

## Non-invasive ultrasonic mass flow rate and volumetric flow rate measurement of saturated steam

### Features

- Non-invasive measurement of saturated steam up to 356 °F without fluid contact – no need to open the pipe
- Temperature-compensated mass flow rate calculation via saturated steam curve possible
- Very high measuring dynamics of 0.33 to 197 ft/s – no need to reduce pipe diameters
- Cost-efficient due to start-up during ongoing operation and without pressure/energy loss in the steam network
- Drift-free and maintenance-free, as no wear and tear
- Compact transducers that are easy to insulate – no energy loss at the measuring point
- Smart meter/IoT ready via Ethernet interface with corresponding IP data protocols (e.g. Modbus TCP)
- Sophisticated support software for parameterization, remote control, recording and automatic state diagnosis (FluxDiagReader, FluxDiag, Advanced Meter Verification)

### Applications

For the following measuring tasks in pharmaceutical, food and manufacturing industries, building technology and hospitals:

- Energy management and energy efficiency
- Quantity balancing and cost distribution
- Consumption metering
- Process/boiler optimization



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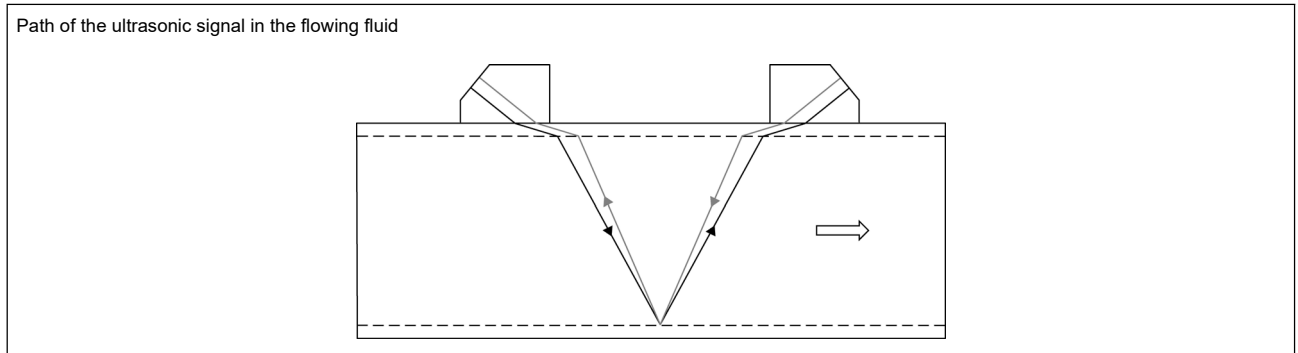
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## Function

### Measurement principle

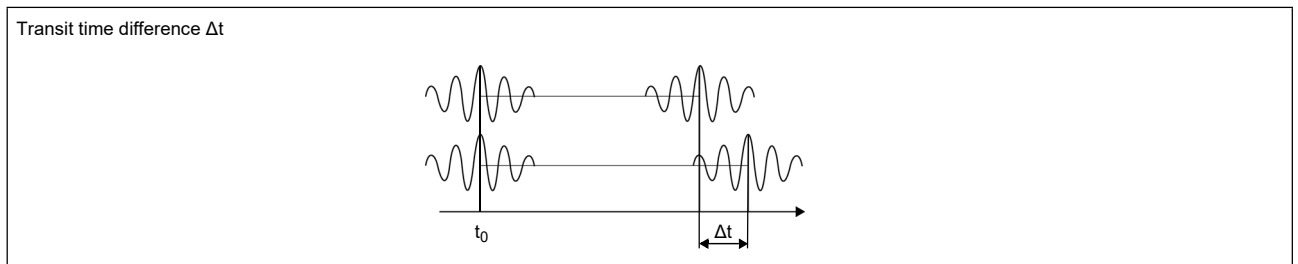
The transducers are mounted on the pipe which is completely filled with the fluid. The ultrasonic signals are emitted alternately by a transducer and received by the other. The physical quantities are determined from the transit times of the ultrasonic signals.



As the fluid where the ultrasound propagates is flowing, the transit time of the ultrasonic signal in flow direction is shorter than the one against the flow direction.

The transit time difference  $\Delta t$  is measured and allows the flowmeter to determine the average flow velocity along the propagation path of the ultrasonic signals. A flow profile correction is then performed in order to obtain the area averaged flow velocity, which is proportional to the volumetric flow rate.

The integrated microprocessors control the entire measuring cycle. The received ultrasonic signals are checked for measurement usability and evaluated for their reliability. Noise signals are eliminated.



### Calculation of volumetric flow rate

$$\dot{V} = k_{Re} \cdot A \cdot k_a \cdot \frac{\Delta t}{2 \cdot t_y}$$

where

- $\dot{V}$  - volumetric flow rate
- $k_{Re}$  - fluid mechanic calibration factor
- $A$  - cross-sectional pipe area
- $k_a$  - acoustic calibration factor
- $\Delta t$  - transit time difference
- $t_y$  - average of transit times in the fluid

### Calculation of mass flow rate

The mass flow rate is calculated from the operating density and the volumetric flow rate:

$$\dot{m} = \rho \cdot \dot{V}$$

The operating density of the fluid is calculated as the function of pressure and temperature of the fluid:

$$\rho = f(p, T)$$

where

- $\rho$  - operating density
- $p$  - fluid pressure
- $T$  - fluid temperature
- $\dot{m}$  - mass flow rate
- $\dot{V}$  - volumetric flow rate

Temperature-compensated mass flow rate calculation via the saturated steam curve is possible.

### Number of sound paths

The number of sound paths is the number of transits of the ultrasonic signal through the fluid in the pipe. Depending on the number of sound paths, the following methods of installation exist:

- **reflect arrangement**

The number of sound paths is even. The transducers are mounted on the same side of the pipe. Correct positioning of the transducers is easy.

- **diagonal arrangement**

The number of sound paths is odd. The transducers are mounted on opposite sides of the pipe.

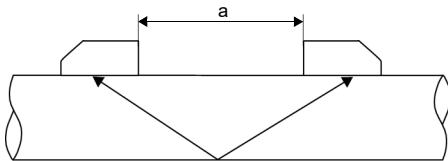
- **direct mode**

Diagonal arrangement with 1 sound path. This should be used in the case of a high signal attenuation by the fluid, pipe or coatings.

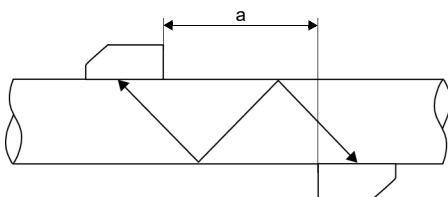
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the transmitter.

As the transducers can be mounted with the transducer mounting fixture in reflect arrangement or diagonal arrangement, the number of sound paths can be adjusted optimally for the application.

