| technical type           |     | G(DL)G1NZ4                                                                         | G(DL)K1NZ4    | GDM2NZ4                                                       | GDP2NZ4       | GDQ2NZ4       |
| transducer frequency     | MHz | 0.2                                                                                | 0.5           | 1                                                             | 2             | 4             |
| inner pipe diameter d    |     |                                                                                    |               |                                                               |               |               |
| min. extended            | mm  | 180                                                                                | 70            | 37                                                            | 18            | 9             |
| min. recommended         | mm  | 240                                                                                | 100           | 48                                                            | 24            | 12            |
| max. recommended         | mm  | 920                                                                                | 370           | 180                                                           | 90            | 46            |
| max. extended            | mm  | 1300                                                                               | 520           | 260                                                           | 130           | 66            |
| pipe wall thickness      |     |                                                                                    |               |                                                               |               |               |
| min.                     | mm  | 11.1                                                                               | 4.4           | 2.2                                                           | 1.1           | 0.6           |
| material                 |     |                                                                                    |               |                                                               |               |               |
| housing                  |     | PEEK with stainless steel cover 316L (1.4404)                                      |               |                                                               |               |               |
| contact surface          |     | PEEK                                                                               |               |                                                               |               |               |
| degree of protection     |     | IP66 (transducer)<br>IP65/IP67 (on the transmitter side)                           |               | IP66/IP67 (transducer)<br>IP65/IP67 (on the transmitter side) |               |               |
| transducer cable         |     |                                                                                    |               |                                                               |               |               |
| type                     |     | 1699                                                                               |               |                                                               |               |               |
| length                   | m   | 5                                                                                  |               | 4                                                             |               | 3             |
| dimensions               |     |                                                                                    |               |                                                               |               |               |
| length l                 | mm  | 129.5                                                                              | 126.5         | 64                                                            |               | 40            |
| width b                  | mm  | 51                                                                                 | 51            | 32                                                            |               | 22            |
| height h                 | mm  | 67                                                                                 | 67.5          | 40.5                                                          |               | 25.5          |
| dimensional drawing      |     |  |               |                                                               |               |               |
| weight (without cable)   | kg  | 0.47                                                                               | 0.36          | 0.066                                                         |               | 0.016         |
| pipe surface temperature | °C  | -40...+130                                                                         |               |                                                               |               |               |
| ambient temperature      | °C  | -40...+130<br>connector: -20...+60                                                 |               |                                                               |               |               |

