

Portable Ultrasonic Flow Measurement of Gas in Hazardous Areas

Portable instrument for non-invasive, quick ultrasonic flow measurement with clamp-on technology for all types of piping

Features

- Precise bi-directional and highly dynamic flow measurement with the non-intrusive clamp-on technology
- High precision at fast and slow flow rates, no temperature and zero drift
- Portable, easy-to-use flow transmitter with 2 flow channels, multiple inputs/outputs, an integrated data logger with a serial interface
- Extremely resistant carbon fiber housing
- Covered by ATEX zone 2 certification (Ⓔ II3G), IP65 protection - No hot work permit required for hazardous areas
- Compact and very lightweight, allowing the measuring system to be easily carried as personal luggage, e.g. for offshore visits
- Water and dust-tight (IP65); resistant against oil, many liquids and dirt
- Li-Ion battery provides up to 14 hours of measurement operation
- Automatic loading of calibration data and transducer detection for a fast and easy set-up (less than 5 min), providing precise and long-term stable results
- User-friendly design
- Transducers available for a wide range of inner pipe diameters (7...1600 mm) and fluid temperatures (-40...+200 °C)
- Rugged transducers (ATEX-Zone 1 und 2, resistant to rough environments, dust and humidity)
- Robust, water-tight (IP67) transport case with comprehensive accessories
- QuickFix for fast mounting of the flow transmitter in difficult conditions

Applications

Designed for the following industries:

- Upstream (on- and offshore)
- Midstream and downstream (pipelines and refineries)
- Chemical industry
- Energy sector (e.g. HVAC, geothermal, power plants)



FLUXUS G608 supported by handle



Measurement with transducers mounted by the portable Variofix VP



Measurement with the flow transmitter fixed to the pipe by the QuickFix pipe mounting fixture

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Function

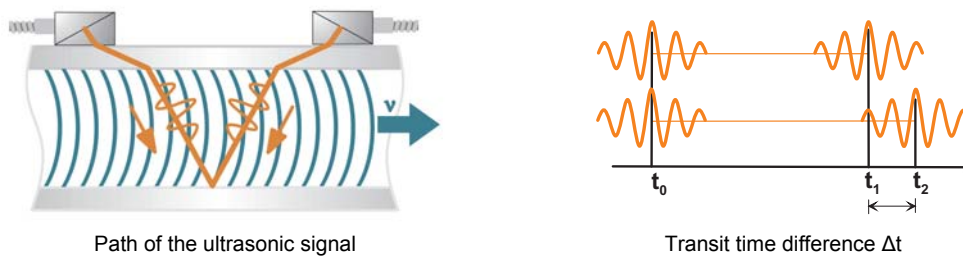
Measurement Principle

In order to measure the flow of a medium in a pipe, ultrasonic signals are used, employing the transit time difference principle. Ultrasonic signals are emitted by a transducer installed on the pipe and received by a second transducer. These signals are emitted alternately in the flow direction and against it.

As the medium in which the signals propagate is flowing, the transit time of the ultrasonic signals in the flow direction is shorter than against the flow direction.

The transit time difference, Δt , 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.

Two integrated microprocessors control the entire measuring process. This allows the flowmeter to remove disturbance signals, and to check each received ultrasonic wave for its validity which reduces noise.



Calculation of Volumetric Flow Rate

$$Q = k_{Re} \cdot A \cdot k_a \cdot \Delta t / (2 \cdot t_{fl})$$

where:

- Q - volumetric flow rate
- k_{Re} - fluid mechanics calibration factor
- A - cross-sectional pipe area
- k_a - acoustical calibration factor
- Δt - transit time difference
- t_{fl} - transit time in the medium

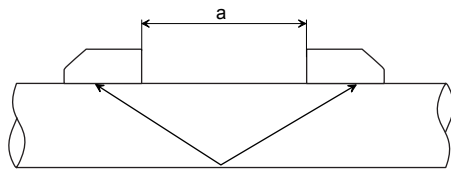
Number of Sound Paths

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

- **reflection mode**
The number of sound paths is even. Both of the transducers are mounted on the same side of the pipe. Correct positioning of the transducers is easier.
- **diagonal mode**
The number of sound paths is odd. Both of the transducers are mounted on opposite sides of the pipe. In the case of a high signal attenuation by the medium, pipe and coatings, diagonal mode with 1 sound path will be used.

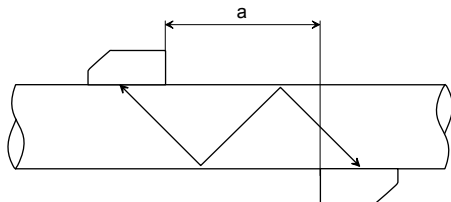
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

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

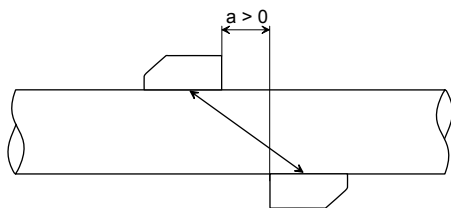


Reflection mode, number of sound paths: 2

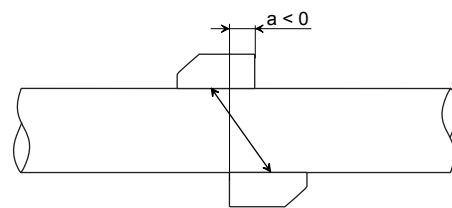
a - transducer distance



Diagonal mode, number of sound paths: 3



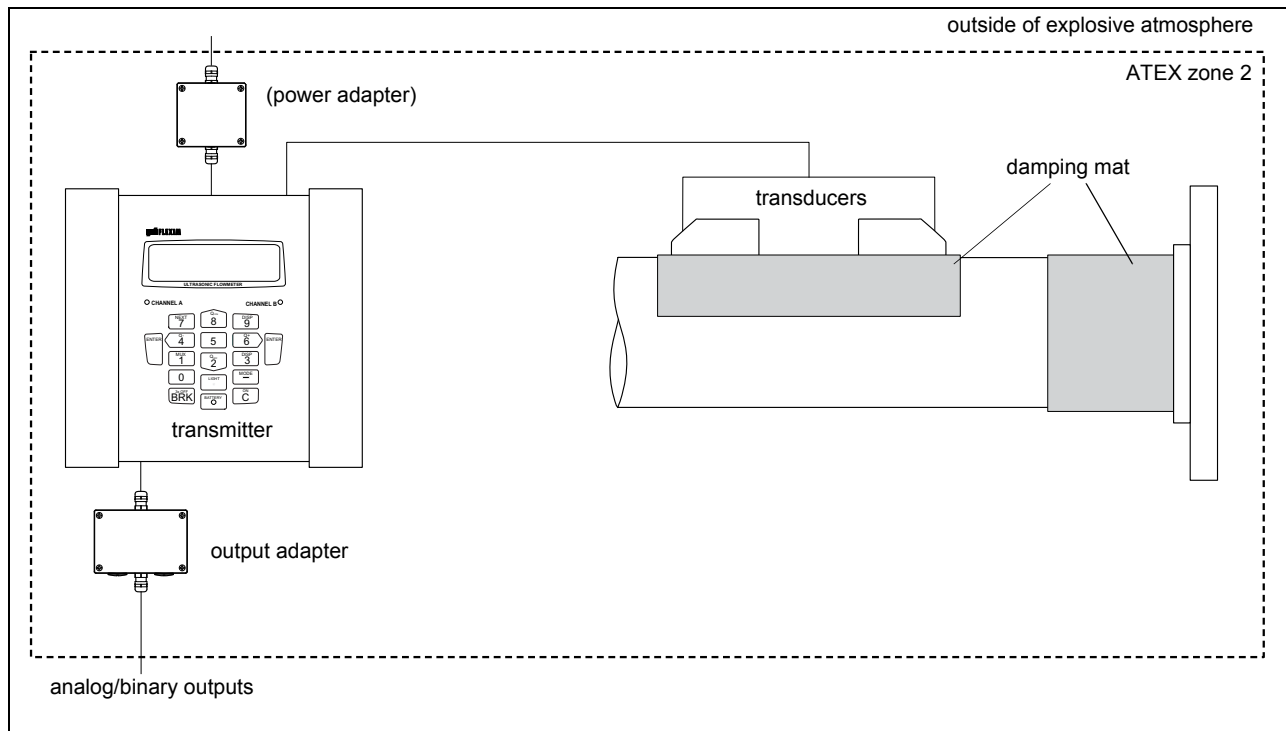
Diagonal mode, number of sound paths: 1



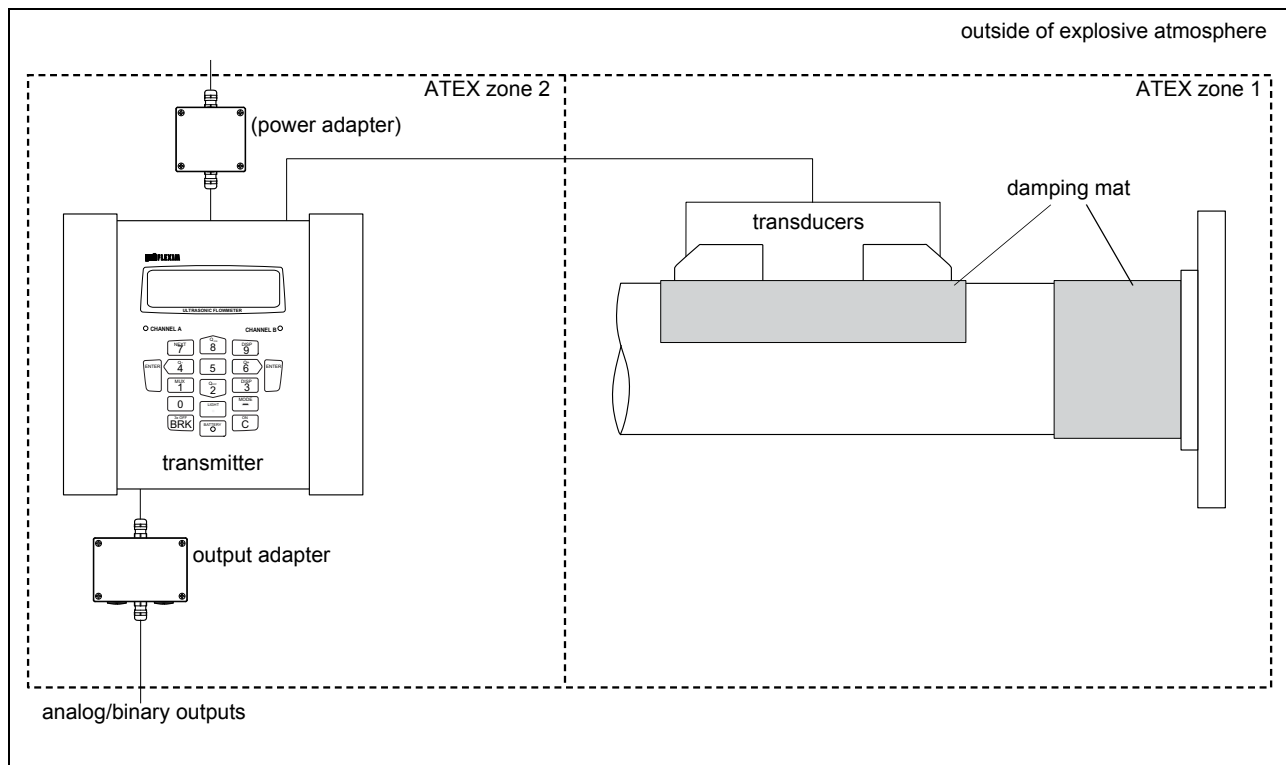
Diagonal mode, number of sound paths: 1,
negative transducer distance

