

Portable ultrasonic flow measurement of gas and liquids in hazardous areas

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

Features

- Precise bidirectional and highly dynamic flow measurement with the non-invasive clamp-on technology
- High precision at fast and slow flow rates, high temperature and zero point stability
- Portable, easy-to-use flow transmitter with 2 flow channels, multiple inputs, an integrated data logger with a serial interface
- Extremely resistant carbon fiber housing
- Covered by FM Class I Div. 2 certification
- Compact and very lightweight, allowing the measuring system to be easily carried as personal luggage, e.g. for offshore visits
- Water tight; resistant against oil, many liquids and dirt
- Li-Ion battery provides up to 25 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 and fluid temperatures
- Rugged transducers (FM Class I Div. 2, resistant to rough environments and humidity)
- Robust, water-tight (IP67) transport case with comprehensive accessories
- QuickFix for fast mounting of the flow transmitter in difficult conditions
- Including measurement of liquids

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



Measurement with transducers mounted with the portable Variofix VP



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

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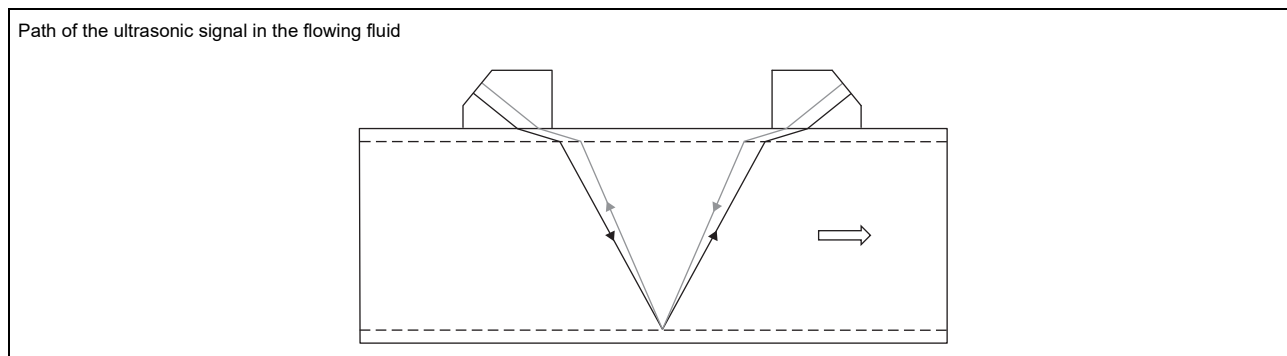
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Function

Measurement principle

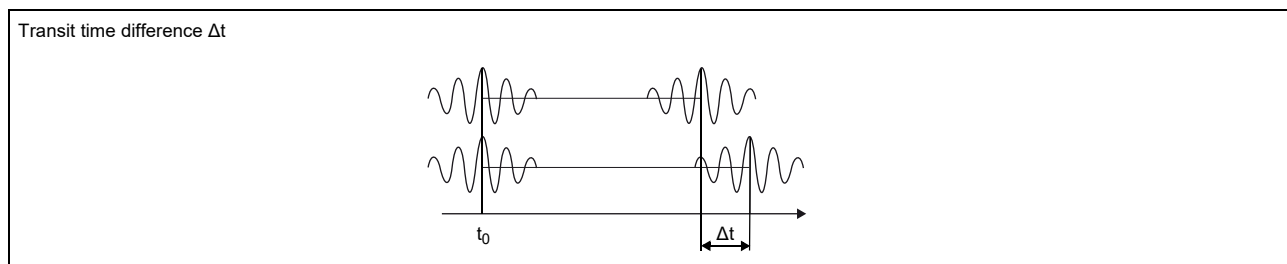
The transducers are mounted on the pipe which is completely filled with the fluid. The ultrasonic signals are emitted alternately by a transducer and received by the other. The physical quantities are determined from the transit times of the ultrasonic signals.



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 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.

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 mechanics calibration factor
- A - cross-sectional pipe area
- k_a - acoustical calibration factor
- Δt - transit time difference
- t_y - average of transit times in the fluid

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:

- **reflection arrangement**

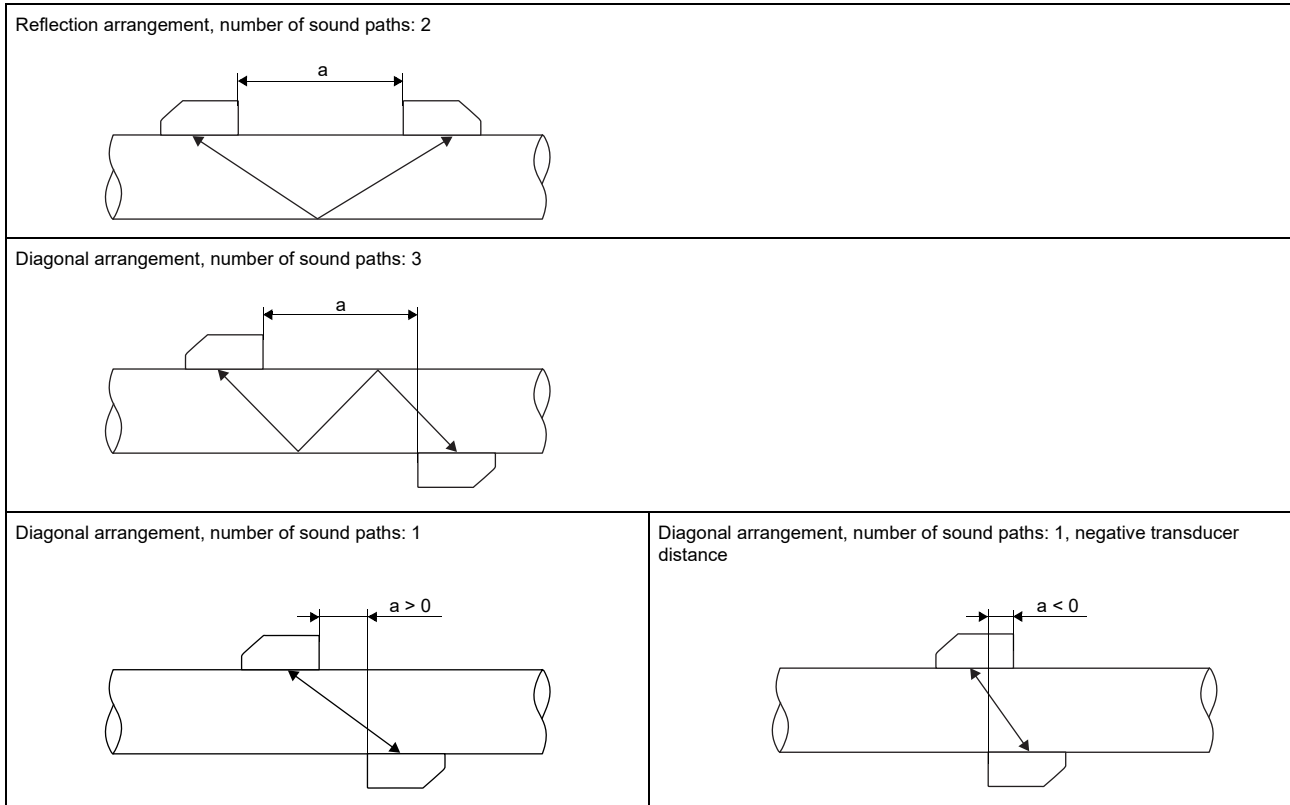
The number of sound paths is even. The transducers are mounted on the same side of the pipe. Correct positioning of the transducers is easier.

- **diagonal arrangement**

The number of sound paths is odd. The transducers are mounted on opposite sides of the pipe. In the case of a high signal attenuation by the fluid, pipe and coatings, diagonal arrangement with 1 sound path will be used.

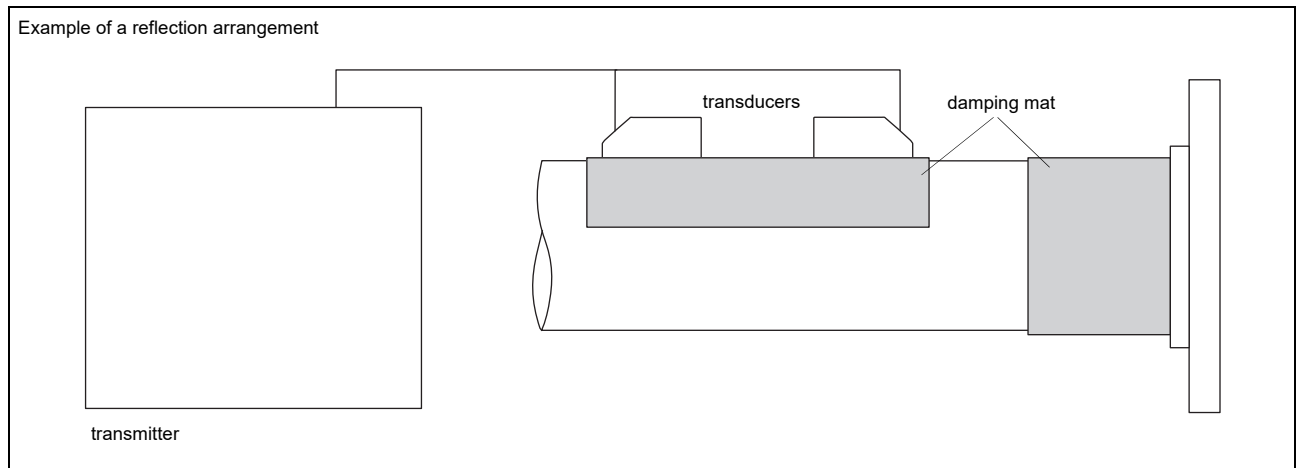
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

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



a - transducer distance

Typical measurement setup



Standard volumetric flow rate

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

$$\dot{V}_N = \dot{V} \cdot \frac{p}{p_N} \cdot \frac{T_N}{T} \cdot \frac{1}{K}$$

where

- \dot{V}_N - standard volumetric flow rate
- \dot{V} - 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 - compressibility coefficient of the gas: ratio of the compressibility factors of the gas at operating conditions and at standard conditions Z/Z_N



The operational pressure p and the operational temperature T of the fluid will be entered directly as fixed values into the transmitter. If temperature inputs are installed (optional), the temperature can be measured by the customer and fed in the transmitter.