**Shear wave transducers (nonEx, TS, extended temperature range - high-temperature steam measurement)**

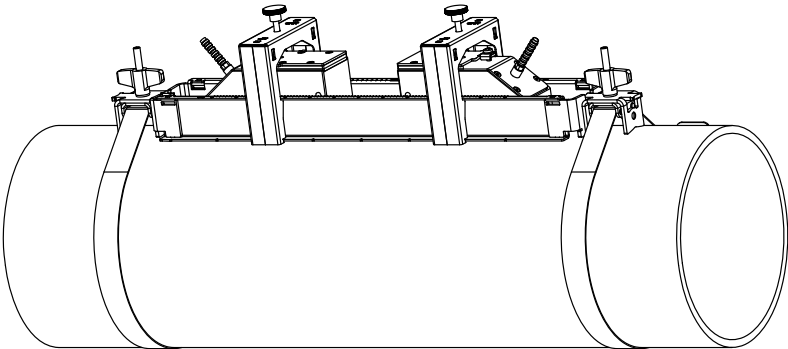
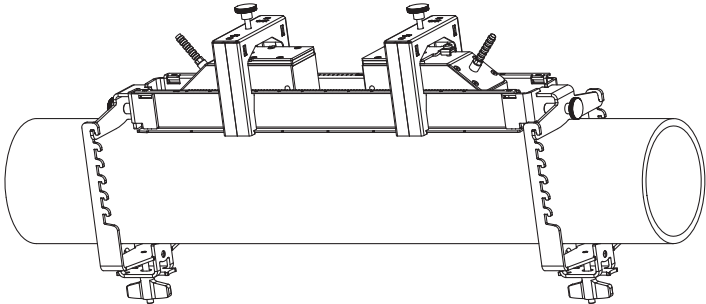
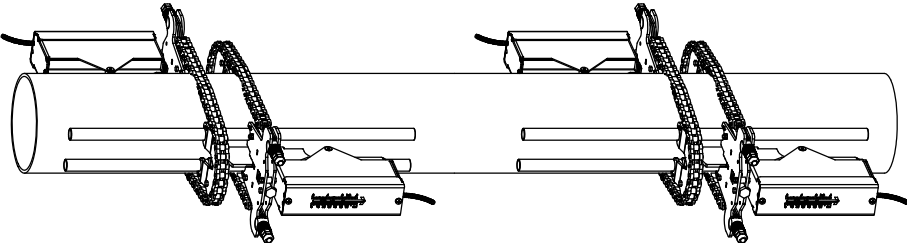
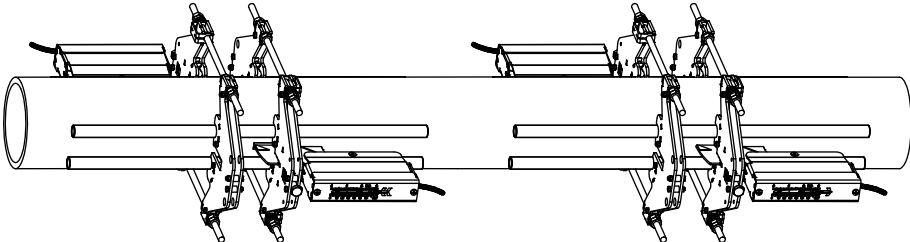
|                          |     |                                                                                   |               |               |
|--------------------------|-----|-----------------------------------------------------------------------------------|---------------|---------------|
| order code               |     | GSM-E***_**NY                                                                     | GSP-E***_**NY | GSQ-E***_**NY |
| technical type           |     | GDM2EZ4                                                                           | GDP2EZ4       | GDQ2EZ4       |
| transducer frequency     | MHz | 1                                                                                 | 2             | 4             |
| inner pipe diameter d    |     |                                                                                   |               |               |
| min. extended            | mm  | 32                                                                                | 16            | 8             |
| min. recommended         | mm  | 41                                                                                | 20            | 10            |
| max. recommended         | mm  | 180                                                                               | 90            | 45            |
| max. extended            | mm  | 260                                                                               | 130           | 65            |
| pipe wall thickness      |     |                                                                                   |               |               |
| min.                     | mm  | 2.2                                                                               | 1.1           | 0.6           |
| material                 |     |                                                                                   |               |               |
| housing                  |     | PI with stainless steel cover 316L (1.4301)                                       |               |               |
| contact surface          |     | PI                                                                                |               |               |
| degree of protection     |     | IP66/IP67 (transducer)<br>IP65/IP67 (on the transmitter side)                     |               |               |
| transducer cable         |     |                                                                                   |               |               |
| type                     |     | 6111                                                                              |               |               |
| length                   | m   | 4                                                                                 |               | 3             |
| dimensions               |     |                                                                                   |               |               |
| length l                 | mm  | 64                                                                                |               | 40            |
| width b                  | mm  | 32                                                                                |               | 22            |
| height h                 | mm  | 40.5                                                                              |               | 25.5          |
| dimensional drawing      |     |  |               |               |
| weight (without cable)   | kg  | 0.066                                                                             |               | 0.017         |
| pipe surface temperature | °C  | 100...240 <sup>1</sup>                                                            |               | 100...200     |
| ambient temperature      | °C  | -30...+200<br>connector: -20...+60                                                |               |               |
| temperature compensation |     | x                                                                                 |               |               |