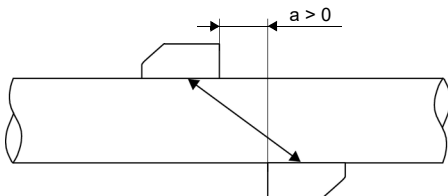
Reflect arrangement, number of sound paths: 2



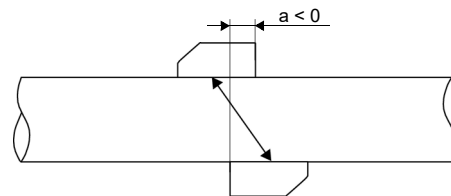
Diagonal arrangement, number of sound paths: 3



Direct mode, number of sound paths: 1

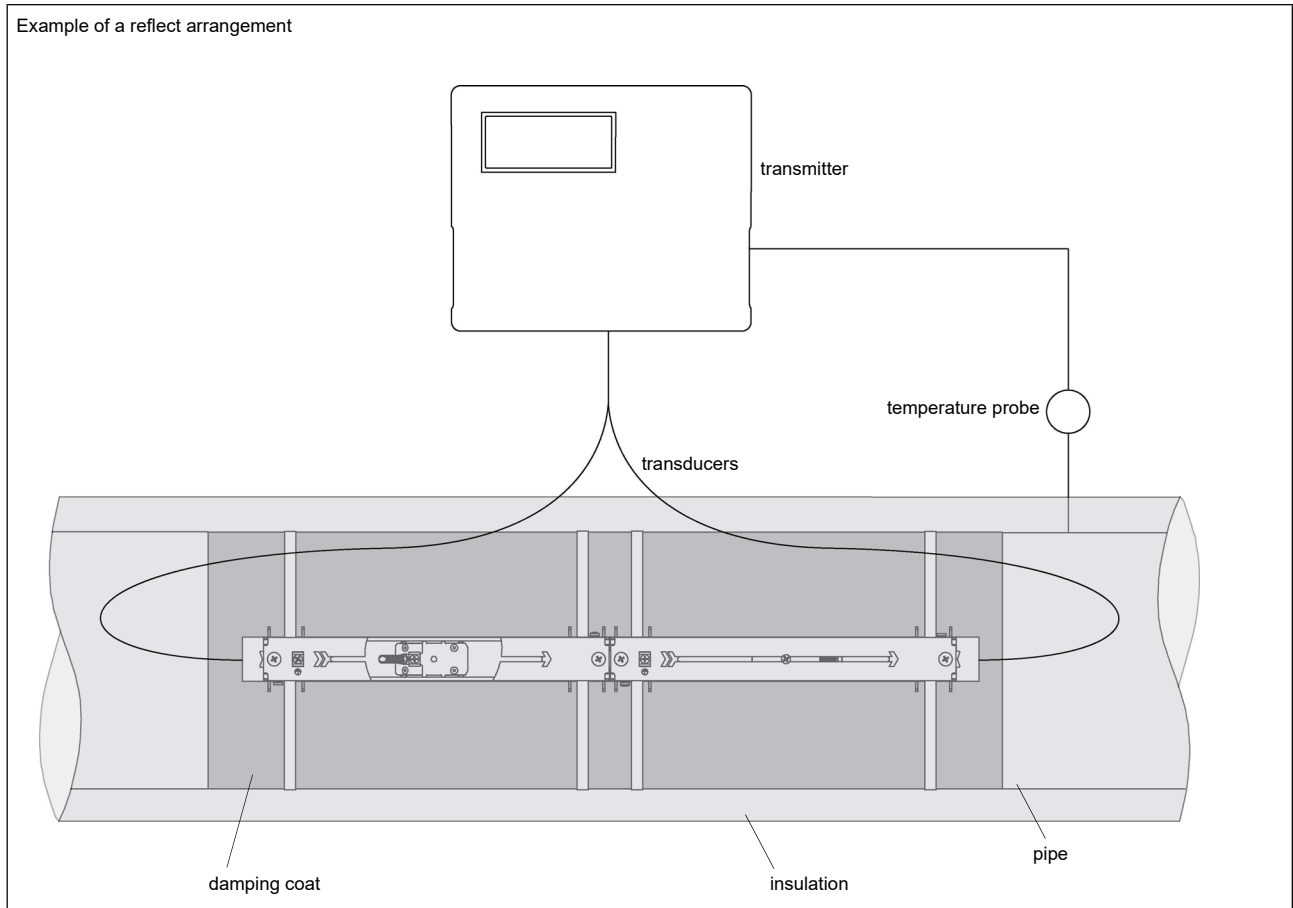


Direct mode, number of sound paths: 1, negative transducer distance





a - transducer distance

### Typical measurement setup



# Transmitter

## Technical data

|  | FLUXUS G532ST-LT (analog outputs)  | FLUXUS G532ST-LT (process interface)   |
|--|--|--|
|  |   |  |
| design   | field device with 1 measuring channel  |  |
| application  | steam measurement <sup>2</sup>   |  |
| <b>measurement</b>   |  |  |
| measurement principle  | transit time difference correlation principle  |  |
| flow velocity  | depending on pipe diameter and transducer, see diagrams  |  |
| repeatability  | 0.15 % MV ±0.02 ft/s   |  |
| fluid  | saturated steam, superheated steam   |  |
| fluid pressure   | psia   | 44 to 145  |
| fluid temperature  | °F   | 275 to 356   |
| temperature compensation                                     | corresponding to the recommendations in ANSI/ASME MFC-5.1-2011   |  |
| <b>measurement uncertainty (volumetric flow rate)</b>        |  |  |
| measurement uncertainty of the measuring system <sup>1</sup> | ±0.3 % MV ±0.02 ft/s<br>includes calibration certificate traceable to NIST   |  |
| measurement uncertainty at the measuring point               | ±1 to 3 % MV ±0.02 ft/s, depending on the application  |  |
| <b>transmitter</b>   |  |  |
| power supply   | <ul style="list-style-type: none"> <li>• 90 to 250 V/50 to 60 Hz or</li> <li>• 11 to 32 V DC</li> </ul>  |  |
| power consumption  | W  | < 10   |
| number of measuring channels                                 | 1  |  |
| damping  | s  | 0 to 100 (adjustable)  |
| measuring cycle  | Hz   | 100 to 1000  |
| response time  | s  | 1  |
| housing material   | aluminum, powder coated  |  |
| degree of protection   | IP66   |  |
| dimensions   | inch   | see dimensional drawing  |
| weight   | lb   | 7  |
| fixation   | wall mounting, optional: 2" pipe mounting  |  |
| ambient temperature  | °F   | -4 to +140   |
| display  | 128 x 64 pixels, backlight   |  |
| menu language  | English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian, Chinese  |  |
| <b>certificates</b>  |  |  |
| use in unclassified (ordinary) locations                     | optional:<br>certification type: 532ST<br> FM23NUS0010<br>FM23NCA0007   |  |
| <b>measuring functions</b>                                   |  |  |
| physical quantities  | operating volumetric flow rate, mass flow rate, flow velocity  |  |
| totalizer  | volume, mass   |  |
| diagnostic functions   | sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times   |  |
| <b>communication interfaces</b>                              |  |  |
| service interfaces   | measured value transmission, parametrization of the transmitter:<br><ul style="list-style-type: none"> <li>• USB</li> <li>• LAN</li> </ul>   | measured value transmission, parametrization of the transmitter:<br><ul style="list-style-type: none"> <li>• USB</li> <li>• LAN</li> </ul>                     |
| process interfaces   | -  | 1 option:<br><ul style="list-style-type: none"> <li>• Modbus RTU</li> <li>• BACnet MS/TP</li> <li>• HART</li> <li>• Modbus TCP</li> <li>• BACnet IP</li> </ul> |
| <b>accessories</b>   |  |  |
| data transmission kit  | USB cable  |  |
| software   | <ul style="list-style-type: none"> <li>• FluxDiagReader: reading of measured values and parameters, graphical representation</li> <li>• FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrization of the transmitter</li> </ul> |  |
| <b>data logger</b>   |  |  |
| loggable values  | all physical quantities and totalized physical quantities  |  |
| capacity   | max. 800 000 measured values   |  |