Typical Measurement Setup

ATEX zone 2



ATEX zone 2/ATEX zone 1



Standard Volumetric Flow Rate

The standard volumetric flow rate can be selected as physical quantity to be measured. It will be calculated internally by:

$$Q_N = Q \cdot p/p_N \cdot T_N/T \cdot 1/K$$

where:

| | | |
|-------|---|-------------------------------------|
| Q_N | - | standard volumetric flow rate |
| Q | - | operating volumetric flow rate |
| p_N | - | standard pressure (absolute value) |
| p | - | operating pressure (absolute value) |
| T_N | - | standard temperature in K |
| T | - | operating temperature in K |
| K | - | gas compressibility factor |



The operational pressure p and the operational temperature T of the medium will be entered directly as fixed values into the transmitter.

The gas compressibility factor K will be entered in the transmitter:

- as fixed value or
- as approximation according to e.g. AGA8 or GERG

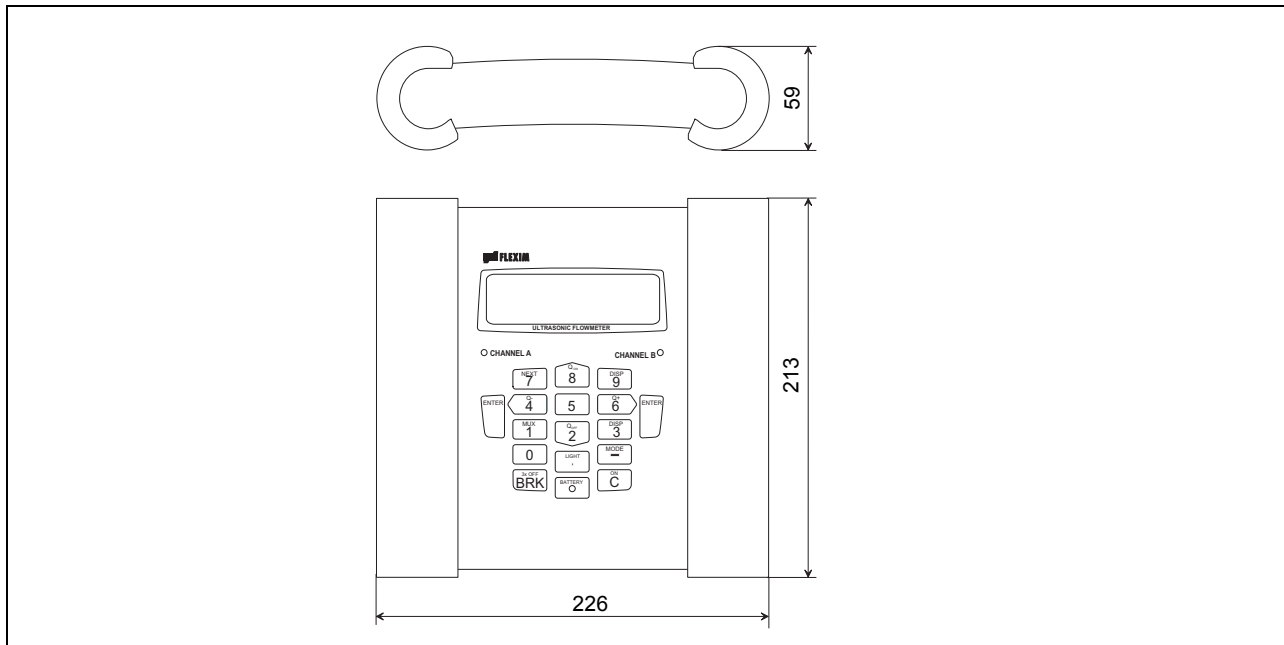
Flow Transmitter

Technical Data

| FLUXUS | | G608**-A2 | |
|--|---|---|----------|
| design | portable, ATEX zone 2 | | |
|  | | | |
| measurement | | | |
| measurement principle | transit time difference correlation principle | | |
| flow velocity | 0.01...35 m/s, depending on pipe diameter | | |
| repeatability | 0.15 % of reading ±0.01 m/s | | |
| medium | all acoustically conductive gases, e.g. nitrogen, air, oxygen, hydrogen, argon, helium, ethylene, propane | | |
| temperature compensation | corresponding to the recommendations in ANSI/ASME MFC-5M-1985 | | |
| accuracy | | | |
| - volumetric flow rate | ± 1...3 % of reading ±0.01 m/s depending on application ± 0.5 % of reading ±0.01 m/s with field calibration | | |
| flow transmitter | | | |
| power supply | 100...240 V/50...60 Hz (power supply unit, outside of explosive atmosphere), 10.5...15 V DC (socket at transmitter, with power adapter (optional)), U _m = 16 V, integrated battery | | |
| battery | Li-Ion, 7.2 V/4.5 Ah operating time (without outputs, inputs and backlight): > 14 h | | |
| power consumption | < 6 W | | |
| number of flow measuring channels | 2 | | |
| signal attenuation | 0...100 s, adjustable | | |
| measuring cycle (1 channel) | 100...1000 Hz | | |
| response time | 1 s (1 channel), option: 70 ms | | |
| housing material | PA, TPS, PC, Polyester, stainless steel | | |
| degree of protection according to IEC/EN 60529 | IP65 | | |
| dimensions | see dimensional drawing | | |
| weight | 1.9 kg | | |
| fixation | QuickFix pipe mounting fixture | | |
| operating temperature | -10...+60 °C | | |
| display | 2 x 16 characters, dot matrix, backlight | | |
| menu language | English, German, French, Dutch, Spanish | | |
| explosion protection | | | |
| A T E X | category | gas: 3G | dust: 2D |
| | EPL | Gc | Db |
| | zone | 2 | 21 |
| | marking | CE 0637  II3G Ex nA nC ic IIC (T6)T4 Gc II2D Ex tb IIIC T 100 °C Db T _a -10...+(50)60 °C | |
| | certification | IBExU10ATEX1067 | |
| | type of protection | gas: non sparking dust: protection by enclosure | |

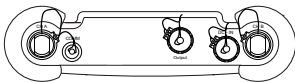
| FLUXUS | G608**-A2 |
|---|---|
| measuring functions | |
| physical quantities | operating volumetric flow rate, standard volumetric flow rate, mass flow rate, flow velocity |
| totalizer | volume, mass |
| calculation functions | average, difference, sum |
| diagnostic functions | sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times |
| data logger | |
| loggable values | all physical quantities, totaled values and diagnostic values |
| capacity | > 100 000 measured values |
| communication | |
| interface | RS232/USB |
| serial data kit | |
| software (all Windows™ versions) | - FluxData: download of measurement data, graphical presentation, conversion to other formats (e.g. for Excel™) - FluxKoeff: creating medium data sets |
| cable | RS232 |
| adapter | RS232 - USB |
| transport case | |
| dimensions | 500 x 400 x 190 mm |
| outputs | |
| | The outputs are galvanically isolated from the transmitter. |
| number | see standard scope of supply on page 9 |
| accessories | output adapter (optional) |
| current output | |
| range | 0/4...20 mA |
| accuracy | 0.1 % of reading ±15 µA |
| passive output | $U_{ext} = 4...9 \text{ V}$, depending on R_{ext} $R_{ext} < 200 \Omega$ |
| binary output | |
| optorelay | 26 V/100 mA |
| binary output as alarm output - functions | limit, change of flow direction or error |
| binary output as pulse output - pulse value - pulse width | 0.01...1000 units 1...1000 ms |