## Transducer mounting fixture

### Order code

| 1, 2                        | 3          | 4 | 5                       | 6    | 7...10 | no. of character |                     |     |        |                                                     |                                |
|-----------------------------|------------|---|-------------------------|------|--------|------------------|---------------------|-----|--------|-----------------------------------------------------|--------------------------------|
| transducer mounting fixture | transducer | - | measurement arrangement | size | -      | fixation         | outer pipe diameter | /   | option | description                                         |                                |
| VM                          |            |   |                         |      |        |                  |                     |     |        | portable Variofix                                   |                                |
| WN                          |            |   |                         |      |        |                  |                     |     |        | WaveInjector WI-550                                 |                                |
| WH                          |            |   |                         |      |        |                  |                     |     |        | WaveInjector WI-630                                 |                                |
|                             | A          |   |                         |      |        |                  |                     |     |        | all transducers                                     |                                |
|                             | N          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency M, P, Q       |                                |
|                             | W          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency G, H, K, M, P |                                |
|                             | F          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency F             |                                |
|                             | G          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency G             |                                |
|                             | H          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency H             |                                |
|                             | K          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency K             |                                |
|                             | M          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency M             |                                |
|                             | P          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency P             |                                |
|                             | Q          |   |                         |      |        |                  |                     |     |        | transducers with transducer frequency Q             |                                |
|                             |            |   | D                       |      |        |                  |                     |     |        |                                                     | diagonal arrangement           |
|                             |            |   | R                       |      |        |                  |                     |     |        |                                                     | reflection arrangement         |
|                             |            |   |                         | S    |        |                  |                     |     |        |                                                     | small                          |
|                             |            |   |                         | M    |        |                  |                     |     |        |                                                     | medium                         |
|                             |            |   |                         |      | S      |                  |                     |     |        |                                                     | tension straps                 |
|                             |            |   |                         |      | C      |                  |                     |     |        |                                                     | chains                         |
|                             |            |   |                         |      | T      |                  |                     |     |        |                                                     | threaded rods                  |
|                             |            |   |                         |      | G      |                  |                     |     |        |                                                     | tension belts                  |
|                             |            |   |                         |      | H      |                  |                     |     |        |                                                     | high-temperature tension belts |
|                             |            |   |                         |      |        | 0020             |                     |     |        |                                                     | 10...20 mm                     |
|                             |            |   |                         |      |        | 0040             |                     |     |        |                                                     | 20...40 mm                     |
|                             |            |   |                         |      |        | 0130             |                     |     |        |                                                     | 10...130 mm                    |
|                             |            |   |                         |      |        | 0360             |                     |     |        |                                                     | 130...360 mm                   |
|                             |            |   |                         |      |        | 0920             |                     |     |        |                                                     | 360...920 mm                   |
|                             |            |   |                         |      |        | 2000             |                     |     |        |                                                     | 920...2000 mm                  |
|                             |            |   |                         |      |        | 0070             |                     |     |        |                                                     | 33...70 mm                     |
|                             |            |   |                         |      |        | 0120             |                     |     |        |                                                     | 70...120 mm                    |
|                             |            |   |                         |      |        | 0170             |                     |     |        |                                                     | 70...125 mm                    |
|                             |            |   |                         |      |        | 0220             |                     |     |        |                                                     | 70...220 mm                    |
|                             |            |   |                         |      | 0370   |                  |                     |     |        | 70...370 mm                                         |                                |
|                             |            |   |                         |      | 0520   |                  |                     |     |        | 70...520 mm                                         |                                |
|                             |            |   |                         |      | 0560   |                  |                     |     |        | 350...560 mm                                        |                                |
|                             |            |   |                         |      | 0850   |                  |                     |     |        | 560...850 mm                                        |                                |
|                             |            |   |                         |      | 1000   |                  |                     |     |        | 600...1000 mm                                       |                                |
|                             |            |   |                         |      |        |                  |                     | R04 |        | retention hooks (outer pipe diameter 40 mm)         |                                |
|                             |            |   |                         |      |        |                  |                     | R10 |        | retention hooks (outer pipe diameter 100 mm)        |                                |

Technical data

|                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>portable Variofix VM and tension belts or high-temperature tension belts</div> <div></div> | <div>material: stainless steel 316Ti (1.4571)<br/>dimensions:<br/>G, H, K: 542 x 94 x 115 mm<br/>M, P, Q: 534 x 74 x 86 mm</div> <div><b>tension belts</b><br/>material: steel, powder coated, textile<br/>tension belt<br/>length: 5 m, 7 m<br/>ambient temperature: max. 60 °C<br/>outer pipe diameter:<br/>max. 1500 mm, 2100 mm</div> <div><b>high-temperature tension belts</b><br/>material:<br/>clasp: stainless steel 304 (1.4301)<br/>tension belt: Aramid<br/>length: 2 m, 5 m<br/>ambient temperature: max. 260 °C<br/>outer pipe diameter:<br/>max. 600 mm, 1500 mm</div> |
| <div>portable Variofix VM and retention hooks</div> <div></div>                                | <div>material: stainless steel 316Ti (1.4571), 304 (1.4301)<br/>dimensions:<br/>G, H, K: 542 x 94 x max. 292 mm<br/>M, P, Q: 534 x 74 x max. 292 mm<br/>outer pipe diameter:<br/>max. 40 mm, max. 100 mm</div>                                                                                                                                                                                                                                                                                                                                                                        |
| <div>WaveInjector with chains</div> <div></div>                                              | <div>see Technical specification<br/>TSWaveInjectorVx-x</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <div>WaveInjector with threaded rods</div> <div></div>                                       | <div>outer pipe diameter:<br/>35...380 mm<br/>see Technical specification<br/>TSWaveInjectorVx-x</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## Coupling materials for transducers