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

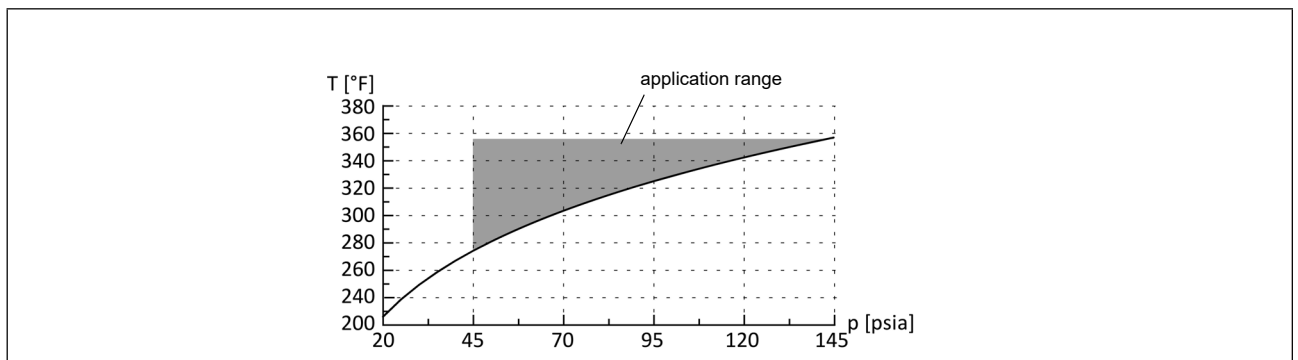
<sup>2</sup> test measurement to validate the application required in advance

|   |                    | FLUXUS G532ST-LT (analog outputs)   | FLUXUS G532ST-LT (process interface)  |
|---|--------------------|---|---|
| <b>outputs</b>  |                    |   |   |
| The outputs are galvanically isolated from the transmitter. |                    |   |   |
| <b>• switchable current output</b>                          |                    |   |   |
| configurable according to NAMUR NE 43                       |                    |   |   |
| number  |                    | 1   | optional: 1 (HART)  |
| range   | mA                 | 4 to 20 (alarm current: 3.2 to 3.99, 20.01 to 24, hardware fault current: 3.2)  | 4 to 20 (alarm current: 3.2 to 3.99, 20.01 to 24, hardware fault current: 3.2)  |
| uncertainty   |                    | 0.04 % of output value $\pm 3 \mu\text{A}$  | 0.04 % of output value $\pm 3 \mu\text{A}$  |
| active output   |                    | $R_{\text{ext}} = 250 \text{ to } 530 \Omega$ , $U_{\text{opencircuit}} = 28 \text{ V DC}$                                | $R_{\text{ext}} = 250 \text{ to } 530 \Omega$ , $U_{\text{opencircuit}} = 28 \text{ V DC}$  |
| passive output  |                    | $U_{\text{ext}} = 9 \text{ to } 30 \text{ V DC}$ , depending on $R_{\text{ext}}$ ( $R_{\text{ext}} < 458 \Omega$ at 20 V) | $U_{\text{ext}} = 9 \text{ to } 30 \text{ V DC}$ , depending on $R_{\text{ext}}$ ( $R_{\text{ext}} < 458 \Omega$ at 20 V)                 |
| current output in HART mode                                 |                    |   |   |
| • range   | mA                 | -   | 4 to 20 (alarm current: 3.5 to 3.99, 20.01 to 22, hardware fault current: 3.2)  |
| • active output   |                    | -   | $R_{\text{ext}} = 250 \text{ to } 530 \Omega$ , $U_{\text{opencircuit}} = 28 \text{ V DC}$  |
| • passive output  |                    | -   | $U_{\text{ext}} = 9 \text{ to } 30 \text{ V DC}$ , depending on $R_{\text{ext}}$ ( $R_{\text{ext}} = 250 \text{ to } 458 \Omega$ at 20 V) |
| <b>• digital output</b>                                     |                    |   |   |
| number  |                    | 2   | -   |
| functions   |                    | <ul style="list-style-type: none"> <li>• frequency output</li> <li>• binary output</li> <li>• pulse output</li> </ul>     | -   |
| operating parameters  |                    | $U_{\text{ext}} = (8.2 \pm 0.1) \text{ V DC}$   | -   |
| <b>frequency output</b>                                     |                    |   |   |
| • range   | kHz                | 0 to 10   | -   |
| <b>binary output</b>  |                    |   |   |
| • binary output as alarm output                             |                    | limit, change of flow direction or error  | -   |
| <b>pulse output</b>   |                    |   |   |
| • pulse value   | units              | 0.01 to 1000  | -   |
| • pulse width   | ms                 | 0.05 to 1000  | -   |
| <b>inputs</b>   |                    |   |   |
| The inputs are galvanically isolated from the transmitter.  |                    |   |   |
| <b>• temperature input</b>                                  |                    |   |   |
| number  |                    | 1   |   |
| type  |                    | Pt100/Pt1000  |   |
| connection  |                    | 4-wire  |   |
| range   | $^{\circ}\text{F}$ | -238 to +1040   |   |
| resolution  | K                  | 0.01  |   |
| accuracy  |                    | $\pm 0.01 \% \text{ MV} \pm 0.03 \text{ K}$   |   |