The gas compressibility coefficient K of the gas is entered in the transmitter:

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

Transmitter

Technical data

		FLUXUS G608**-F2
		
design	portable, FM Class I Div. 2	
measurement		
measurement principle	transit time difference correlation principle	
flow velocity	m/s	0.01...35 m/s, depending on pipe diameter
repeatability	0.15 % of reading \pm 0.005 m/s	
fluid	all acoustically conductive gases, e.g. nitrogen, air, oxygen, hydrogen, argon, helium, ethylene, propane	
temperature compensation	corresponding to the recommendations in ANSI/ASME MFC-5.1-2011	
measurement uncertainty (volumetric flow rate)		
measurement uncertainty of measuring system ¹	\pm 0.3 % of reading \pm 0.005 m/s	
measurement uncertainty at the measuring point	\pm 1...3 % of reading \pm 0.005 m/s, depending on application	
transmitter		
power supply	<ul style="list-style-type: none"> • 100...230 V/50...60 Hz (power supply unit, outside of explosive atmosphere) • 10.5...15 V DC (socket at transmitter) • integrated battery 	
integrated battery	h	Li-Ion, 7.2 V/6.2 Ah
operating time	<ul style="list-style-type: none"> • > 14 h (without inputs and backlight) • > 25 h (1 measuring channel, ambient temperature > 10 °C, without inputs and backlight) 	
power consumption	W	< 6 (with inputs and backlight), charging: 18
number of measuring channels	2	
damping	s	0...100 (adjustable)
measuring cycle	Hz	100...1000 (1 channel)
response time	s	1 (1 channel), option: 0.07
housing material	PA, TPS, PC, Polyester, stainless steel	
degree of protection	IP65	
dimensions	mm	see dimensional drawing
weight	kg	2.2
fixation	QuickFix pipe mounting fixture	
ambient temperature	°C	-10...+60
display	2 x 16 characters, dot matrix, backlight	
menu language	English, German, French, Dutch, Spanish	
explosion protection		
• FM		
marking		NI/CI. I /Div. 2/ GP. A,B,C,D / T5 Ta = 60 °C
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	
communication interfaces		
service interfaces	<ul style="list-style-type: none"> • RS232 • USB (with adapter) 	
accessories		
serial data kit	<ul style="list-style-type: none"> • cable • adapter 	
software	<ul style="list-style-type: none"> • FluxDiagReader: download of measured values and parameters, graphical presentation • FluxDiag (optional): download of measurement data, graphical presentation, report generation • FluxSubstanceLoader: upload of fluid data sets 	
adapter	<ul style="list-style-type: none"> • input adapter (if number of inputs > 2) 	
transport case	dimensions: 500 x 400 x 190 mm	
data logger		
loggable values	all physical quantities, totaled values and diagnostic values	
capacity	> 100 000 measured values	

¹ with aperture calibration of the transducers

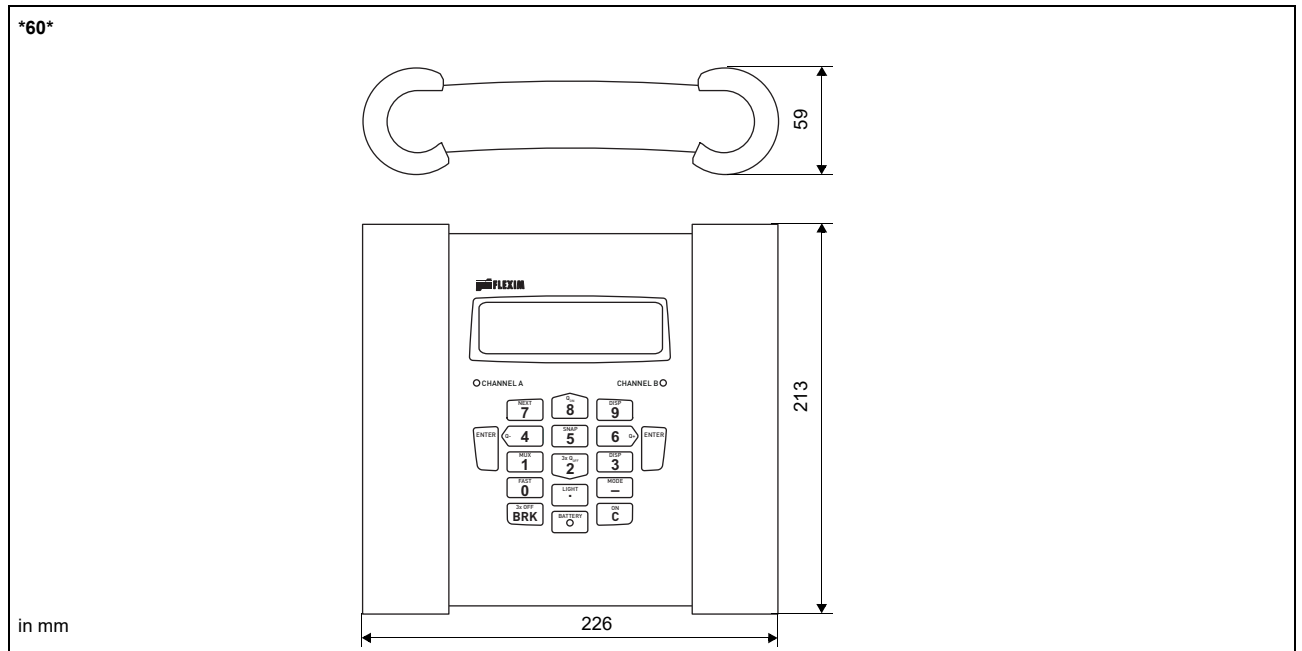
For the technical data in the flow measurement of liquids mode see Technical specification TSFLUXUS_F608xx-F2V*.*.

FLUXUS G608**-F2	
inputs	
	The inputs are galvanically isolated from the transmitter.
number	max. 4
• temperature input	
type	Pt100/Pt1000
connection	4-wire
range	°C -150...+560
resolution	K 0.01
accuracy	±0.01 % of reading ±0.03 K

¹ with aperture calibration of the transducers

For the technical data in the flow measurement of liquids mode see Technical specification TSFLUXUS_F608xx-F2V*-*.