### Technical data

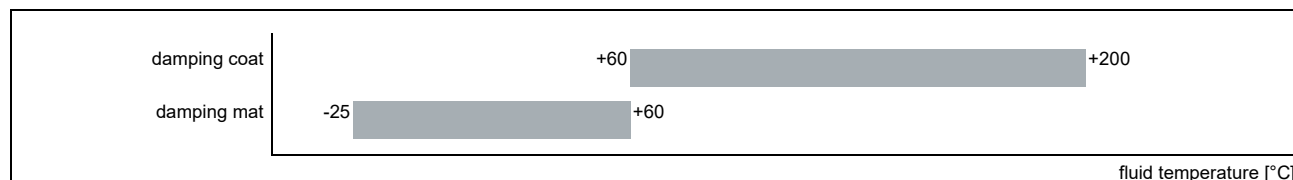
| type                                     | ambient temperature<br>°C | application                                                                | remark                                                                                  |
|------------------------------------------|---------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| coupling compound type E<br>(Elbesil BL) | -30...+200                | gas measurement<br>steam measurement<br>high-temperature steam measurement | steam measurement, high-temperature steam measurement: in combination with type VT only |
| coupling foil type A                     | max. 280                  | high-temperature steam measurement                                         |                                                                                         |
| coupling foil type B                     | 280...630                 | high-temperature steam measurement                                         |                                                                                         |
| coupling foil type VT                    | -10...+200                | gas measurement<br>steam measurement<br>high-temperature steam measurement | fluid temperature 200 °C: min. 2 years                                                  |

## Damping material

Damping material will be used to reduce acoustic noise influences on the measurement.

### Selection

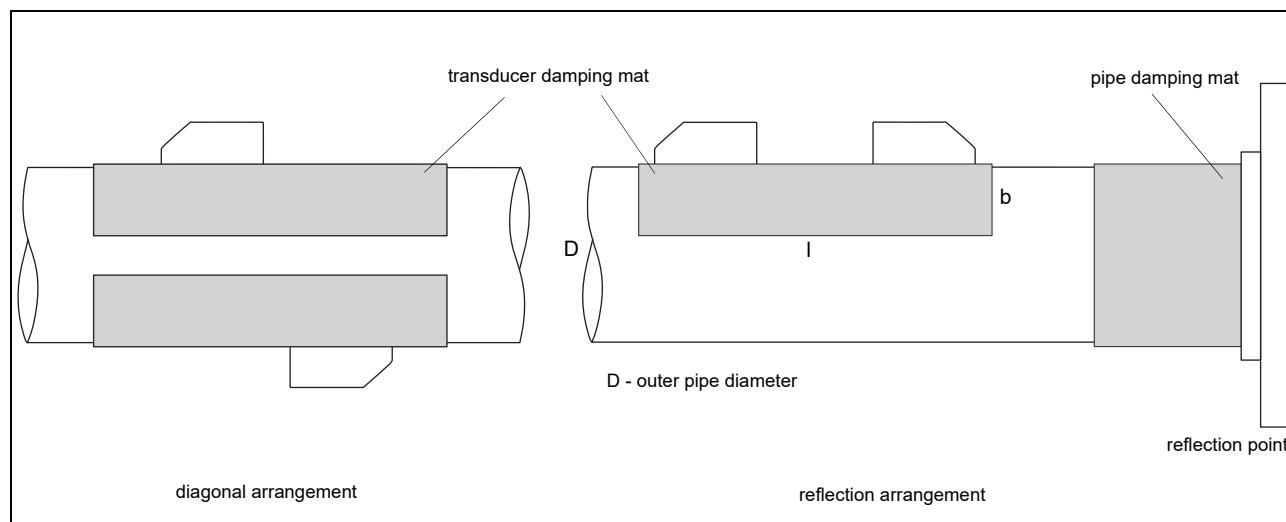
| application                        | damping material                                  |
|------------------------------------|---------------------------------------------------|
| gas measurement                    | damping mat (optional)<br>damping coat (optional) |
| steam measurement                  | damping coat                                      |
| high-temperature steam measurement | -                                                 |