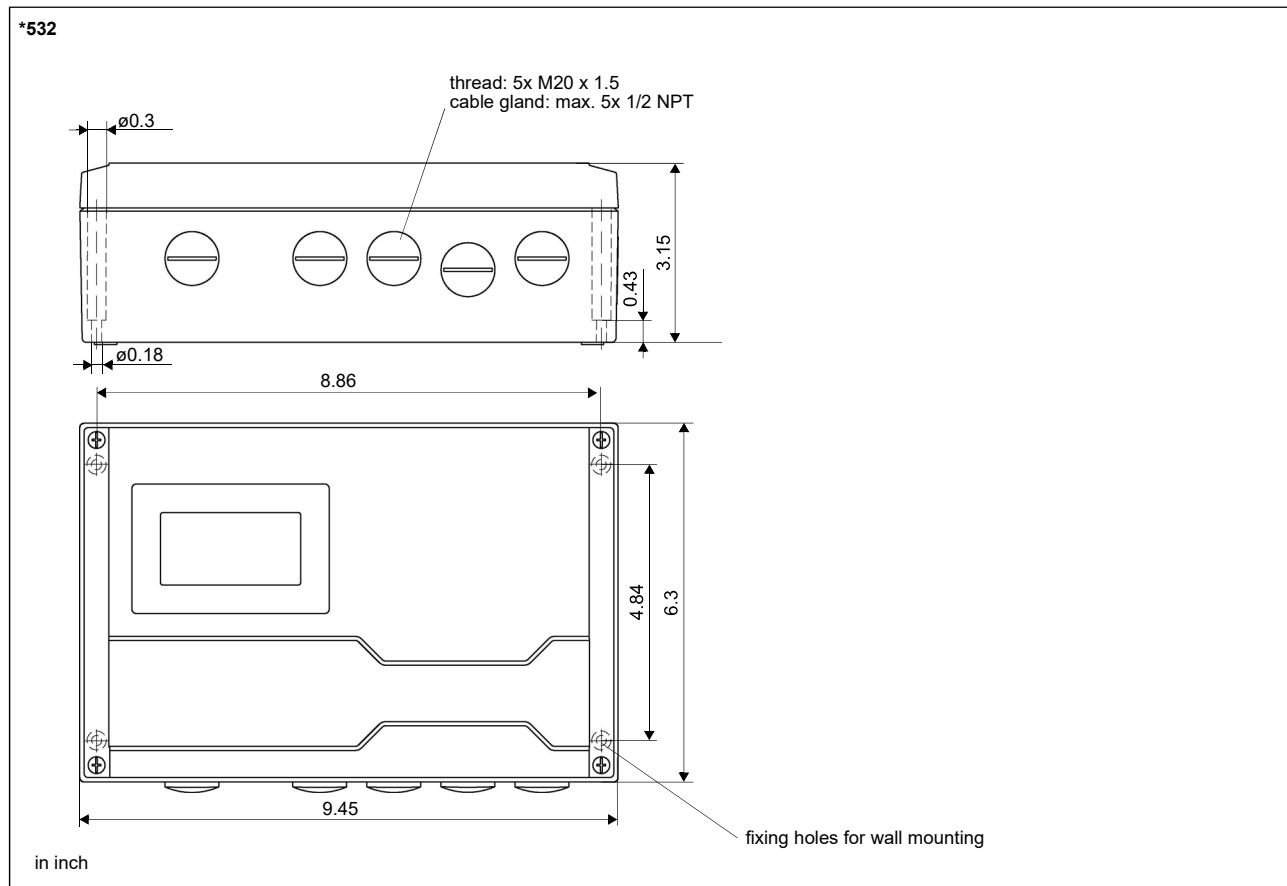
<sup>1</sup> with aperture calibration of the transducers