Dimensions

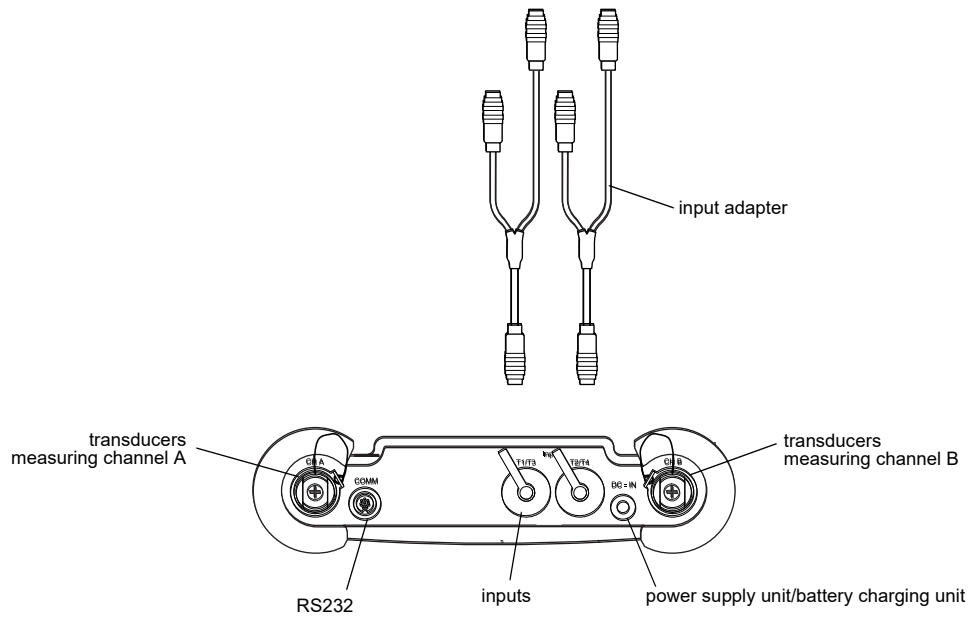


Standard scope of supply

	G608 Standard	G608 CA-Energy
application	flow measurement of gas	flow measurement of compressed air, industrial gases and liquids
	2 independent measuring channels	
	calculation of standard volumetric flow rate	calculation of standard volumetric flow rate, with optional use of current measured temperature values
		liquids: integrated heat flow computer for monitoring of energy flows
inputs		
temperature input	-	4
accessories		
transport case	x	x
power supply unit, mains cable	x	x
battery	x	x
input adapter	-	2
QuickFix pipe mounting fixture for transmitter	x	x
serial data kit	x	x
measuring tape	x	x
wall thickness probe	-	x
user manual, safety instructions, Quick start guide	x	x
connector board at the upper side of the transmitter		

Adapters

*608**-F2

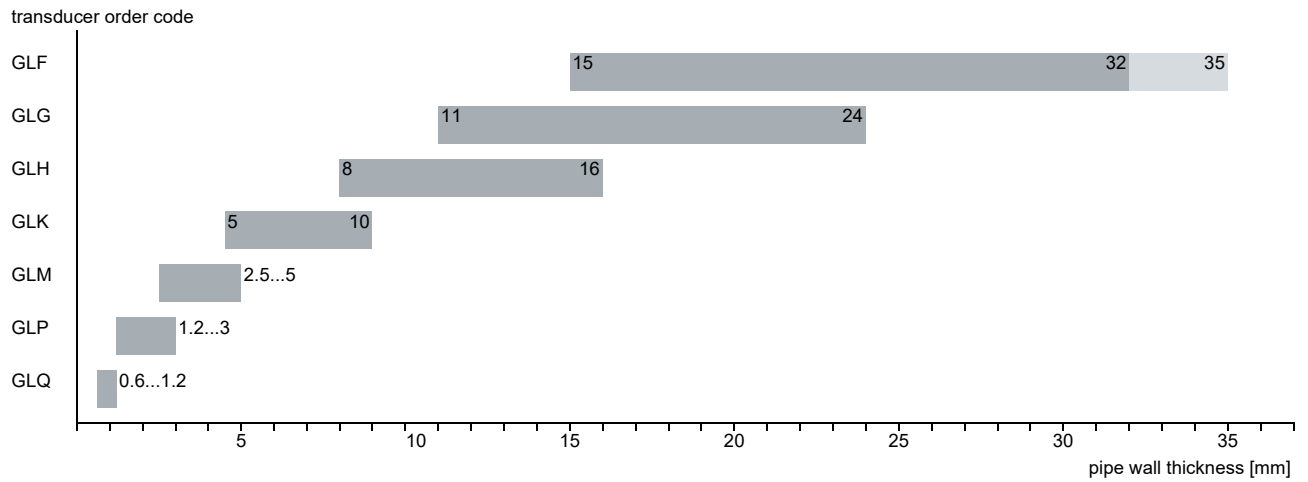


Transducers

Transducer selection

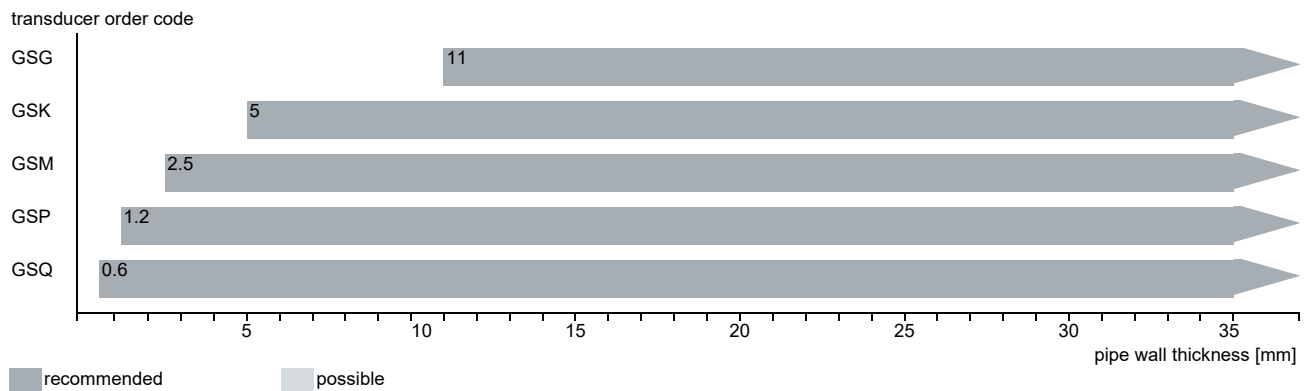
Step 1a

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:



Step 2

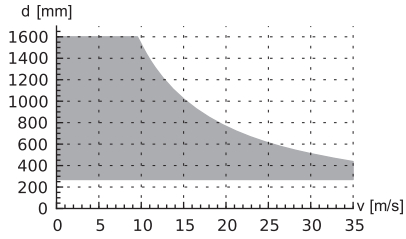
inner pipe diameter d dependent on the flow velocity v of the fluid in the pipe

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

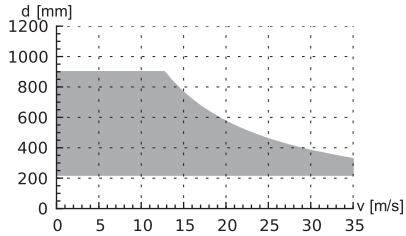
Lamb wave transducers: If the values d and v are not in the range, the diagonal arrangement with 1 sound path may be used, i.e. the same characteristics can be used with doubling the inner pipe diameter. If the values are still not in the range, shear waves transducers regarding the pipe wall thickness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

Lamb wave transducer¹

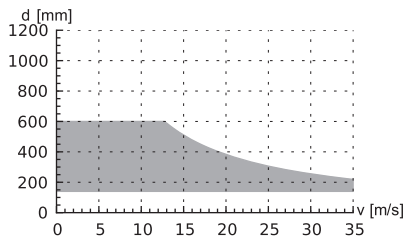
shear wave transducer¹



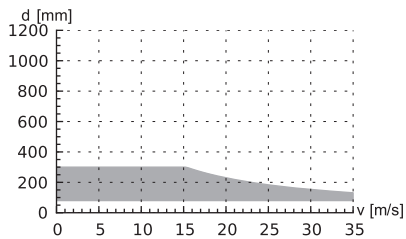
GLF



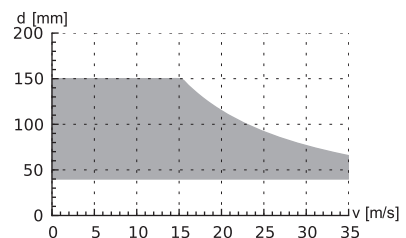
GLG



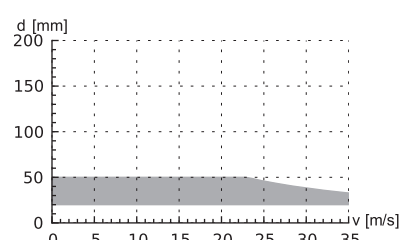
GLH



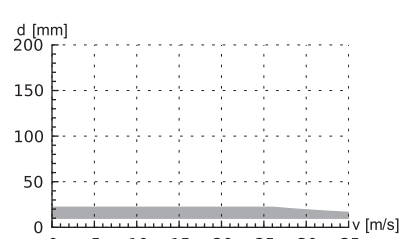
GLK



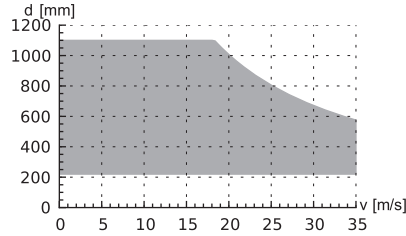
GLM



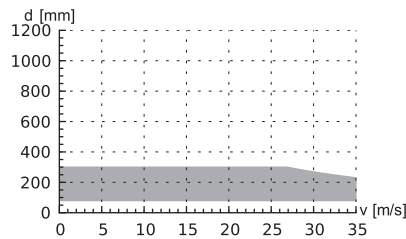
GLP



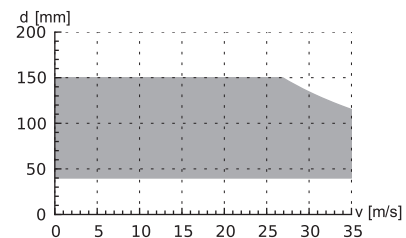
GLQ



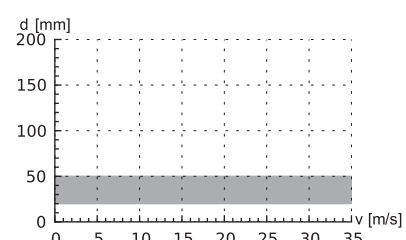
GSG



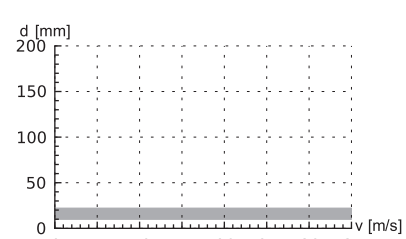
GSK



GSM



GSP



GSQ

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

Step 3

min. fluid pressure

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

shear wave transducer			
transducer order code	fluid 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
GSQ	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	mm	14.3	8.6	38
	selected transducer		GLG or GLH	GLH or GLK	GS
2	inner pipe diameter	mm	581	96.8	143
	max. flow velocity	m/s	15	30	30
	selected transducer		GLG	GLK	GSK
3	min. fluid pressure	bar	20	15	40
	selected transducer		GLG	GLK	GSK

Step 4

for the characters 4...11 of the transducer order code (ambient temperature, explosion protection, connection system, extension cable) see page 12

Step 5

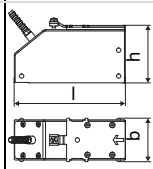
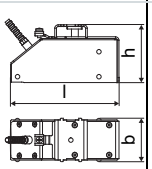
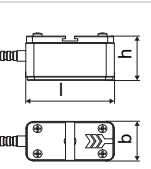
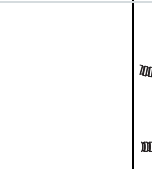

for the technical data of the selected transducer see page 13 et seqq.