### Damping mats

Transducer damping mats will be installed below the transducers.

Pipe damping mats will be installed at reflection points, e.g. flange, weld.



### Selection of damping mats

| type                   | description                                                             | outer pipe diameter<br>mm | dimensions<br>l x b x h<br>mm | transducer frequency |   |   |   |   |   |   |       | technical type | ambient temperature<br>°C    | remark |
|------------------------|-------------------------------------------------------------------------|---------------------------|-------------------------------|----------------------|---|---|---|---|---|---|-------|----------------|------------------------------|--------|
|                        |                                                                         |                           |                               | F                    | G | H | K | M | P | Q |       |                |                              |        |
| transducer damping mat |                                                                         |                           |                               |                      |   |   |   |   |   |   |       |                |                              |        |
| D                      | for temporary installation (multiple use), fixed with coupling compound | < 80                      | 450 x 115 x 0.5               | -                    | - | - | - | x | x | x | D20S3 | -25...+60      |                              |        |
|                        |                                                                         | ≥ 80                      | 900 x 230 x 0.5               | -                    | - | - | x | x | - | - | D20S2 |                |                              |        |
|                        |                                                                         |                           | 900 x 230 x 1.3               | x                    | x | x | - | - | - | - | D50S2 |                |                              |        |
| pipe damping mat       |                                                                         |                           |                               |                      |   |   |   |   |   |   |       |                |                              |        |
| A                      | for temporary installation (multiple use), fixed with coupling compound | < 300                     | 300 x 115 x 0.5               | x                    | x | x | x | x | x | x | A20S4 | -25...+60      | for quantity see table below |        |

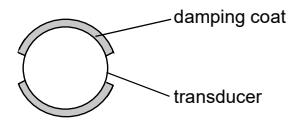
### Quantity for pipe damping mat - type A

(depending on outer pipe diameter)

| outer pipe diameter D<br>mm | transducer frequency<br>F, G, H | K, M, P, Q |
|-----------------------------|---------------------------------|------------|
| 100                         | 12                              | 6          |
| 200                         | 24                              | 12         |
| 300                         | 32                              | 16         |

## Damping coat

Example (diagonal arrangement)



## Technical data

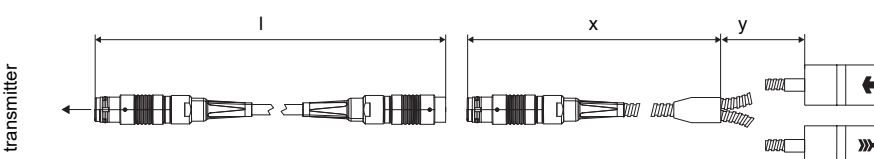
|                                           |    |                                                  |
|-------------------------------------------|----|--------------------------------------------------|
| item number                               |    | 992080-13                                        |
| material                                  |    | multipolymeric matrix/inorganic ceramic coating  |
| packing drum                              | I  | 1                                                |
| properties                                |    | heat-resistant, inert                            |
| fluid temperature when applying           | °C | 10...200                                         |
| drying time (example)                     |    | approx. 3 h at 20 °C<br>approx. 15 min at 150 °C |
| temperature resistance in dry state       | °C | max. 650                                         |
| durability of the packing drum (unopened) |    | 2 years                                          |

Observe installation instructions (TI\_DampingCoat).