Dimensions

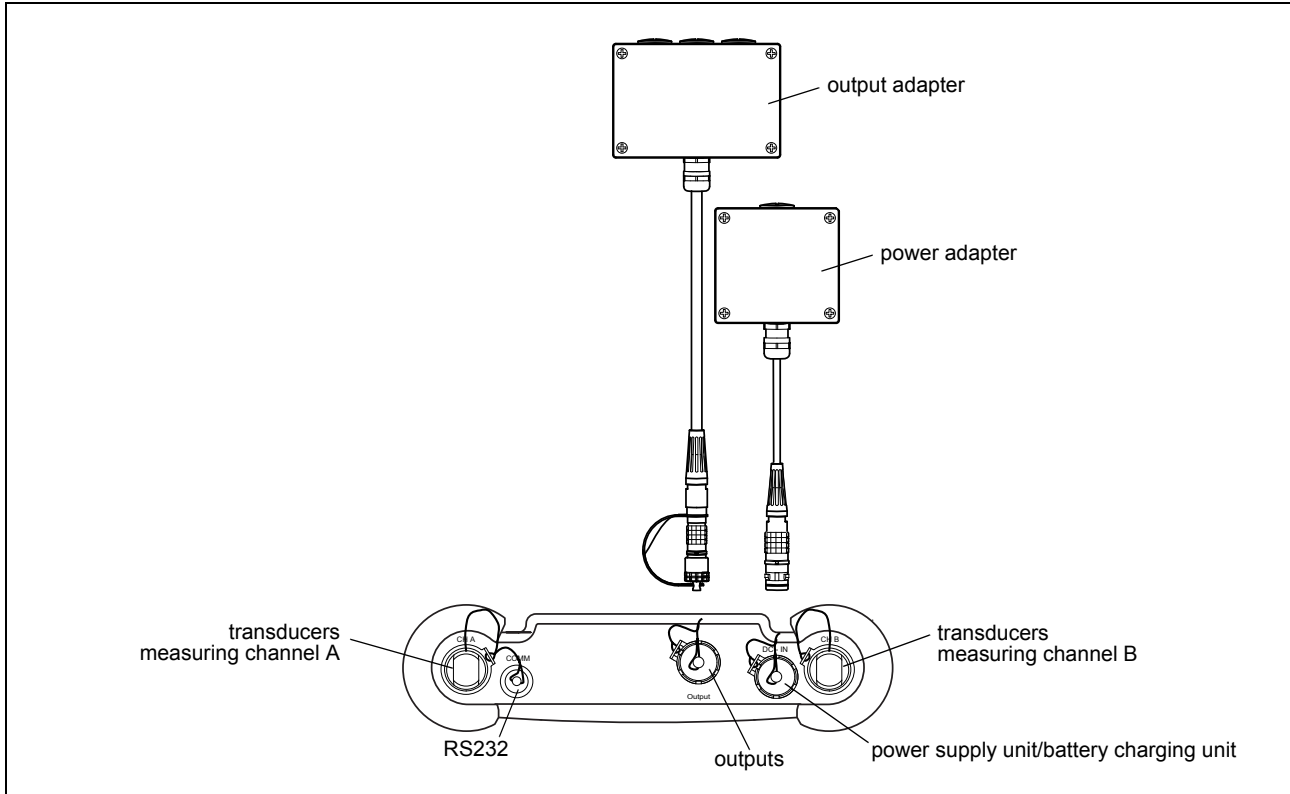


in mm

Standard Scope of Supply

| G608 Standard | |
|--|---|
| order code | FLUXUS G608**-A22-3N-NN-2D-II-NN-NN |
| application | all flow measurements on gas |
| outputs | |
| passive current output | 2 |
| binary output | 2 |
| inputs | |
| temperature input | - |
| accessories | |
| transport case | x |
| power supply unit, mains cable | x |
| battery | x |
| QuickFix pipe mounting fixture for transmitter | x |
| serial data kit | x |
| measuring tape | x |
| user manual, safety instructions, Quick Start Guide | x |
| connector board at the upper side of the transmitter |  |

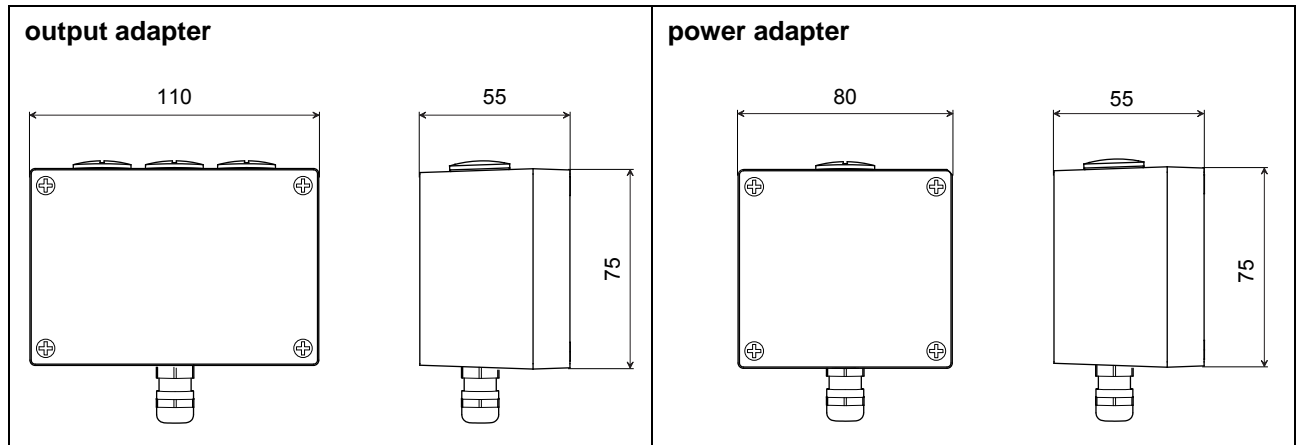
Adapters (optional)



Technical Data

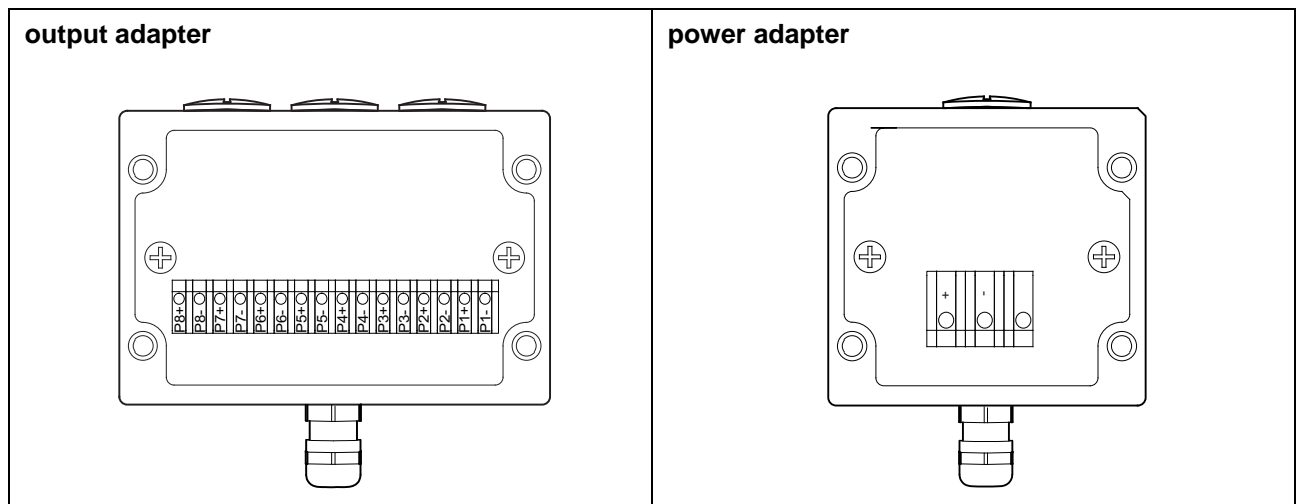
| | | output adapter | power adapter |
|--|--------------------|---|----------------|
| technical type | | OA608A2 | PA608A2 |
| dimensions | | see dimensional drawing | |
| weight | kg | 0.36 | 0.29 |
| material | | | |
| housing | | polyester | |
| gasket | | silicone | |
| degree of protection according to IEC/EN 60529 | | IP66 | |
| operating temperature | | | |
| min. | °C | -20 | |
| max. | °C | +90 | |
| explosion protection | | | |
| zone | | 2 | |
| A T E X | marking | CE (Ex) II3G Ex nA II T6 Gc Ta -20...+60 °C | |
| X | type of protection | non sparking | |

Dimensions



in mm

Terminal Assignment

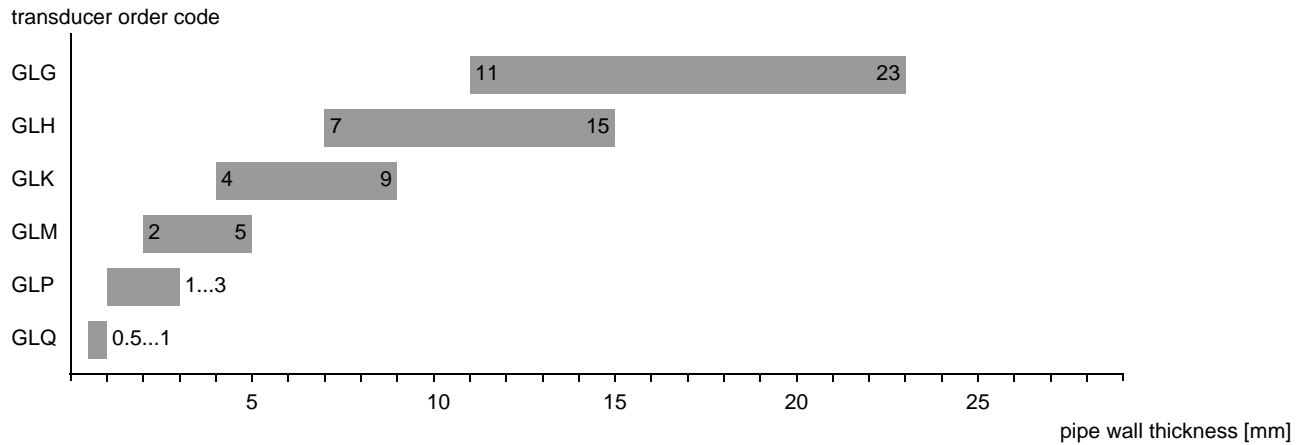


Transducers

Transducer Selection

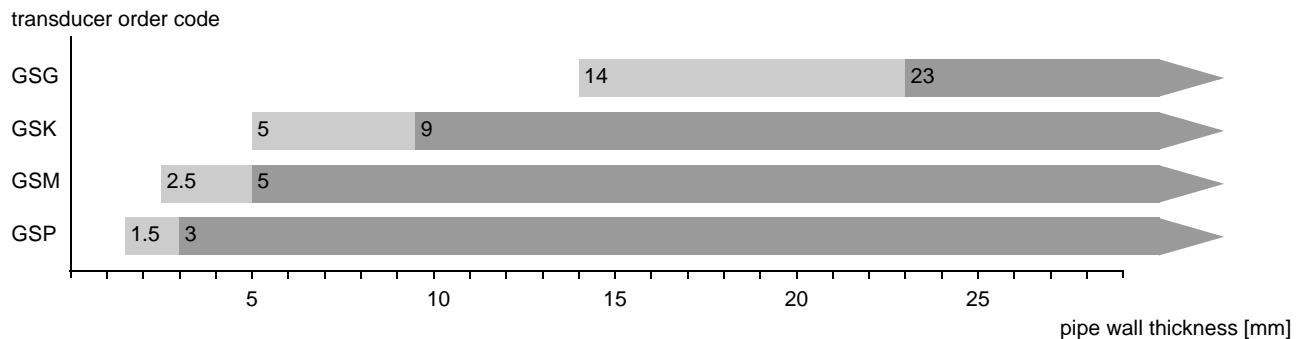
Step 1a

Select a Lamb wave transducer:



Step 1b

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



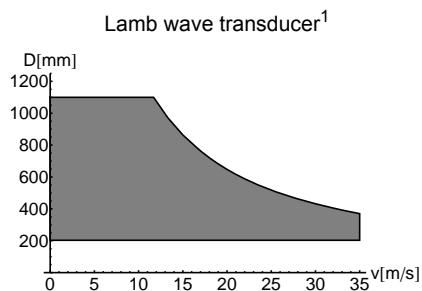
recommended
 possible

Step 2

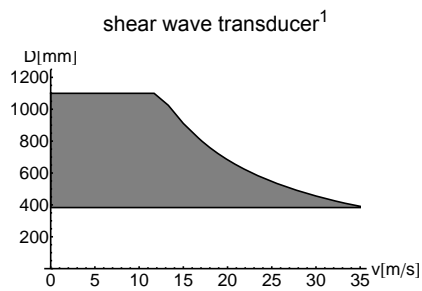
inner pipe diameter d dependent on the flow velocity v of the medium in the pipe

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.