Transducer order code

1, 2	3	4	5, 6	7, 8	9...11	no. of character				
transducer	transducer frequency	-	ambient temperature	explosion protection	connection system	-	extension cable	/	option	description
GS										set of ultrasonic flow transducers for gas measurement, shear wave
GL										set of ultrasonic flow transducers for gas measurement, Lamb wave
	F									0.15 MHz
	G									0.2 MHz
	H									0.3 MHz
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
		N								normal temperature range
		E								extended temperature range
			F2							FM Class I Div. 2
				NL						with Lemo connector
						XXX				0 m: without extension cable > 0 m: with extension cable
								LC		long transducer cable

Technical data

Shear wave transducers (FM Class I Div. 2, NL)

order code		GSG-NF2NL/**	GSK-NF2NL/**	GSM-NF2NL/**	GSP-NF2NL/**	GSQ-NF2NL/**
technical type		G(DL)G1N51	G(DL)K1N51	G(DL)M1N51	G(DL)P1N51	G(DL)Q1N51
transducer frequency	MHz	0.2	0.5	1	2	4
fluid pressure¹						
min. extended	bar	metal pipe: 20				
min.	bar	metal pipe: 30, plastic pipe: 1				
inner pipe diameter d²						
min. extended	mm	180	60	30	15	7
min. recommended	mm	220	80	40	20	10
max. recommended	mm	900	300	150	50	22
max. extended	mm	1100	360	180	60	30
pipe wall thickness						
min.	mm	11	5	2.5	1.2	0.6
material						
housing		PEEK with stainless steel cap 304 (1.4301)		stainless steel 304 (1.4301)		
contact surface		PEEK		PEEK		
degree of protection		IP67		IP67		
transducer cable						
type		1699				
length	m	5		4		3
length (**-****/LC)	m	9				
dimensions						
length l	mm	129.5	126.5	60	42.5	
width b	mm	51	51	30	18	
height h	mm	67	67.5	33.5	21.5	
dimensional drawing						
weight (without cable)	kg	0.47	0.36	0.035	0.011	
pipe surface temperature						
min.	°C	-40				
max.	°C	+130				
ambient temperature						
min.	°C	-40				
max.	°C	+130				
temperature compensation		x				
explosion protection						
• FM						
pipe surface temperature (Ex)						
• min.	°C	-40				
• max.	°C	+125				
degree of protection		IP66				
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860				

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 fluids on request
 inner pipe diameter max. recommended/max. extended: in reflection arrangement and for a flow velocity of 15 m/s


Shear wave transducers (FM Class I Div. 2, NL, extended temperature range)

order code		GSM-EF2NL/**	GSP-EF2NL/**	GSQ-EF2NL/**
technical type		G(DL)M1E51	G(DL)P1E51	G(DL)Q1E51
transducer frequency	MHz	1	2	4
fluid pressure¹				
min. extended	bar	metal pipe: 20		
min.	bar	metal pipe: 30, plastic pipe: 1		
inner pipe diameter d²				
min. extended	mm	30	15	7
min. recommended	mm	40	20	10
max. recommended	mm	150	50	22
max. extended	mm	180	60	30
pipe wall thickness				
min.	mm	2.5	1.2	0.6
material				
housing		stainless steel 304 (1.4301)		
contact surface		Sintimid		
degree of protection		IP65		
transducer cable				
type		1699		
length	m	4		3
length (**-*****/LC)	m	9		
dimensions				
length l	mm	60		42.5
width b	mm	30		18
height h	mm	33.5		21.5
dimensional drawing				
weight (without cable)	kg	0.042		0.011
pipe surface temperature				
min.	°C	-30		
max.	°C	+200		
ambient temperature				
min.	°C	-30		
max.	°C	+200		
temperature compensation		x		
explosion protection				
• FM				
pipe surface temperature (Ex)				
• min.	°C	-40		
• max.	°C	+190		
degree of protection		IP66		
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

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 fluids on request
 inner pipe diameter max. recommended/max. extended: in reflection arrangement and for a flow velocity of 15 m/s

Lamb wave transducers (FM Class I Div. 2, NL)