## Dimensioning

| transducer frequency | number of packing drums |      |      |
|----------------------|-------------------------|------|------|
|                      | outer pipe diameter     |      |      |
|                      | ≤300                    | ≤500 | ≤700 |
|                      | mm                      |      |      |
| F                    | 3                       | 4    | 5    |
| G                    | 2                       | 3    | 4    |
| H                    | 2                       | 2    | 3    |
| K                    | 2                       | 2    | -    |
| M                    | 2                       | -    | -    |
| P                    | 1                       | -    | -    |
| Q                    | 1                       | -    | -    |

## Connection systems

| connection system NY                                                               |                               |
|------------------------------------------------------------------------------------|-------------------------------|
| direct connection/connection with extension cable                                  | transducers<br>technical type |
|  | *****Z4<br>*****C4            |

### Cable

| transducer cable    |          |                                |
|---------------------|----------|--------------------------------|
| type                |          | 1699                           |
| weight              | kg/<br>m | 0.094                          |
| ambient temperature | °C       | -55...+200                     |
| cable jacket        |          |                                |
| material            |          | PTFE                           |
| outer diameter      | mm       | 2.9                            |
| thickness           | mm       | 0.3                            |
| colour              |          | brown                          |
| shield              |          | x                              |
| sheath              |          |                                |
| material            |          | stainless steel 316Ti (1.4571) |
| outer diameter      | mm       | 8                              |

| extension cable     |          |                              |                 |
|---------------------|----------|------------------------------|-----------------|
| type                |          | 1750                         | 2551            |
| standard length     | m        | 5<br>10                      | -               |
| max. length         | m        | 10                           | see table below |
| weight              | kg/<br>m | 0.12                         | 0.083           |
| ambient temperature | °C       | < 80                         | -25...+80       |
| cable jacket        |          |                              |                 |
| material            |          | PE                           | TPE-O           |
| outer diameter      | mm       | 6                            | 8               |
| thickness           | mm       | 0.5                          |                 |
| colour              |          | black                        | black           |
| shield              |          | x                            | x               |
| sheath              |          |                              |                 |
| material            |          | stainless steel 304 (1.4301) | -               |
| outer diameter      | mm       | 9                            | -               |
| remark              |          | optional                     |                 |

### Cable length

| transducer<br>frequency       |   | F, G, H, K |   |      | M, P |   |      | Q |   |      | S |   |      |
|-------------------------------|---|------------|---|------|------|---|------|---|---|------|---|---|------|
| transducers<br>technical type |   | x          | y | l    | x    | y | l    | x | y | l    | x | y | l    |
| connection system NY          |   |            |   |      |      |   |      |   |   |      |   |   |      |
| transducers<br>technical type |   | x          | y | l    | x    | y | l    | x | y | l    | x | y | l    |
| *D***Z4 <sup>1</sup>          | m | 2          | 3 | ≤ 25 | 2    | 2 | ≤ 25 | 2 | 1 | ≤ 25 | 1 | 1 | ≤ 20 |
| *R***C4 <sup>1</sup>          |   |            |   |      |      |   |      |   |   |      |   |   |      |
| *L***Z4 <sup>1</sup>          | m | 2          | 7 | ≤ 25 | -    | - | -    | - | - | -    | - | - | -    |
| *T***C4 <sup>1</sup>          |   |            |   |      |      |   |      |   |   |      |   |   |      |

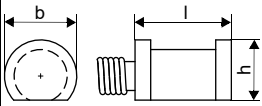
<sup>1</sup> l > 25...100 m on request

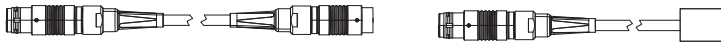
x, y - transducer cable length

l - max. length of extension cable

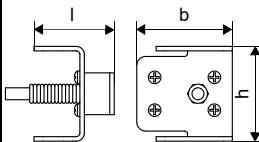
## Clamp-on temperature probe (optional)