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

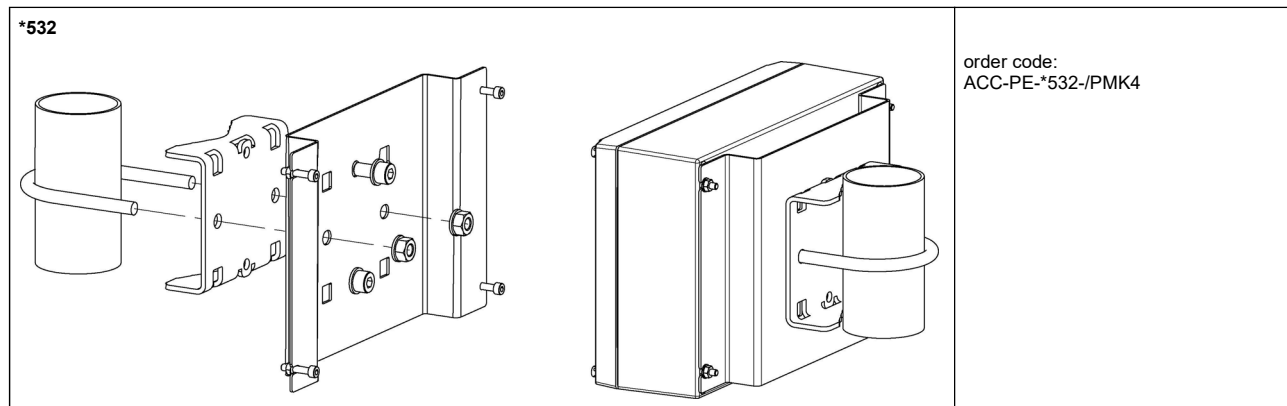
### Saturated steam pressure curve



### Dimensions



### 2" pipe mounting kit (optional)

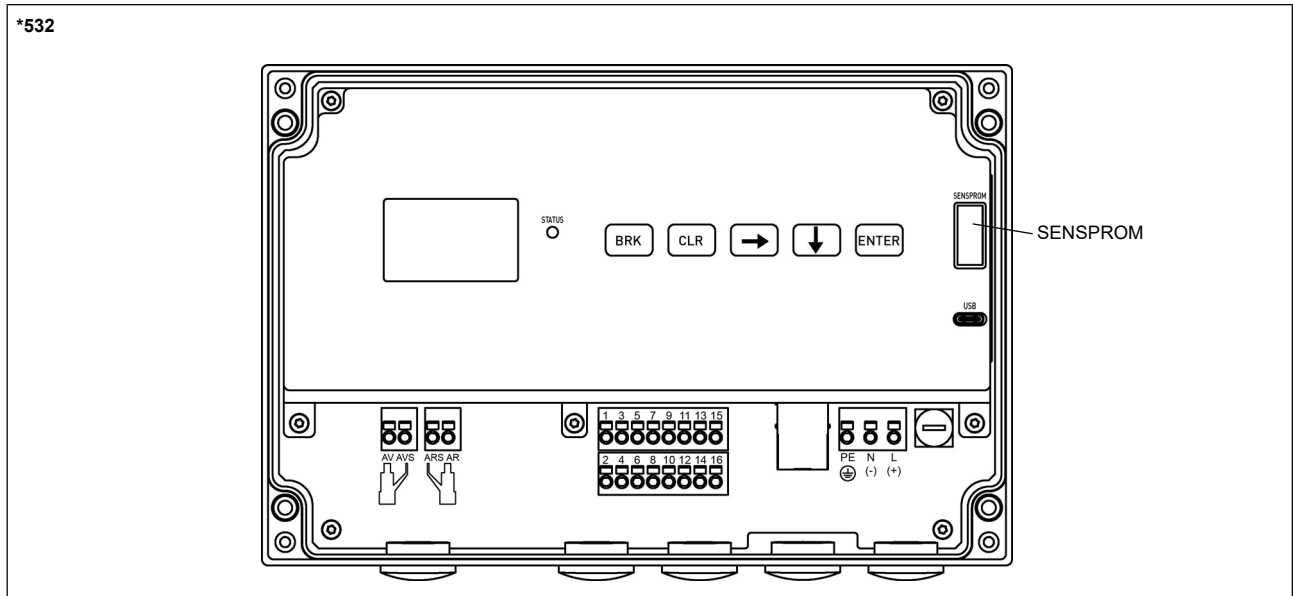


### Storage

- 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: -4...+140 °F



## Terminal assignment



| power supply <sup>1</sup> |                      |          |                      |
|---------------------------|----------------------|----------|----------------------|
| terminal                  | connection (AC)      | terminal | connection (DC)      |
| PE                        | protective conductor | PE       | protective conductor |
| N                         | neutral conductor    | (-)      | -                    |
| L                         | outer conductor      | (+)      | +                    |

| transducers |                 |            |  |  |
|-------------|-----------------|------------|--|--|
| terminal    | connection      | transducer |  |  |
| AV          | signal          |            |  |  |
| AVS         | internal shield |            |  |  |
| ARS         | internal shield |            |  |  |
| AR          | signal          |            |  |  |
| cable gland | external shield |            |  |  |

| outputs, inputs <sup>1, 2</sup> |                             |
|---------------------------------|-----------------------------|
| terminal                        | connection                  |
| 13+, 14-                        | passive current output      |
| 13-, 14+                        | active current output       |
| 9+, 10-<br>11+, 12-             | digital output              |
| 15+, 16-                        | passive current output/HART |
| 15-, 16+                        | active current output/HART  |
| 1, 2, 3, 4                      | temperature input           |

| temperature probe |                   |                                 |
|-------------------|-------------------|---------------------------------|
| terminal          | direct connection | connection with extension cable |
| 1                 | red               | white                           |
| 2                 | white             | red                             |
| 3                 | red               | black                           |
| 4                 | white             | green                           |

| communication interfaces |                                   |  |
|--------------------------|-----------------------------------|--|
| terminal                 | connection                        | communication interface  |
| 15                       | signal +                          | • Modbus RTU <sup>1</sup>  |
| 16                       | signal -                          | • BACnet MS/TP <sup>1</sup>  |
| USB                      | type C<br>Hi-Speed USB 2.0 Device | service (FluxDiag/FluxDiagReader)                                  |
| LAN                      | RJ45<br>10/100 Mbps Ethernet      | • service (FluxDiag/FluxDiagReader)<br>• Modbus TCP<br>• BACnet IP |

<sup>1</sup> cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

<sup>2</sup> The number, type and terminal assignment are customized.