order code	GLF-NF2NL/**	GLG-NF2NL/**	GLH-NF2NL/**	GLK-NF2NL/**	GLM-NF2NL/**	GLP-NF2NL/**	GLQ-NF2NL/**
technical type	G(RT)F1N51	G(RT)G1N51	G(RT)H1N51	G(RT)K1N51	G(RT)M1N51	G(RT)P1N51	G(RT)Q1N51
transducer frequency	MHz 0.15	0.2	0.3	0.5	1	2	4
fluid pressure¹							
min. extended	bar	metal pipe: 10		metal pipe: 10 (d > 120 mm) 3 (d < 120 mm)	metal pipe: 3 (d < 60 mm)	metal pipe: 3 (d < 35 mm)	metal pipe: 3 (d < 15 mm)
min.	bar	metal pipe: 15 plastic pipe: 1		metal pipe: 15 (d > 120 mm) 10 (d < 120 mm) plastic pipe: 1	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	220	180	110	60	30	15
min. recommended	mm	270	220	140	80	40	20
max. recommended	mm	1200	900	600	300	150	50
max. extended	mm	1600	1400	1000	360	180	60
pipe wall thickness							
min.	mm	15	11	8	5	2.5	1.2
max.	mm	32	24	16	10	5	3
max. extended		35	-	-	-	-	-
material							
housing		PPSU with stainless steel cap 316Ti (1.4571)	PPSU with stainless steel cap 304 (1.4301)				
contact surface		PPSU					
degree of protection		IP65	IP67	IP65			
transducer cable							
type		1699					
length	m	5			4		3
length (**-****/LC)	m	9					
dimensions							
length l	mm	163	128.5		74	42	
width b	mm	54	51		32	22	
height h	mm	91.3	67.5		40.5	25.5	
dimensional drawing							
weight (without cable)	kg	0.935	0.471		0.077	0.019	
pipe surface temperature							
min.	°C	-40					
max.	°C	+130					
ambient temperature							
min.	°C	-40					
max.	°C	+130					
temperature compensation		x					
explosion protection							
• FM							
pipe surface temperature (Ex)							
• min.	°C	-40					
• max.	°C	+165					
degree of protection		IP66					
marking		 NI/CI. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860					

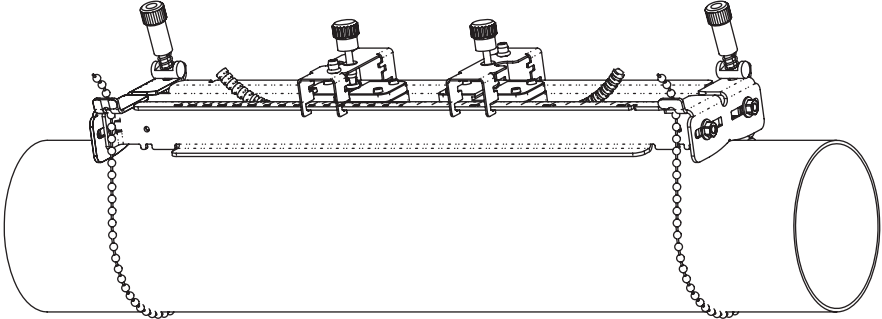
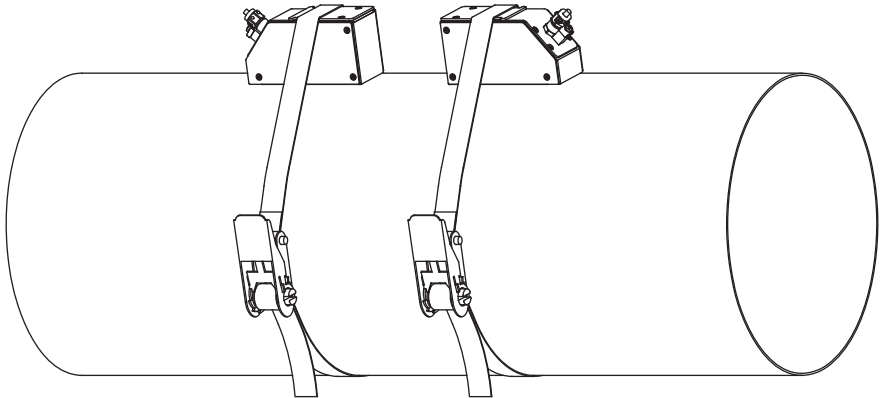
¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

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

Transducer mounting fixture

Order code

1, 2	3	4	5	6	7...9	no. of character
transducer mounting fixture	transducer	measurement arrangement	size	fixation	outer pipe diameter	description
VP						portable Variofix
TB						tension belts
	A					all transducers
		D				reflection arrangement or diagonal arrangement
		R				reflection arrangement
			M			medium
				C		chains
				G		tension belts
				N		without fixation
					055	10...550 mm
					150	50...1500 mm
					210	50...2100 mm

<p>portable Variofix VP and chains</p> 	<p>material: stainless steel 304 (1.4301), 301 (1.4310), 303 (1.4305) dimensions: 414 x 94 x 76 mm chain length: 2 m</p>
<p>tension belts TB</p> 	<p>material: steel, powder coated and textile tension belt length: 5/7 m ambient temperature: max. 60 °C outer pipe diameter: max. 1500/2100 mm</p>

Coupling materials for transducers

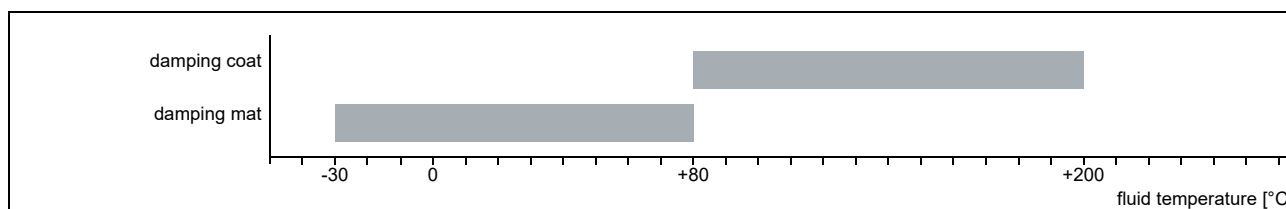
normal temperature range (4th character of transducer order code = N)		extended temperature range (4th character of transducer order code = E)	
< 100 °C	< 170 °C	< 150 °C	< 200 °C
coupling compound type N	coupling compound type E	coupling compound type E	coupling compound type E or H