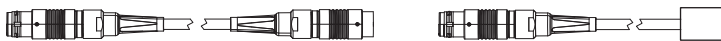
### Technical data

| PT12NY, PT13NY                                              |    |                                                                                                      |
|-------------------------------------------------------------|----|------------------------------------------------------------------------------------------------------|
| item number                                                 |    | PTN12NY:<br>• 630415-1<br>• 630414-1 (matched)<br><br>PTN13NY:<br>• 630413-1<br>• 630412-1 (matched) |
| design                                                      |    | clamp-on<br>with connector                                                                           |
| type                                                        |    | PTN12NY: Pt100<br>PTN13NY: Pt1000                                                                    |
| connection                                                  |    | 4-wire                                                                                               |
| measuring range                                             | °C | -30...+250                                                                                           |
| accuracy T                                                  |    | ±(0.15 °C + 2 · 10 <sup>-3</sup> ·  T [°C] )<br>class A                                              |
| accuracy ΔT<br>(2x Pt matched<br>according to<br>EN 1434-1) |    | ≤ 0.1 K (3 K < ΔT ≤ 6 K), more<br>corresponding to EN 1434-1                                         |
| response time                                               | s  | 50<br>(t <sub>50</sub> , T <sub>1</sub> = 25 °C, T <sub>2</sub> = 60 °C)                             |
| housing material                                            |    | aluminum                                                                                             |
| degree of protection                                        |    | IP54                                                                                                 |
| dimensions                                                  |    |                                                                                                      |
| length l                                                    | mm | 20                                                                                                   |
| width b                                                     | mm | 15                                                                                                   |
| height h                                                    | mm | 13                                                                                                   |
| dimensional drawing                                         |    |                    |
| weight                                                      | kg | 0.25 (without connector)                                                                             |
| accessories                                                 |    |                                                                                                      |
| thermal conductivity<br>paste 200 °C                        |    | x                                                                                                    |
| thermal conductivity<br>foil 250 °C                         |    | x                                                                                                    |

| Connection system                                                                  |  |  |  |
|------------------------------------------------------------------------------------|--|--|--|
| direct connection/connection with extension cable                                  |  |  |  |
|  |  |  |  |

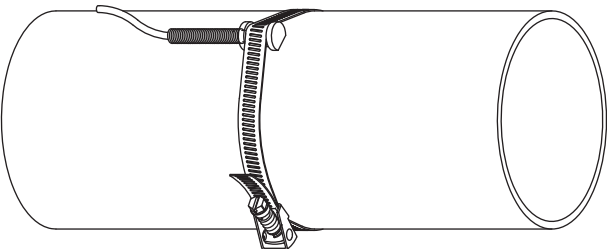
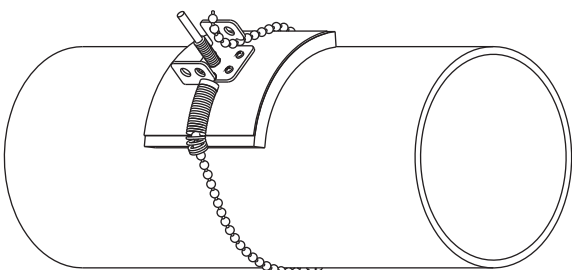
| Cable               |    |                          |                                |
|---------------------|----|--------------------------|--------------------------------|
|                     |    | temperature probe        | extension cable                |
| type                |    | 4 x 0.22 mm <sup>2</sup> | LIYCY 8 x 0.14 mm <sup>2</sup> |
| standard length     | m  | 3                        | 5/10/25                        |
| max. length         | m  | -                        | 200                            |
| ambient temperature | °C | -30...+250               | -25...+80                      |
| min. bend radius    | mm | 27                       | 68                             |
| cable jacket        |    |                          |                                |
| material            |    | PFA                      | PVC                            |
| outer diameter      | mm | 3.8 ±0.15                | 4.8 ±0.2                       |
| colour              |    | black                    | grey                           |

| PT12FY                                                      |                                                                                   |                                                                                         |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| item number                                                 |                                                                                   | <ul style="list-style-type: none"><li>• 630415-2</li><li>• 630414-2 (matched)</li></ul> |
| design                                                      |                                                                                   | clamp-on<br>short response time,<br>with connector                                      |
| type                                                        |                                                                                   | Pt100                                                                                   |
| connection                                                  |                                                                                   | 4-wire                                                                                  |
| measuring range                                             | °C                                                                                | -50...+250                                                                              |
| accuracy T                                                  |                                                                                   | ±(0.15 °C + 2 · 10 <sup>-3</sup> ·  T [°C] )<br>class A                                 |
| accuracy ΔT<br>(2x Pt matched<br>according to<br>EN 1434-1) |                                                                                   | ≤ 0.1 K (3 K < ΔT < 6 K), more<br>corresponding to EN 1434-1                            |
| response time                                               | s                                                                                 | 8<br>(t50, T1 = 25 °C, T2 = 60 °C)                                                      |
| housing material                                            |                                                                                   | PEEK, stainless steel 304<br>(1.4301), copper                                           |
| degree of protection                                        |                                                                                   | IP54                                                                                    |
| dimensions                                                  |                                                                                   |                                                                                         |
| length l                                                    | mm                                                                                | 14                                                                                      |
| width b                                                     | mm                                                                                | 30                                                                                      |
| height h                                                    | mm                                                                                | 27                                                                                      |
| dimensional drawing                                         |  |                                                                                         |
| weight                                                      | kg                                                                                | 0.32 (without connector)                                                                |
| accessories                                                 |                                                                                   |                                                                                         |
| thermal conductivity<br>paste 200 °C                        |                                                                                   | x                                                                                       |
| thermal conductivity<br>foil 250 °C                         |                                                                                   | x                                                                                       |
| plastic protection<br>plate, insulation foam                |                                                                                   | x                                                                                       |