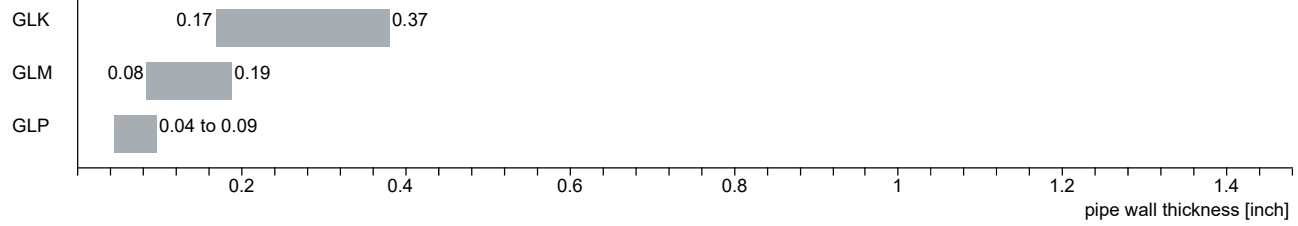
# Transducers

## Transducer selection

### Step 1

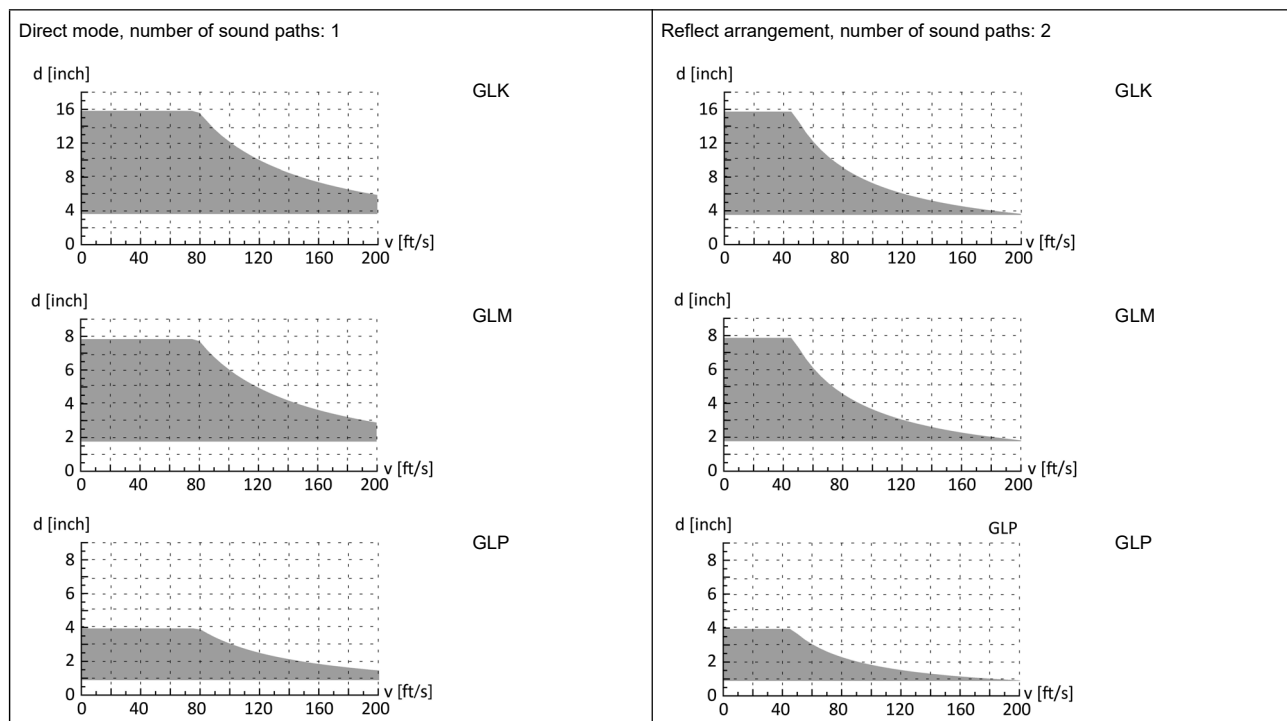
pipe wall thickness

transducer order code



### Step 2

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



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

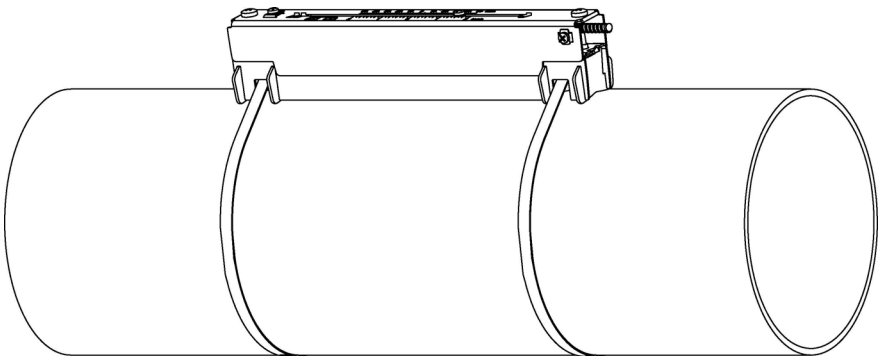
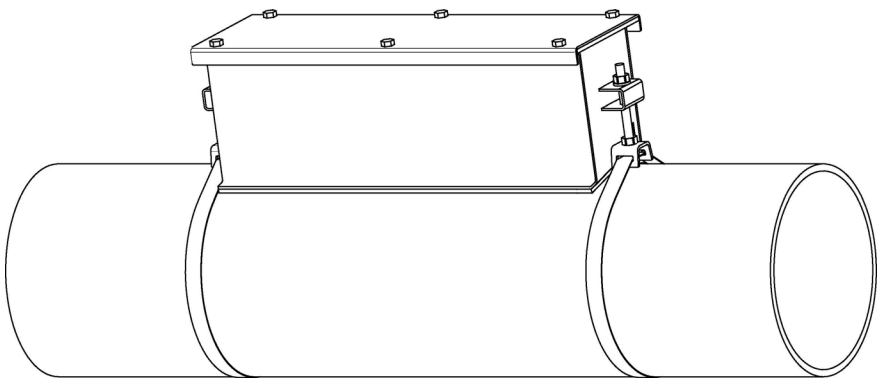
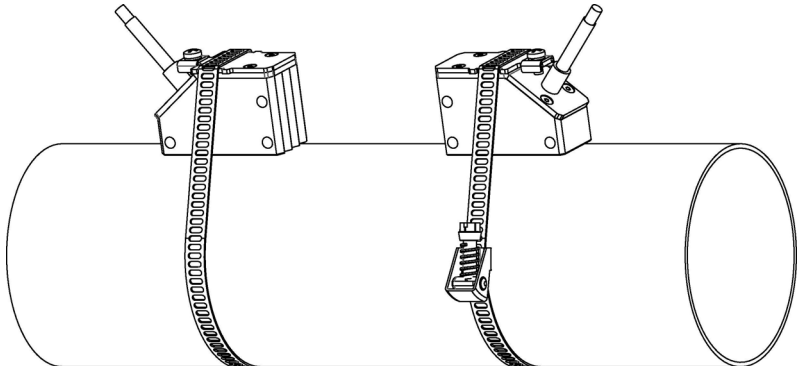
## Technical data

### Lamb wave transducers

|                              |      |                                       |               |               |
|------------------------------|------|---------------------------------------|---------------|---------------|
| order code                   |      | GLK-SNNN-**TS                         | GLM-SNNN-**TS | GLP-SNNN-**TS |
| technical type               |      | G(RT)K1S53                            | G(RT)M1S53    | G(RT)P1S53    |
| transducer frequency MHz     |      | 0.5                                   | 1             | 2             |
| fluid pressure               |      | see saturated steam pressure curve    |               |               |
| <b>inner pipe diameter d</b> |      |                                       |               |               |
| min.                         | inch | 3.5                                   | 1.8           | 0.91          |
| max.                         | inch | 15.7                                  | 7.9           | 3.9           |
| <b>pipe wall thickness</b>   |      |                                       |               |               |
| min.                         | inch | 0.17                                  | 0.08          | 0.04          |
| max.                         | inch | 0.37                                  | 0.19          | 0.09          |
| <b>material</b>              |      |                                       |               |               |
| housing                      |      | PPSU with stainless steel cover 316Ti |               |               |
| contact surface              |      | PPSU                                  |               |               |
| degree of protection         |      | IP66                                  |               |               |
| <b>transducer cable</b>      |      |                                       |               |               |
| type                         |      | 1699                                  |               |               |
| length                       | ft   | 16                                    | 13            |               |
| length (**-*****/LC)         | ft   | 29                                    | 29            |               |
| <b>dimensions</b>            |      |                                       |               |               |
| length l                     | inch | 5.06                                  | 2.91          |               |
| width b                      | inch | 2.01                                  | 1.3           |               |
| height h                     | inch | 2.66                                  | 1.59          |               |
| dimensional drawing          |      |                                       |               |               |
| weight (without cable)       | lb   | 1.8                                   | 0.35          |               |
| <b>storing temperature</b>   |      |                                       |               |               |
| storing temperature          | °F   | -40 to +311                           |               |               |
| operating temperature        | °F   | 212 to 356 (nonEx)                    |               |               |
| warm-up time                 | h    | 3                                     | 1             |               |
| temperature compensation     |      | x                                     |               |               |

completely thermally insulated transducer installation necessary

## Transducer mounting fixture

|   |   |
|---|---|
| <p>PermaRail (VLK, VLM)</p>                       | <p>material: stainless steel 304, 301, 410<br/>option OS: 316Ti, 316L, 17-7PH<br/>inner length:<br/><b>VLK:</b> 13.7 inch,<br/><b>VLM:</b> 9.2 inch<br/>dimensions:<br/><b>VLK:</b> 16.65 x 3.54 x 3.66 inch<br/><b>VLM:</b> 12.17 x 2.24 x 2.48 inch</p>                 |
| <p>PermaLok PL</p>                               | <p>material: stainless steel 316<br/>dimensions:<br/><b>PLK-RL:</b> 19.25 x 3.9 x 3.95 inch<br/><b>PLK-DS:</b> 13.25 x 3.85 x 3.95 inch<br/><b>PLM:</b> 25.25 x 3.08 x 3.15 inch<br/>weight:<br/><b>PLK-RL:</b> 6 lb<br/><b>PLK-DS:</b> 4.2 lb<br/><b>PLM:</b> 6.6 lb</p> |
| <p>quick release clasps and tension straps</p>  | <p>material: stainless steel 410, 200</p>   |