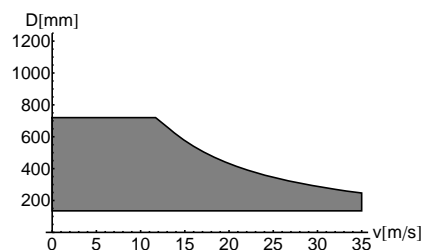
Lamb wave transducers: If the values d and v are not in the range, diagonal mode with 1 sound path may be used, i.e. the same characteristics can be used with doubling the inner pipe diameter. If the values are still not in the range, shear waves transducers regarding the pipe wall thickness have to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



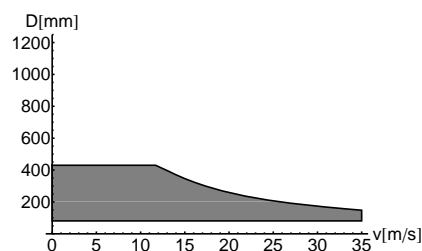
GLG



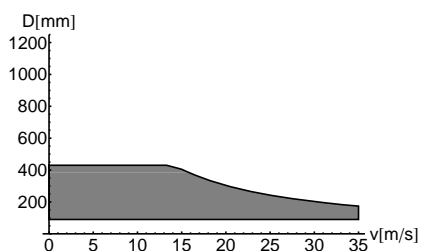
GSG



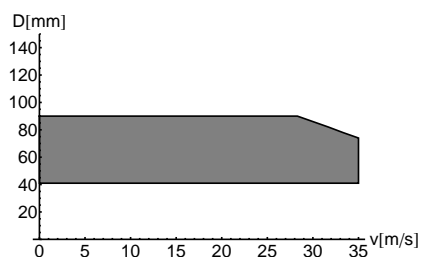
GLH



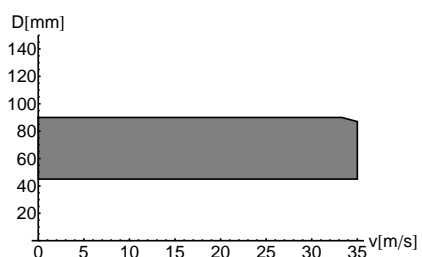
GLK



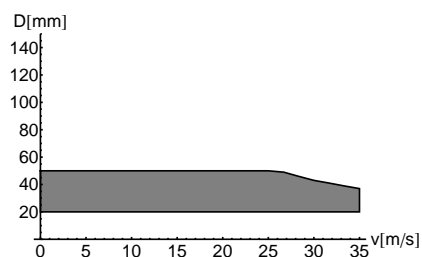
GSK



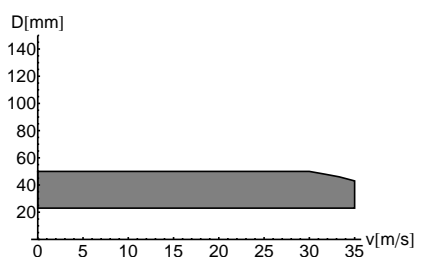
GLM



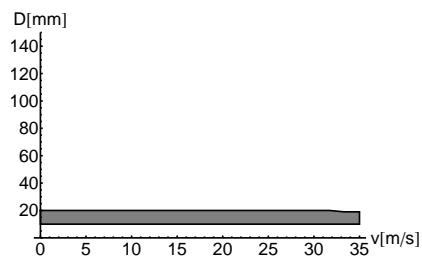
GSM



GLP



GSP



GLQ

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

Step 3

min. medium pressure

| Lamb wave transducer | | | |
|-----------------------|------------------------------------|-----------------------------------|--------------|
| transducer order code | medium pressure ¹ [bar] | | |
| | metal pipe | | plastic pipe |
| | min. | min. extended | min. |
| GLG | 15 | 10 | 1 |
| GLH | 15 | 10 | 1 |
| GLK | 15 (d > 120 mm) 10 (d < 120 mm) | 10 (d > 120 mm) 5 (d < 120 mm) | 1 |
| GLM | 10 (d > 60 mm) 5 (d < 60 mm) | - | 1 |
| GLP | 10 (d > 35 mm) 5 (d < 35 mm) | - | 1 |
| GLQ | 10 (d > 15 mm) 5 (d < 15 mm) | - | 1 |

| shear wave transducer | | | |
|-----------------------|------------------------------------|---------------|--------------|
| transducer order code | medium pressure ¹ [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 |

¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

d - inner pipe diameter

Example

| step | | | | | | |
|------|--|-----------|------------------|--|--|------------------|
| 1 | pipe wall thickness selected transducer | mm | 12 GLG or GLH | 12 GLG or GLH | 12 GLG or GLH | 30 GS |
| 2 | inner pipe diameter max. flow velocity selected transducer | mm m/s | 800 15 GLG | 600 15 GLG or GLH | 800 30 values not in the range of the characteristics, but by using diagonal mode with 1 sound path, the inner pipe diameter in the characteristics is doubled: GLG | 300 15 GSK |
| 3 | min. medium pressure selected transducer | bar | 17 GLG | 17 GLG or GLH influence of acoustic noise is reduced with increased transducer frequency, thus recommended: GLH | 17 GLG | 35 GSK |

Step 4

for the characters 4...11 of the transducer order code (operating temperature, explosion protection, connection system, extension cable) see page 15

Step 5

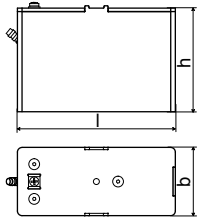
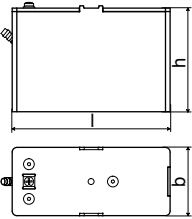
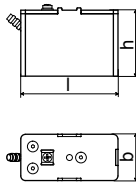
for the technical data of the selected transducer see page 16 et seqq.

Transducer Order Code

| 1, 2 | 3 | 4 | 5, 6 | 7, 8 | 9...11 | 12, 13 | no. of character | | | |
|------------|----------------------|---|-----------------------|----------------------|-------------------|--------|------------------|----|--------|--|
| transducer | transducer frequency | - | operating temperature | explosion protection | connection system | - | extension cable | / | option | description |
| GL | | | | | | | | | | set of ultrasonic flow transducers for gas measurement, Lamb wave |
| GS | | | | | | | | | | set of ultrasonic flow transducers for gas measurement, shear wave |
| | G | | | | | | | | | 0.2 MHz |
| | H | | | | | | | | | 0.3 MHz (Lamb wave only) |
| | K | | | | | | | | | 0.5 MHz |
| | M | | | | | | | | | 1 MHz |
| | P | | | | | | | | | 2 MHz |
| | Q | | | | | | | | | 4 MHz (Lamb wave only) |
| | | N | | | | | | | | normal temperature range |
| | | E | | | | | | | | extended temperature range (shear wave transducers with transducer frequency M, P) |
| | | | A1 | | | | | | | ATEX zone 1 |
| | | | A2 | | | | | | | ATEX zone 2 |
| | | | | NL | | | | | | with Lemo connector |
| | | | | | | XXX | | | | cable length in m, for max. length of extension cable see page 27 (connector outside of ATEX zone 1) |
| | | | | | | | | LC | | long transducer cable (ATEX zone 1) |
| example | | | | | | | | | | |
| GL | K | - | N | A2 | NL | - | 030 | | | Lamb wave transducer 0.5 MHz, normal temperature range, ATEX zone 2, connection system NL with Lemo connector and extension cable 30 m |
| | | - | | | | - | | / | | |

Technical Data

Shear Wave Transducers (zone 1)

| technical type | | GDG1NW1 | GLG1NW1 | GDK1NW1 | GLK1NW1 | GDM2NW1 | GLM2NW1 |
|--|---------------------------------------|---|--------------|--|--------------|---|--------------|
| order code | | GSG-NA1NL | GSG-NA1NL/LC | GSK-NA1NL | GSK-NA1NL/LC | GSM-NA1NL | GSM-NA1NL/LC |
| transducer frequency | | 0.2 | | 0.5 | | 1 | |
| medium pressure¹ | | | | | | | |
| min. extended | bar | metal pipe: 20 | | metal pipe: 20 | | metal pipe: 20 | |
| min. | bar | metal pipe: 30 | | metal pipe: 30 | | metal pipe: 30 | |
| | | plastic pipe: 1 | | plastic pipe: 1 | | plastic pipe: 1 | |
| inner pipe diameter d² | | | | | | | |
| min. extended | mm | 250 | | 70 | | 30 | |
| min. recommended | mm | 380 | | 80 | | 40 | |
| max. recommended | mm | 810 | | 500 | | 80 | |
| max. extended | mm | 1100 | | 720 | | 120 | |
| pipe wall thickness | | | | | | | |
| min. | mm | 14 | | 5 | | 2.5 | |
| max. | mm | - | | - | | - | |
| material | | | | | | | |
| housing | | PEEK with stainless steel cap and transducer shoe 304 (1.4301) | | PEEK with stainless steel cap and transducer shoe 304 (1.4301) | | PEEK with stainless steel cap and transducer shoe 304 (1.4301) | |
| contact surface | | PEEK | | PEEK | | PEEK | |
| degree of protection according to IEC/EN 60529 | | IP65 | | IP65 | | IP65 | |
| transducer cable | | | | | | | |
| type | | 1699 | 1699 | 1699 | 1699 | 1699 | 1699 |
| length | m | 5 | 9 | 5 | 9 | 4 | 9 |
| dimensions | | | | | | | |
| length l | mm | 136.5 | | 136.5 | | 84 | |
| width b | mm | 59 | | 59 | | 40 | |
| height h | mm | 90.5 | | 90.5 | | 59 | |
| dimensional drawing | |  | |  | |  | |
| operating temperature | | | | | | | |
| min. | °C | -40 | | -40 | | -40 | |
| max. | °C | +130 | | +130 | | +130 | |
| temperature compensation | | x | | x | | x | |
| explosion protection | | | | | | | |
| transducer | | GSG-NA1NL | GSG-NA1NL/LC | GSK-NA1NL | GSK-NA1NL/LC | GSM-NA1NL | GSM-NA1NL/LC |
| category | | gas: 2/3G dust: 2D | | gas: 2/3G dust: 2D | | gas: 2/3G dust: 2D | |
| EPL | | Gb/Gc Db | | Gb/Gc Db | | Gb/Gc Db | |
| zone | | 1/2 21 | | 1/2 21 | | 1/2 21 | |
| explosion protection temperature (pipe surface) | | | | | | | |
| min. | °C | -55 | | -55 | | -55 | |
| max. | °C | +180 | | +180 | | +180 | |
| A T E X | marking | II2/3G Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | | II2/3G Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | | II2/3G Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | |
| | certification | IBExU10ATEX1162 X | | IBExU10ATEX1162 X | | IBExU10ATEX1162 X | |
| | type of protection | gas: powder filling, non sparking dust: protection by enclosure | | gas: powder filling, non sparking dust: protection by enclosure | | gas: powder filling, non sparking dust: protection by enclosure | |
| | necessary transducer mounting fixture | - | | - | | - | |
| | | | | | | | |