| Connection system                                                                  |  |  |
|------------------------------------------------------------------------------------|--|--|
| direct connection/connection with extension cable                                  |  |  |
|  |  |  |

| Cable               |    |                          |                                |
|---------------------|----|--------------------------|--------------------------------|
|                     |    | temperature probe        | extension cable                |
| type                |    | 4 x 0.22 mm <sup>2</sup> | LIYCY 8 x 0.14 mm <sup>2</sup> |
| standard length     | m  | 3                        | 5/10/25                        |
| max. length         | m  | -                        | 200                            |
| ambient temperature | °C | -50...+250               | -25...+80                      |
| min. bend radius    | mm | 27                       | 68                             |
| cable jacket        |    |                          |                                |
| material            |    | PFA                      | PVC                            |
| outer diameter      | mm | 3.8 ±0.15                | 4.8 ±0.2                       |
| colour              |    | black                    | grey                           |

Fixation

|                                                                                                                               |                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <div>tension strap PT12N</div> <div></div> | <div>material: stainless steel 301 (1.4310),<br/>410 (1.4006)<br/>thermal insulation necessary</div> |
| <div>ball chain PT12F</div> <div></div>    | <div>material: stainless steel 316L (1.4404)<br/>length: 1 m</div>                                   |

## Wall thickness measurement (optional)

The pipe wall thickness is an important pipe parameter which has to be determined exactly for a good measurement. However, the pipe wall thickness often is unknown.

The wall thickness probe can be connected to the transmitter instead of the flow transducers and the wall thickness measurement mode is activated automatically.

Acoustic coupling compound is applied to the wall thickness probe which then is placed firmly on the pipe. The wall thickness is displayed and can be stored directly in the transmitter.

## Technical data

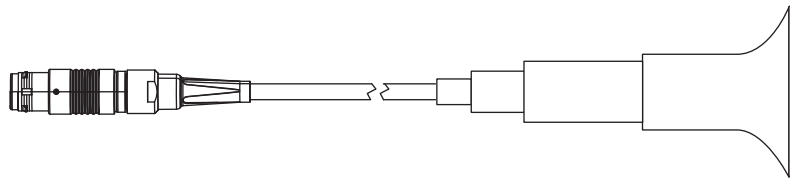
| DWR1NZ4                      |    |                                         |
|------------------------------|----|-----------------------------------------|
| item number                  |    | 630522-0                                |
| measuring range <sup>1</sup> | mm | 1...250                                 |
| resolution                   | mm | 0.01                                    |
| accuracy                     |    | 1 % ±0.1 mm                             |
| fluid temperature            | °C | -20...+200,<br>short-time peak max. 500 |
| <b>cable</b>                 |    |                                         |
| type                         |    | 2616                                    |
| length                       | m  | 1.5                                     |
| <b>Connector</b>             |    |                                         |
| length                       | °C | -20...+60                               |

<sup>1</sup> The measuring range depends on the attenuation of the ultrasonic signal in the pipe. For strongly attenuating plastics (e.g. PFA, PTFE, PP) the measuring range is smaller.

## Cable

| 2616                |    |       |
|---------------------|----|-------|
| ambient temperature | °C | <200  |
| <b>cable jacket</b> |    |       |
| material            |    | FEP   |
| outer diameter      | mm | 5.1   |
| colour              |    | black |
| shield              |    | x     |

DWR1NZ4



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