## Coupling materials for transducers

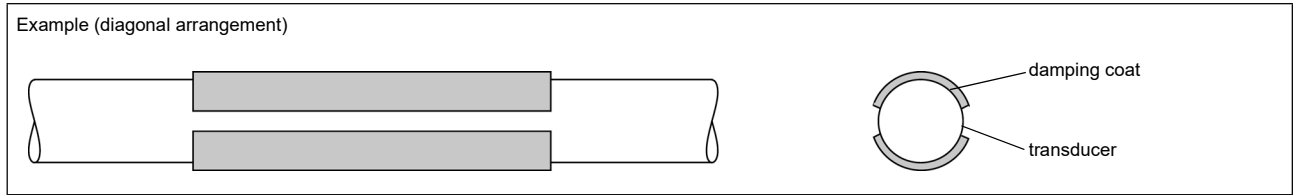
| type                                  | ambient temperature<br>°F |
|---------------------------------------|---------------------------|
| coupling pad type VT <sup>1</sup>     | 14 to +392                |
| coupling compound type E <sup>2</sup> | -22 to +392               |

<sup>1</sup> fluid temperature 392 °F: min. 2 years

<sup>2</sup> in combination with type VT only

## Damping coat

The damping coat will be used to reduce acoustic noise influences on the measurement.



### Technical data

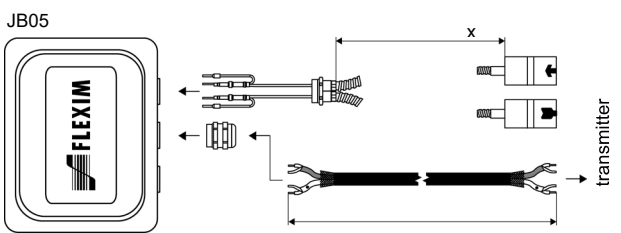
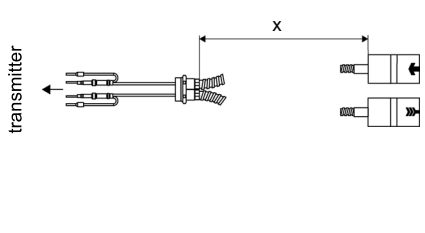
|   |     |  |
|---|-----|--|
| order code                                |     | ACC-PE-GNNN-/DPL1                                |
| material                                  |     | multipolymeric matrix/inorganic ceramic coating  |
| packing drum                              | gal | 1  |
| properties                                |     | heat-resistant, inert                            |
| fluid temperature when applying           | °F  | 50 to 392  |
| drying time (example)                     |     | approx. 3 h at 68 °F<br>approx. 15 min at 302 °F |
| temperature resistance in dry state       | °F  | max. 1202  |
| durability of the packing drum (unopened) |     | 2 years  |

Observe installation instructions (TI\_DampingCoat).

### Dimensioning

| transducer frequency | number of packing drums |       |
|----------------------|-------------------------|-------|
|                      | outer pipe diameter     |       |
|                      | ≤11.8                   | ≤19.7 |
|                      | inch                    |       |
| K                    | 1                       | 1     |
| M                    | 1                       | -     |
| P                    | 1                       | -     |

## Connection systems

| connection system T1  |  |                            |
|---|--|----------------------------|
| connection with extension cable   | direct connection  | transducers technical type |
|  |  | *****53                    |

## Cable

| transducer cable    |       |   |
|---------------------|-------|---|
| type                |       | 1699                                    |
| weight              | lb/ft | 0.06                                    |
| ambient temperature | °F    | -67 to +392                             |
| cable jacket        |       |   |
| material            |       | PTFE                                    |
| outer diameter      | inch  | 0.11                                    |
| thickness           | inch  | 0.01                                    |
| color               |       | brown                                   |
| shield              |       | x                                       |
| sheath              |       |   |
| material            |       | stainless steel 304<br>option OS: 316Ti |
| outer diameter      | inch  | 0.31                                    |

| extension cable     |       |  |
|---------------------|-------|--|
| type                |       | 2615   |
| weight              | lb/ft | 0.12   |
| ambient temperature | °F    | -22 to +158  |
| properties          |       | halogen-free<br>fire propagation test according to IEC 60332-1<br>combustion test according to IEC 60754-2 |
| cable jacket        |       |  |
| material            |       | PUR  |
| outer diameter      | inch  | 0.47   |
| thickness           | inch  | 0.08   |
| color               |       | black  |
| shield              |       | x  |

## Cable length

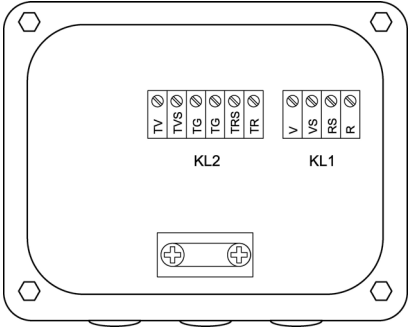
| transducer frequency       |    | K  |       | M, P |       |
|----------------------------|----|----|-------|------|-------|
|                            |    | x  | l     | x    | l     |
| transducers technical type |    | x  | l     | x    | l     |
| *R***5*                    | ft | 16 | ≤ 984 | 13   | ≤ 984 |
| option LC: *T***5*         | ft | 29 | ≤ 984 | 29   | ≤ 984 |

x = transducer cable length

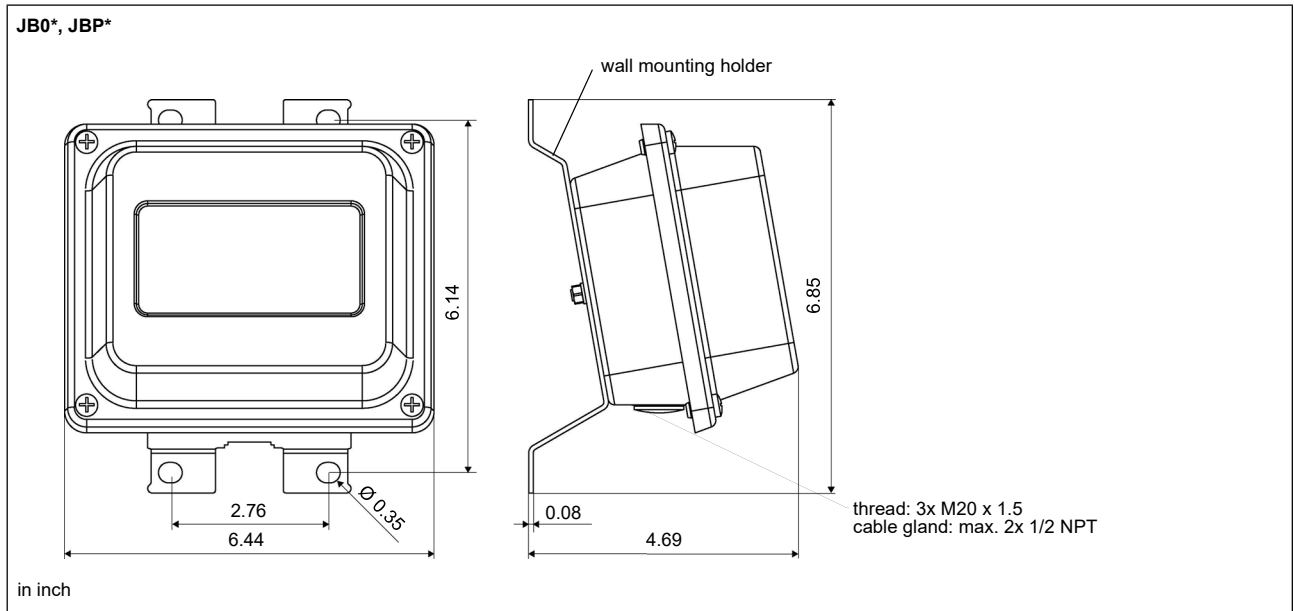
l = max. length of extension cable (depending on the application)