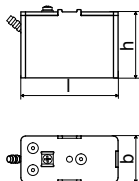
¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² shear wave transducer:

typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request

pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

Shear Wave Transducers (zone 1)

| | | | |
|--|---------------------------------------|---|---------------------|
| technical type | | GDP2NW1 | GLP2NW1 |
| order code | | GSP-NA1NL | GSP-NA1NL/LC |
| transducer frequency | MHz | 2 | |
| medium pressure¹ | | | |
| min. extended | bar | metal pipe: 20 | |
| min. | bar | metal pipe: 30 plastic pipe: 1 | |
| inner pipe diameter d² | | | |
| min. extended | mm | 15 | |
| min. recommended | mm | 20 | |
| max. recommended | mm | 40 | |
| max. extended | mm | 60 | |
| pipe wall thickness | | | |
| min. | mm | 1.5 | |
| max. | mm | - | |
| material | | | |
| housing | | PEEK with stainless steel cap and transducer shoe 304 (1.4301) | |
| contact surface | | PEEK | |
| degree of protection according to IEC/EN 60529 | | IP65 | |
| transducer cable | | | |
| type | | 1699 | 1699 |
| length | m | 4 | 9 |
| dimensions | | | |
| length l | mm | 84 | |
| width b | mm | 40 | |
| height h | mm | 59 | |
| dimensional drawing | |  | |
| operating temperature | | | |
| min. | °C | -40 | |
| max. | °C | +130 | |
| temperature compensation | | x | |
| explosion protection | | | |
| transducer | | GSP-NA1NL | GSP-NA1NL/LC |
| category | | gas: 2/3G dust: 2D | |
| EPL | | Gb/Gc Db | |
| zone | | 1/2 21 | |
| explosion protection temperature (pipe surface) | | | |
| min. | °C | -55 | |
| max. | °C | +180 | |
| A T E X | marking | CE 0637 (Ex) II2/3G Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | |
| | certification | IBExU10ATEX1162 X | |
| | type of protection | gas: powder filling, non sparking dust: protection by enclosure | |
| | necessary transducer mounting fixture | - | |

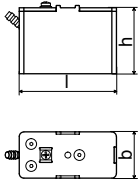
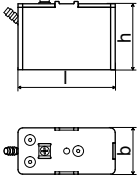
¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² shear wave transducer:

typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request

pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

Shear Wave Transducers (zone 1, extended temperature range)

| | | | | | |
|--|---------------------------------------|---|---------------------|---|---------------------|
| technical type | | GDM2EW5 | GLM2EW5 | GDP2EW5 | GLP2EW5 |
| order code | | GSM-EA1NL | GSM-EA1NL/LC | GSP-EA1NL | GSP-EA1NL/LC |
| transducer frequency | MHz | 1 | | 2 | |
| medium pressure¹ | | | | | |
| min. extended | bar | metal pipe: 20 | | metal pipe: 20 | |
| min. | bar | metal pipe: 30 | | metal pipe: 30 | |
| | | plastic pipe: 1 | | plastic pipe: 1 | |
| inner pipe diameter d² | | | | | |
| min. extended | mm | 30 | | 15 | |
| min. recommended | mm | 40 | | 20 | |
| max. recommended | mm | 80 | | 40 | |
| max. extended | mm | 120 | | 60 | |
| pipe wall thickness | | | | | |
| min. | mm | 2.5 | | 1.5 | |
| max. | mm | - | | - | |
| material | | | | | |
| housing | | PI with stainless steel cap and transducer shoe 304 (1.4301) | | PI with stainless steel cap and transducer shoe 304 (1.4301) | |
| contact surface | | PI | | PI | |
| degree of protection according to IEC/EN 60529 | | IP56 | | IP56 | |
| transducer cable | | | | | |
| type | | 6111 | 6111 | 6111 | 6111 |
| length | m | 4 | 9 | 4 | 9 |
| dimensions | | | | | |
| length l | mm | 84 | | 84 | |
| width b | mm | 40 | | 40 | |
| height h | mm | 59 | | 59 | |
| dimensional drawing | |  | |  | |
| operating temperature | | | | | |
| min. | °C | -30 | | -30 | |
| max. | °C | +200 | | +200 | |
| temperature compensation | | x | | x | |
| explosion protection | | | | | |
| transducer | | GSM-EA1NL | GSM-EA1NL/LC | GSP-EA1NL | GSP-EA1NL/LC |
| category | | gas :2/3G dust: 2D | | gas: 2/3G dust: 2D | |
| EPL | | Gb/Gc Db | | Gb/Gc Db | |
| zone | | 1/2 21 | | 1/2 21 | |
| explosion protection temperature (pipe surface) | | | | | |
| min. | °C | -45 | | -45 | |
| max. | °C | +225 | | +225 | |
| A T E X | marking | CE 0637 Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIA TX | | CE 0637 Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIA TX | |
| | certification | IBExU10ATEX1162 X | | IBExU10ATEX1162 X | |
| | type of protection | gas: powder filling, non sparking dust: protection by enclosure | | gas: powder filling, non sparking dust: protection by enclosure | |
| | necessary transducer mounting fixture | - | | - | |

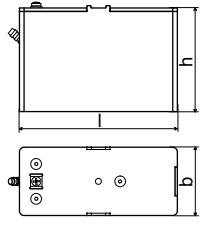
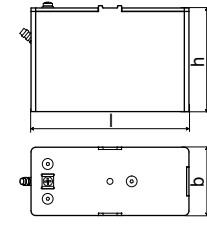
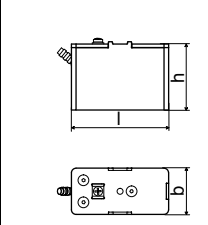
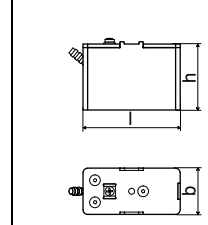
¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² shear wave transducer:

typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request

pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

Shear Wave Transducers (zone 2)

| technical type | | GDG1NH1 | GDK1NH1 | GDM2NH1 | GDP2NH1 |
|--|---------------------------------------|---|---|--|---|
| order code | | GSG-NA2NL | GSK-NA2NL | GSM-NA2NL | GSP-NA2NL |
| transducer frequency | | MHz 0.2 | 0.5 | 1 | 2 |
| medium pressure¹ | | | | | |
| min. extended min. | bar | metal pipe: 20 metal pipe: 30 plastic pipe: 1 | metal pipe: 20 metal pipe: 30 plastic pipe: 1 | metal pipe: 20 metal pipe: 30 plastic pipe: 1 | metal pipe: 20 metal pipe: 30 plastic pipe: 1 |
| inner pipe diameter d² | | | | | |
| min. extended | mm | 250 | 70 | 30 | 15 |
| min. recommended | mm | 380 | 80 | 40 | 20 |
| max. recommended | mm | 810 | 500 | 80 | 40 |
| max. extended | mm | 1100 | 720 | 120 | 60 |
| pipe wall thickness | | | | | |
| min. | mm | 14 | 5 | 2.5 | 1.5 |
| max. | mm | - | - | - | - |
| material | | | | | |
| housing | | PEEK with stainless steel cap and transducer shoe 304 (1.4301) | PEEK with stainless steel cap and transducer shoe 304 (1.4301) | PEEK with stainless steel cap and transducer shoe 304 (1.4301) | PEEK with stainless steel cap and transducer shoe 304 (1.4301) |
| contact surface | | PEEK | PEEK | PEEK | PEEK |
| degree of protection according to IEC/EN 60529 | | IP65 | IP65 | IP65 | IP65 |
| transducer cable | | | | | |
| type | | 1699 | 1699 | 1699 | 1699 |
| length | m | 5 | 5 | 4 | 4 |
| dimensions | | | | | |
| length l | mm | 136.5 | 136.5 | 84 | 84 |
| width b | mm | 59 | 59 | 40 | 40 |
| height h | mm | 90.5 | 90.5 | 59 | 59 |
| dimensional drawing | |  |  |  |  |
| operating temperature | | | | | |
| min. | °C | -40 | -40 | -40 | -40 |
| max. | °C | +130 | +130 | +130 | +130 |
| temperature compensation | | x | x | x | x |
| explosion protection | | | | | |
| transducer | | GSG-NA2NL | GSK-NA2NL | GSM-NA2NL | GSP-NA2NL |
| category | | gas: 3G dust: 2D | gas: 3G dust: 2D | gas: 3G dust: 2D | gas: 3G dust: 2D |
| EPL | | Gc Db | Gc Db | Gc Db | Gc Db |
| zone | | 2 21 | 2 21 | 2 21 | 2 21 |
| explosion protection temperature (pipe surface) | | | | | |
| min. | °C | -55 | -55 | -55 | -55 |
| max. | °C | +190 | +190 | +190 | +190 |
| A T E X | marking | CE 0637 Ex II3G Ex nA IIC T6...T2 Gc X II2D Ex tb IIIC TX Db | CE 0637 Ex II3G Ex nA IIC T6...T2 Gc X II2D Ex tb IIIC TX Db | CE 0637 Ex II3G Ex nA IIC T6...T2 Gc X II2D Ex tb IIIC TX Db | CE 0637 Ex II3G Ex nA IIC T6...T2 Gc X II2D Ex tb IIIC TX Db |
| | certification | IBExU10ATEX1163 X | IBExU10ATEX1163 X | IBExU10ATEX1163 X | IBExU10ATEX1163 X |
| | type of protection | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure |
| | necessary transducer mounting fixture | - | - | - | - |
| | | | | | |

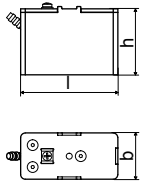
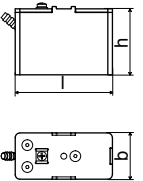
¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² shear wave transducer:

typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request

pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

Shear Wave Transducers (zone 2, extended temperature range)

| | | | |
|--|---------------------------------------|---|---|
| technical type | | GDM2EH5 | GDP2EH5 |
| order code | | GSM-EA2NL | GSP-EA2NL |
| transducer frequency | MHz | 1 | 2 |
| medium pressure¹ | | | |
| min. extended | bar | metal pipe: 20 | metal pipe: 20 |
| min. | bar | metal pipe: 30 | metal pipe: 30 |
| | | plastic pipe: 1 | plastic pipe: 1 |
| inner pipe diameter d² | | | |
| min. extended | mm | 30 | 15 |
| min. recommended | mm | 40 | 20 |
| max. recommended | mm | 80 | 40 |
| max. extended | mm | 120 | 60 |
| pipe wall thickness | | | |
| min. | mm | 2.5 | 1.5 |
| max. | mm | - | - |
| material | | | |
| housing | | PI with stainless steel cap and transducer shoe 304 (1.4301) | PI with stainless steel cap and transducer shoe 304 (1.4301) |
| contact surface | | PI | PI |
| degree of protection according to IEC/EN 60529 | | IP56 | IP56 |
| transducer cable | | | |
| type | | 6111 | 6111 |
| length | m | 4 | 4 |
| dimensions | | | |
| length l | mm | 84 | 84 |
| width b | mm | 40 | 40 |
| height h | mm | 59 | 59 |
| dimensional drawing | |  |  |
| operating temperature | | | |
| min. | °C | -30 | -30 |
| max. | °C | +200 | +200 |
| temperature compensation | | x | x |
| explosion protection | | | |
| transducer | | GSM-EA2NL | GSP-EA2NL |
| category | | gas: 3G dust: 2D | gas: 3G dust: 2D |
| EPL | | Gc Db | Gc Db |
| zone | | 2 21 | 2 21 |
| explosion protection temperature (pipe surface) | | | |
| min. | °C | -45 | -45 |
| max. | °C | +235 | +235 |
| A T E X | marking | CE 0637 Ex nA IIC T6...T2 Gc X II2D Ex tb IIIA TX Db | CE 0637 Ex nA IIC T6...T2 Gc X II2D Ex tb IIIA TX Db |
| | certification | IBExU10ATEX1163 X | IBExU10ATEX1163 X |
| | type of protection | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure |
| | necessary transducer mounting fixture | - | - |

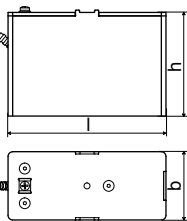
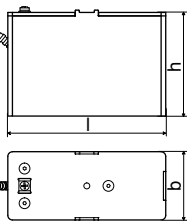
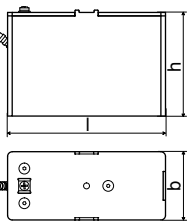
¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² shear wave transducer:

typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request

pipe diameter min. recommended/max. recommended/max. extended: in diagonal mode and for a flow velocity of 15 m/s

Lamb Wave Transducers (zone 1)

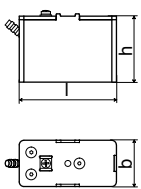
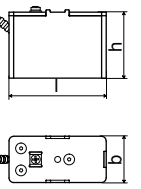
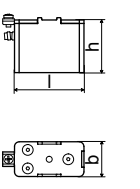
| technical type | | GRG1NW3 | GTG1NW3 | GRH1NW3 | GTH1NW3 | GRK1NW3 | GTK1NW3 |
|--|---------------------------------------|---|---------------------|--|---------------------|--|---------------------|
| order code | | GLG-NA1NL | GLG-NA1NL/LC | GLH-NA1NL | GLH-NA1NL/LC | GLK-NA1NL | GLK-NA1NL/LC |
| transducer frequency | MHz | 0.2 | | 0.3 | | 0.5 | |
| medium pressure¹ | | | | | | | |
| min. extended | bar | metal pipe: 10 | | metal pipe: 10 | | metal pipe: 10 | |
| min. | bar | metal pipe: 15 plastic pipe: 1 | | metal pipe: 15 plastic pipe: 1 | | metal pipe: 10 (d > 120 mm), 5 (d < 120 mm) metal pipe: 15 (d > 120 mm), 10 (d < 120 mm) plastic pipe: 1 | |
| inner pipe diameter d² | | | | | | | |
| min. extended | mm | 190 | | 120 | | 60 | |
| min. recommended | mm | 220 | | 140 | | 80 | |
| max. recommended | mm | 900 | | 600 | | 300 | |
| max. extended | mm | 1600 | | 1000 | | 500 | |
| pipe wall thickness | | | | | | | |
| min. | mm | 11 | | 7 | | 4 | |
| max. | mm | 23 | | 15 | | 9 | |
| material | | | | | | | |
| housing | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | |
| contact surface | | PPSU | | PPSU | | PPSU | |
| degree of protection according to IEC/EN 60529 | | IP65 | | IP65 | | IP65 | |
| transducer cable | | | | | | | |
| type | | 1699 | 1699 | 1699 | 1699 | 1699 | 1699 |
| length | m | 5 | 9 | 5 | 9 | 5 | 9 |
| dimensions | | | | | | | |
| length l | mm | 136.5 | | 136.5 | | 136.5 | |
| width b | mm | 59 | | 59 | | 59 | |
| height h | mm | 90.5 | | 90.5 | | 90.5 | |
| dimensional drawing | |  | |  | |  | |
| operating temperature | | | | | | | |
| min. | °C | -40 | | -40 | | -40 | |
| max. | °C | +170 | | +170 | | +170 | |
| temperature compensation | | x | | x | | x | |
| explosion protection | | | | | | | |
| transducer | | GLG-NA1NL | GLG-NA1NL/LC | GLH-NA1NL | GLH-NA1NL/LC | GLK-NA1NL | GLK-NA1NL/LC |
| category | | gas: 2/3G dust: 2D | | gas: 2/3G dust: 2D | | gas: 2/3G dust: 2D | |
| EPL | | Gb/Gc Db | | Gb/Gc Db | | Gb/Gc Db | |
| zone | | 1/2 21 | | 1/2 21 | | 1/2 21 | |
| explosion protection temperature (pipe surface) | | | | | | | |
| min. | °C | -55 | | -55 | | -55 | |
| max. | °C | +140 | | +140 | | +140 | |
| A T E X | marking | CE 0637 (Ex) II2/3G Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | | CE 0637 (Ex) II2/3G Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | | CE 0637 (Ex) II2/3G Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | |
| | certification | IBExU10ATEX1162 X | | IBExU10ATEX1162 X | | IBExU10ATEX1162 X | |
| | type of protection | gas: powder filling, non sparking dust: protection by enclosure | | gas: powder filling, non sparking dust: protection by enclosure | | gas: powder filling, non sparking dust: protection by enclosure | |
| | necessary transducer mounting fixture | | | | | | |
| | | | | | | | |

¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² Lamb wave transducer:

typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request
 pipe diameter min. recommended/max. recommended: in reflection mode and for a flow velocity of 15 m/s
 pipe diameter max. extended: in diagonal mode and for a flow velocity of 25 m/s

Lamb Wave Transducers (zone 1)

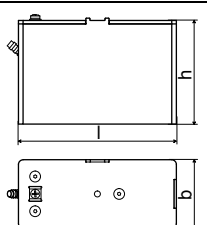
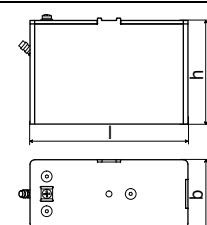
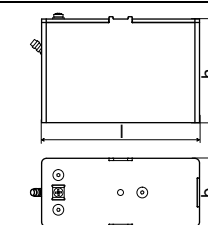
| technical type | | GRM1NW3 | GTM1NW3 | GRP1NW3 | GTP1NW3 | GRQ1NW3 | GTQ1NW3 | |
|--|------------|---|--------------|---|--------------|---|--------------|--|
| order code | | GLM-NA1NL | GLM-NA1NL/LC | GLP-NA1NL | GLP-NA1NL/LC | GLQ-NA1NL | GLQ-NA1NL/LC | |
| transducer frequency | MHz | 1 | | 2 | | 4 | | |
| medium pressure¹ | | | | | | | | |
| min. extended min. | bar bar | - | | - | | - | | |
| | | metal pipe: 10 (d > 60 mm), 5 (d < 60 mm) plastic pipe: 1 | | metal pipe: 10 (d > 35 mm), 5 (d < 35 mm) plastic pipe: 1 | | metal pipe: 10 (d > 15 mm), 5 (d < 15 mm) plastic pipe: 1 | | |
| inner pipe diameter d² | | | | | | | | |
| min. extended | mm | 30 | | 15 | | 7 | | |
| min. recommended | mm | 40 | | 20 | | 10 | | |
| max. recommended | mm | 90 | | 50 | | 22 | | |
| max. extended | mm | 150 | | 70 | | 35 | | |
| pipe wall thickness | | | | | | | | |
| min. | mm | 2 | | 1 | | 0.5 | | |
| max. | mm | 5 | | 3 | | 1 | | |
| material | | | | | | | | |
| housing | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | | |
| contact surface | | PPSU | | PPSU | | PPSU | | |
| degree of protection according to IEC/EN 60529 | | IP65 | | IP65 | | IP65 | | |
| transducer cable | | | | | | | | |
| type | | 1699 | 1699 | 1699 | 1699 | 1699 | 1699 | |
| length | m | 4 | 9 | 4 | 9 | 4 | 9 | |
| dimensions | | | | | | | | |
| length l | mm | 84 | | 84 | | 70 | | |
| width b | mm | 40 | | 40 | | 30 | | |
| height h | mm | 59 | | 59 | | 47.5 | | |
| dimensional drawing | |  | |  | |  | | |
| operating temperature | | | | | | | | |
| min. | °C | -40 | | -40 | | -40 | | |
| max. | °C | +170 | | +170 | | +170 | | |
| temperature compensation | | x | | x | | x | | |
| explosion protection | | | | | | | | |
| transducer | | GLM-NA1NL | GLM-NA1NL/LC | GLP-NA1NL | GLP-NA1NL/LC | GLQ-NA1NL | GLQ-NA1NL/LC | |
| category | | gas: 2/3G dust: 2D | | gas: 2/3G dust: 2D | | gas: 2/3G dust: 2D | | |
| EPL | | Gb/Gc Db | | Gb/Gc Db | | Gb/Gc Db | | |
| zone | | 1/2 21 | | 1/2 21 | | 1/2 21 | | |
| explosion protection temperature (pipe surface) | | | | | | | | |
| min. | °C | -55 | | -55 | | -55 | | |
| max. | °C | +140 | | +140 | | +140 | | |
| marking | | CE 0637 Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | | CE 0637 Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | | CE 0637 Ex q nA IIC T6...T2 Gb/Gc II2D Ex tb IIIC TX | | |
| certification | | IBExU10ATEX1162 X | | IBExU10ATEX1162 X | | IBExU10ATEX1162 X | | |
| type of protection | | gas: powder filling, non sparking dust: protection by enclosure | | gas: powder filling, non sparking dust: protection by enclosure | | gas: powder filling, non sparking dust: protection by enclosure | | |
| necessary transducer mounting fixture | | - | | - | | - | | |
| remark | | | | | | | on request | |

¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² Lamb wave transducer:

typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request
 pipe diameter min. recommended/max. recommended: in reflection mode and for a flow velocity of 15 m/s
 pipe diameter max. extended: in diagonal mode and for a flow velocity of 25 m/s

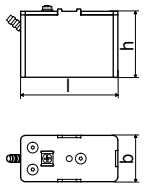
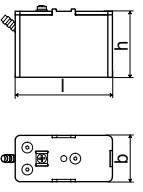
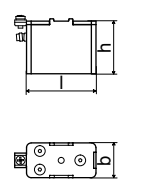
Lamb Wave Transducers (zone 2)

| technical type | | GRG1NH3 | GRH1NH3 | GRK1NH3 |
|--|--|---|---|--|
| order code | | GLG-NA2NL | GLH-NA2NL | GLK-NA2NL |
| transducer frequency | | MHz 0.2 | 0.3 | 0.5 |
| medium pressure¹ | | | | |
| min. extended | | bar metal pipe: 10 | metal pipe: 10 | metal pipe: 10 (d > 120 mm) 5 (d < 120 mm) |
| min. | | bar metal pipe: 15 plastic pipe: 1 | metal pipe: 15 plastic pipe: 1 | metal pipe: 15 (d > 120 mm) 10 (d < 120 mm) plastic pipe: 1 |
| inner pipe diameter d² | | | | |
| min. extended | | mm 190 | 120 | 60 |
| min. recommended | | mm 220 | 140 | 80 |
| max. recommended | | mm 900 | 600 | 300 |
| max. extended | | mm 1600 | 1000 | 500 |
| pipe wall thickness | | | | |
| min. | | mm 11 | 7 | 4 |
| max. | | mm 23 | 15 | 9 |
| material | | | | |
| housing | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | PPSU with stainless steel cap and transducer shoe 304 (1.4301) |
| contact surface | | PPSU | PPSU | PPSU |
| degree of protection according to IEC/EN 60529 | | IP65 | IP65 | IP65 |
| transducer cable | | | | |
| type | | 1699 | 1699 | 1699 |
| length | | m 5 | 5 | 5 |
| dimensions | | | | |
| length l | | mm 136.5 | 136.5 | 136.5 |
| width b | | mm 59 | 59 | 59 |
| height h | | mm 90.5 | 90.5 | 90.5 |
| dimensional drawing | |  |  |  |
| operating temperature | | | | |
| min. | | °C -40 | -40 | -40 |
| max. | | °C +170 | +170 | +170 |
| temperature compensation | | x | x | x |
| explosion protection | | | | |
| transducer | | GLG-NA2NL | GLH-NA2NL | GLK-NA2NL |
| category | | gas: 3G dust: 2D | gas: 3G dust: 2D | gas: 3G dust: 2D |
| EPL | | Gc Db | Gc Db | Gc Db |
| zone | | 2 21 | 2 21 | 2 21 |
| explosion protection temperature (pipe surface) | | | | |
| min. | | °C -55 | -55 | -55 |
| max. | | °C +150 | +150 | +150 |
| marking | | CE 0637 (Ex) I13G Ex nA IIC T6...T2 Gc X I12D Ex tb IIIC TX Db | CE 0637 (Ex) I13G Ex nA IIC T6...T2 Gc X I12D Ex tb IIIC TX Db | CE 0637 (Ex) I13G Ex nA IIC T6...T2 Gc X I12D Ex tb IIIC TX Db |
| certification | | IBExU10ATEX1163 X | IBExU10ATEX1163 X | IBExU10ATEX1163 X |
| type of protection | | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure |
| necessary transducer mounting fixture | | - | - | - |

¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² Lamb wave transducer:
typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request
pipe diameter min. recommended/max. recommended: in reflection mode and for a flow velocity of 15 m/s
pipe diameter max. extended: in diagonal mode and for a flow velocity of 25 m/s

Lamb Wave Transducers (zone 2)

| technical type | | GRM1NH3 | GRP1NH3 | GRQ1NH3 |
|--|------------|---|---|--|
| order code | | GLM-NA2NL | GLP-NA2NL | GLQ-NA2NL |
| transducer frequency | MHz | 1 | 2 | 4 |
| medium pressure¹ | | | | |
| min. extended min. | bar bar | - metal pipe: 10 (d > 60 mm) 5 (d < 60 mm) plastic pipe: 1 | - metal pipe: 10 (d > 35 mm) 5 (d < 35 mm) plastic pipe: 1 | - metal pipe: 10 (d > 15 mm) 5 (d < 15 mm) plastic pipe: 1 |
| inner pipe diameter d² | | | | |
| min. extended | mm | 30 | 15 | 7 |
| min. recommended | mm | 40 | 20 | 10 |
| max. recommended | mm | 90 | 50 | 22 |
| max. extended | mm | 150 | 70 | 35 |
| pipe wall thickness | | | | |
| min. | mm | 2 | 1 | 0.5 |
| max. | mm | 5 | 3 | 1 |
| material | | | | |
| housing | | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | PPSU with stainless steel cap and transducer shoe 304 (1.4301) | PPSU with stainless steel cap and transducer shoe 304 (1.4301) |
| contact surface | | PPSU | PPSU | PPSU |
| degree of protection according to IEC/EN 60529 | | IP65 | IP65 | IP65 |
| transducer cable | | | | |
| type | | 1699 | 1699 | 1699 |
| length | m | 4 | 4 | 3 |
| dimensions | | | | |
| length l | mm | 84 | 84 | 70 |
| width b | mm | 40 | 40 | 30 |
| height h | mm | 59 | 59 | 47.5 |
| dimensional drawing | |  |  |  |
| operating temperature | | | | |
| min. | °C | -40 | -40 | -40 |
| max. | °C | +170 | +170 | +170 |
| temperature compensation | | x | x | x |
| explosion protection | | | | |
| transducer | | GLM-NA1NL | GLP-NA1NL | GLQ-NA1NL |
| category | | gas: 3G dust: 2D | gas: 3G dust: 2D | gas: 3G dust: 2D |
| EPL | | Gc Db | Gc Db | Gc Db |
| zone | | 2 21 | 2 21 | 2 21 |
| explosion protection temperature (pipe surface) | | | | |
| min. | °C | -55 | -55 | -55 |
| max. | °C | +150 | +150 | +150 |
| marking | | CE 0637 Ex II3G Ex nA IIC T6...T2 Gc X II2D Ex tb IIIC TX Db | CE 0637 Ex II3G Ex nA IIC T6...T2 Gc X II2D Ex tb IIIC TX Db | CE 0637 Ex II3G Ex nA IIC T6...T2 Gc X II2D Ex tb IIIC TX Db |
| certification | | IBExU10ATEX1163 X | IBExU10ATEX1163 X | IBExU10ATEX1163 X |
| type of protection | | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure | gas: non sparking dust: protection by enclosure |
| necessary transducer mounting fixture | | - | - | - |
| remark | | | | on request |

¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

² Lamb wave transducer:

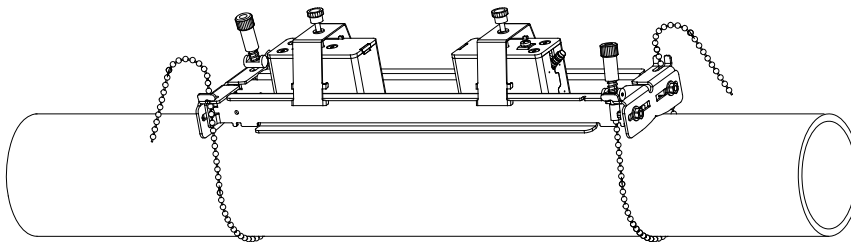
typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request
 pipe diameter min. recommended/max. recommended: in reflection mode and for a flow velocity of 15 m/s
 pipe diameter max. extended: in diagonal mode and for a flow velocity of 25 m/s

Transducer Mounting Fixture

Order Code

| 1, 2 | 3 | 4 | 5 | 6 | 7...9 | no. of character | | |
|-----------------------------|------------|---|----------------|------|-------|------------------|---------------------|----------------------------------|
| transducer mounting fixture | transducer | - | measuring mode | size | - | fixation | outer pipe diameter | description |
| VP | | | | | | | | portable Variofix |
| | A | | | | | | | all transducers |
| | | | D | | | | | reflection mode or diagonal mode |
| | | | R | | | | | reflection mode |
| | | | | M | | | | medium |
| | | | | | C | | | chains |
| | | | | | N | | | without fixation |
| | | | | | | | 055 | 10...550 mm |
| example | | | | | | | | |
| VP | A | - | D | M | - | C | 055 | portable Variofix and chains |
| | | - | | | - | | | |

portable Variofix VP and chains



material: stainless steel 304 (1.4301), 301 (1.4310), 303 (1.4305)

dimensions:
414 x 94 x 76 mm
chain length: 2 m

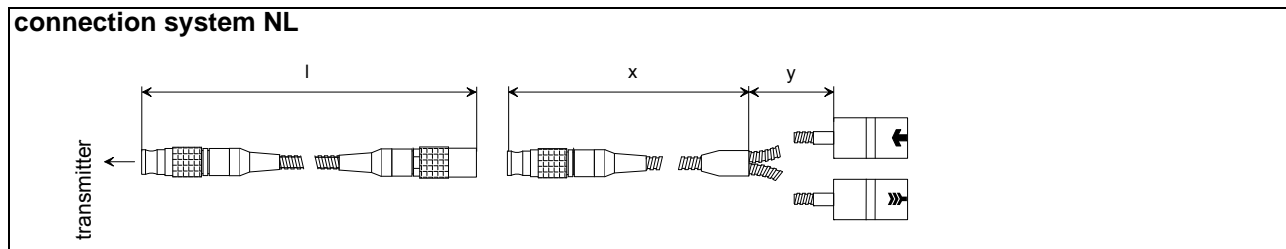
Coupling Materials for Transducers

| | normal temperature range (4th character of transducer order code = N) | | normal temperature range (4th character of transducer order code = E) | |
|--------|---|-----------------------------|---|----------------------------------|
| | < 100 °C | 100...170 °C | < 150 °C | 150...200 °C |
| < 2 h | coupling compound type N | coupling compound type E | coupling compound type E | coupling compound type E or H |
| < 24 h | coupling compound type N | coupling compound type E | coupling compound type E | coupling foil type VT |