# Junction box

## Technical data

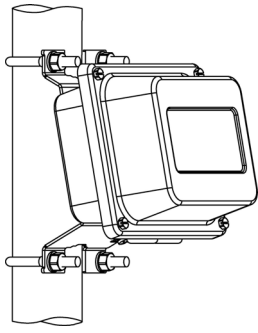
| JB05   |          |   |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
|--|----------|---|----------------|----------|------------|------------|-----|---|--------|---|----|-----------------|--|----|-----------------|---|---|--------|--|----------------|----------|------------|-----|----|--------|-----|-----------------|-----|-----------------|----|--------|
| weight   | lb       | 2.6 lb                                      |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| fixation   |          | wall mounting<br>optional: 2" pipe mounting |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| <b>material</b>  |          |   |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| housing  |          | stainless steel 316L                        |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| gasket   |          | silicone                                    |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| degree of protection   |          | IP66/IP67                                   |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| ambient temperature  | °F       | -40 to +176                                 |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"></div> <div style="width: 45%;"> <p><b>Connection</b></p>  <p><b>Transducers</b></p> <table border="1"> <thead> <tr> <th>terminal strip</th> <th>terminal</th> <th>connection</th> <th>transducer</th> </tr> </thead> <tbody> <tr> <td rowspan="4">KL1</td> <td>V</td> <td>signal</td> <td>↑</td> </tr> <tr> <td>VS</td> <td>internal shield</td> <td></td> </tr> <tr> <td>RS</td> <td>internal shield</td> <td>⤴</td> </tr> <tr> <td>R</td> <td>signal</td> <td></td> </tr> </tbody> </table> <p><b>Extension cable</b></p> <table border="1"> <thead> <tr> <th>terminal strip</th> <th>terminal</th> <th>connection</th> </tr> </thead> <tbody> <tr> <td rowspan="4">KL2</td> <td>TV</td> <td>signal</td> </tr> <tr> <td>TVS</td> <td>internal shield</td> </tr> <tr> <td>TRS</td> <td>internal shield</td> </tr> <tr> <td>TR</td> <td>signal</td> </tr> </tbody> </table> </div> </div> |          |   | terminal strip | terminal | connection | transducer | KL1 | V | signal | ↑ | VS | internal shield |  | RS | internal shield | ⤴ | R | signal |  | terminal strip | terminal | connection | KL2 | TV | signal | TVS | internal shield | TRS | internal shield | TR | signal |
| terminal strip   | terminal | connection                                  | transducer     |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| KL1  | V        | signal                                      | ↑              |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
|  | VS       | internal shield                             |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
|  | RS       | internal shield                             | ⤴              |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
|  | R        | signal                                      |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| terminal strip   | terminal | connection                                  |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
| KL2  | TV       | signal                                      |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
|  | TVS      | internal shield                             |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
|  | TRS      | internal shield                             |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |
|  | TR       | signal                                      |                |          |            |            |     |   |        |   |    |                 |  |    |                 |   |   |        |  |                |          |            |     |    |        |     |                 |     |                 |    |        |

## Dimensions



## 2" pipe mounting kit

JB\*\*



item number: 751035-2



# Clamp-on temperature probe (optional)

## Technical data

| PT13N                                  |   |                          |
|--|---|--------------------------|
| design                                 | clamp-on  |                          |
| type                                   | Pt1000  |                          |
| connection                             | 4-wire  |                          |
| measuring range                        | °F -40 to +392  |                          |
| accuracy T                             | ±(0.27 °F + 2 · 10 <sup>-3</sup> · ( T [°F]  - 32 °F))<br>class A |                          |
| housing material                       | 360 brass alloy   |                          |
| degree of protection                   | NEMA 4  |                          |
| <b>dimensions</b>                      |   |                          |
| length l                               | inch  | 0.79                     |
| width b                                | inch  | 0.59                     |
| height h                               | inch  | 0.49                     |
| dimensional drawing                    |   |                          |
| weight                                 | lb  | 0.437                    |
| <b>accessories</b>                     |   |                          |
| thermal conductivity foil 482 °F       | x   |                          |
| <b>Connection system</b>               |   |                          |
| <b>connection with extension cable</b> |   | <b>direct connection</b> |
| extension cable<br>                    |   |                          |
| <b>Connection</b>                      |   |                          |
|  | <b>temperature probe</b>  |                          |
|  | red   |                          |
|  | red   |                          |
|  | white   |                          |
|  | white   |                          |
| <b>Cable</b>                           |   |                          |
|  | <b>temperature probe</b>  | <b>extension cable</b>   |
| type                                   | 4 x 24 AWG  | 4 x 18 AWG               |
| standard length                        | ft 20   | -                        |
| max. length                            | ft -  | 656                      |
| cable jacket                           | PTFE  | LS PVC                   |

## Fixation

| tension strap PT13N |  |
|---------------------|--|
|                     | material: stainless steel 301, 410<br>thermal insulation necessary |

## Junction box

|                   | <b>Connection</b> <table border="1"> <thead> <tr> <th>temperature probe</th> <th>extension cable</th> </tr> </thead> <tbody> <tr> <td>red</td> <td>white</td> </tr> <tr> <td>red</td> <td>black</td> </tr> <tr> <td>white</td> <td>green</td> </tr> <tr> <td>white</td> <td>red</td> </tr> </tbody> </table> | temperature probe | extension cable | red | white | red | black | white | green | white | red |
|-------------------|--|-------------------|-----------------|-----|-------|-----|-------|-------|-------|-------|-----|
| temperature probe | extension cable  |                   |                 |     |       |     |       |       |       |       |     |
| red               | white  |                   |                 |     |       |     |       |       |       |       |     |
| red               | black  |                   |                 |     |       |     |       |       |       |       |     |
| white             | green  |                   |                 |     |       |     |       |       |       |       |     |
| white             | red  |                   |                 |     |       |     |       |       |       |       |     |