Technical Data

| type | Order Code | operating temperature °C | material | remark |
|-----------------------------|------------|--|----------------------|---|
| coupling compound type N | 990739-1 | -30...+130 | mineral grease paste | |
| coupling compound type E | 990739-2 | -30...+200 | silicone paste | |
| coupling compound type H | 990739-3 | -30...+250 | fluoropolymer paste | |
| coupling foil type VT | 990739-0 | -10...+150, short-time peak max. 200 | fluoroelastomer | for transducers with transducer frequency G, H, K |
| | 990739-6 | | | for shear wave transducers with transducer frequency M, P |
| | 990739-14 | | | for shear wave transducers IP68 and Lambwave transducers with transducer frequency M, P |
| | 990739-15 | | | for shear wave transducers with transducer frequency Q |
| | 990739-5 | | | for Lambwave transducers with transducer frequency Q |

Connection Systems



| transducer frequency (3d character of transducer order code) | | G, H, K | | | M, P | | | Q | | | S | | | |
|--|--------------------------|---------|---|---|------|---|---|------|---|---|------|---|---|------|
| N L | cable length | m | x | y | l | x | y | l | x | y | l | x | y | l |
| | cable length (option LC) | m | 2 | 3 | ≤ 10 | 2 | 2 | ≤ 10 | 2 | 1 | ≤ 10 | 1 | 1 | ≤ 10 |
| | | | 2 | 7 | ≤ 10 | 7 | 2 | ≤ 10 | 8 | 1 | ≤ 10 | - | - | - |

x, y - transducer cable length

l - max. length of extension cable

Transducer Cable

Technical Data

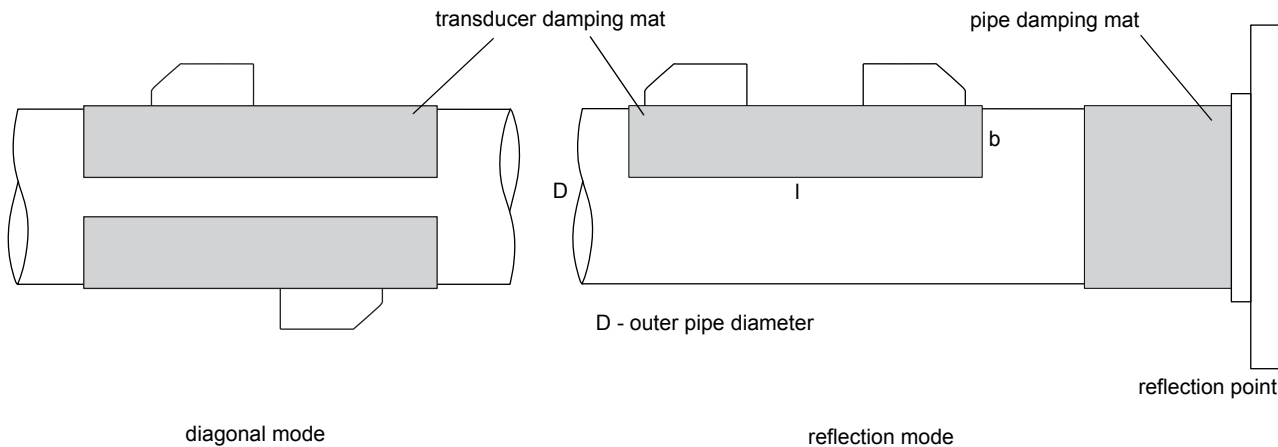
| | | transducer cable | | extension cable | |
|-----------------------|----|------------------------------|------|------------------------------|----|
| type | | 1699 | 6111 | 1750 | |
| standard length | m | see table above | | 5 | 10 |
| operating temperature | °C | -55...+200 | | -100...+225 | |
| sheath | | | | | |
| material | | stainless steel 304 (1.4301) | | stainless steel 304 (1.4301) | |
| outer diameter | mm | 8 | | 9 | |
| cable jacket | | | | | |
| material | | PTFE | | PFA | |
| outer diameter | mm | 2.9 | | 2.7 | |
| thickness | mm | 0.3 | | 0.5 | |
| color | | brown | | white | |
| shield | | x | | x | |

Damping Mats (optional)

Damping mats will be used for the gas measurement to reduce acoustic noise influences on the measurement.

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 mm | dimensions l x b x h mm | transducer frequency | | | | | technical type | operating temperature °C | remark |
|-------------------------------|---|---------------------------|-------------------------------|----------------------|---|---|---|-------|----------------|-----------------------------|------------------------------|
| | | | | G | H | K | M | P | | | |
| transducer damping mat | | | | | | | | | | | |
| D | for temporary installation (multiple use), fixed with coupling compound | < 80 | 450 x 115 x 0.5 | - | - | - | x | x | D20S3 | -25...+60 | |
| | | ≥ 80 | 900 x 230 x 0.5 | - | - | x | x | - | D20S2 | | |
| | | 900 x 230 x 1.3 | 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 | A20S4 | -25...+60 | for quantity see table below |
| B | self-adhesive | ≥ 300 | l x 100 x 0.9 | x | x | x | x | x | B35R2 | -35...+50 | l - see table below |

Quantity for Pipe Damping Mat - type A

(depending on the outer pipe diameter)

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

Length of Pipe Damping Mat - type B

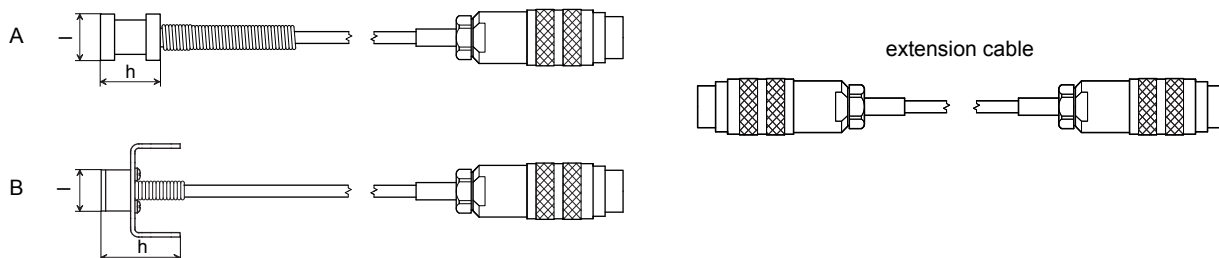
(length l depending on transducer frequency and outer pipe diameter)

| outer pipe diameter D mm | transducer frequency | |
|-----------------------------|----------------------|---------------|
| | G, H mm | K, M, P mm |
| 300 | 12 | 6 |
| 500 | 32 | 16 |
| 1000 | 126 | 63 |

Clamp-on Temperature Probe (optional)

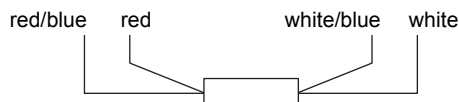
Technical Data

| | | | | | |
|--|----|---|---|---|---|
| order code | | 670415-1 | 670414-1 | 670415-2 | 670414-2 |
| design | | | | short response time | |
| type | | Pt100 | Pt100 matched according to DIN 1434-1 | Pt100 | Pt100 matched according to DIN 1434-1 |
| connection | | 4-wire | | 4-wire | |
| measuring range | °C | -30...+250 | | -50...+250 | |
| accuracy T | | $\pm(0.15 \text{ °C} + 2 \cdot 10^{-3} \cdot T \text{ [°C]})$, class A | | $\pm(0.15 \text{ °C} + 2 \cdot 10^{-3} \cdot T \text{ [°C]})$, class A | |
| accuracy ΔT | | - | $\leq 0.1 \text{ K}$ ($3\text{K} < \Delta T < 6 \text{ K}$), more corresponding to EN 1434-1 | - | $\leq 0.1 \text{ K}$ ($3\text{K} < \Delta T < 6 \text{ K}$), more corresponding to EN 1434-1 |
| response time | s | 50 | | 8 | |
| housing | | aluminum | | PEEK, stainless steel 304 (1.4301), copper | |
| degree of protection according to IEC/EN 60529 | | IP66 | | IP66 | |
| weight (without connector) | kg | 0.25 | 0.5 | 0.32 | 0.64 |
| fixation | | clamp-on | | clamp-on | |
| accessories | | - | | plastic protection plate, insulation foam | |
| dimensions | | | | | |
| length l | mm | 15 | | 14 | |
| width b | mm | 15 | | 30 | |
| height h | mm | 20 | | 27 | |
| dimensional drawing | | A | A | B | |



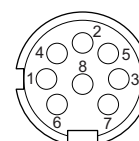
Connection

Temperature Probe



Connector

| pin | cable of temperature probe | extension cable |
|---------|----------------------------|-----------------|
| 1 | white/blue | blue |
| 2 | red/blue | gray |
| 3, 4, 5 | not connected | |
| 6 | red | red |
| 7 | white | white |
| 8 | not connected | |



Cable

| | | cable of temperature probe | extension cable |
|-----------------|---|---|-------------------------------------|
| type | | 4 x 0.25 mm ² black or white | LIYCY 8 x 0.14 mm ² gray |
| standard length | m | 3 | 5/10 |
| max. length | m | - | on request |
| cable jacket | | PTFE | PVC |



FLEXIM GmbH
Wolfener Str. 36
12681 Berlin
Germany
Tel.: +49 (30) 93 66 76 60
Fax: +49 (30) 93 66 76 80

internet: www.flexim.com
e-mail: info@flexim.com

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