Technical data

type	ambient temperature °C
coupling compound type N	-30...+130
coupling compound type E	-30...+200
coupling compound type H	-30...+250

Damping material (optional)

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

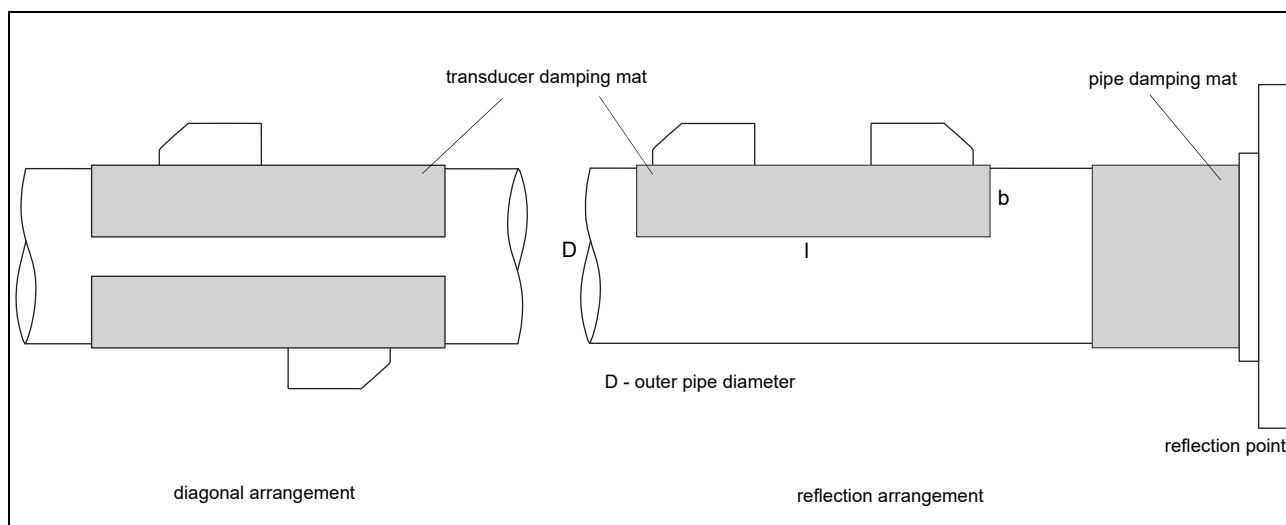


Damping mats

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	ambient temperature °C	remark
				F	G	H	K	M	P	Q			
transducer damping mat													
D	for temporary installation (multiple use), fixed with coupling compound	< 80	450 x 115 x 0.5	-	-	-	-	x	x	x	D20S3	-25...+60	
		≥ 80	900 x 230 x 0.5	-	-	-	x	x	-	-	D20S2		
		900 x 230 x 1.3	x	x	x	-	-	-	-	D50S2			
pipe damping mat													
A	for temporary installation (multiple use), fixed with coupling compound	< 300	300 x 115 x 0.5	x	x	x	x	x	x	x	A20S4	-25...+60	for quantity see table below
B	self-adhesive	≥ 300	l x 100 x 0.9	x	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	
	F, G, H	K, M, P, Q
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	
	F, G, H m	K, M, P m
300	12	6
500	32	16
1000	126	63

Damping coat

For high temperatures it is recommended to apply the damping coat onto the pipe.

Technical data

material		multipolymeric matrix/inorganic ceramic coating
packing drum	I	1
properties		heat resistant, inert

Dimensioning

transducer	number of packing drums		
	outer pipe diameter		
	≤400	≤600	≤800
	mm		
F	3	4	5
G	2	3	4
H	1	2	3
K	1	-	-
M	1	-	-
P	1	-	-
Q	1	-	-

Connection systems

connection system NL	
direct connection/connection with extension cable	transducers technical type ****51

Cable

transducer cable	
type	1699
weight	kg/m 0.094
ambient temperature	°C -55...+200
cable jacket	
material	PTFE
outer diameter	mm 2.9
thickness	mm 0.3
colour	brown
shield	x
sheath	
material	stainless steel 304 (1.4301)
outer diameter	mm 8

extension cable	
type	1750
standard length	m 5 10
weight	kg/m 0.12
ambient temperature	°C < 80
cable jacket	
material	PE
outer diameter	mm 6
thickness	mm 0.5
colour	black
shield	x
sheath	
material	stainless steel 304 (1.4301)
outer diameter	mm 9

Cable length

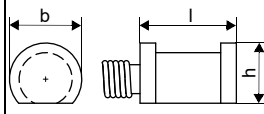
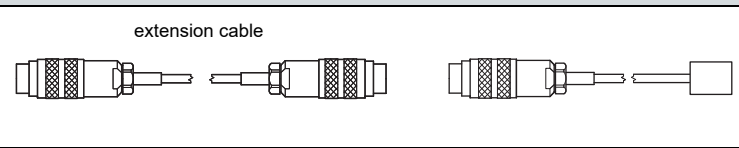
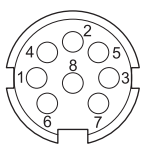
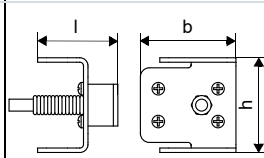
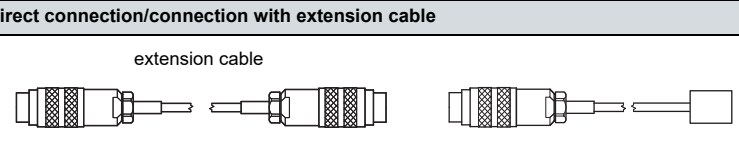
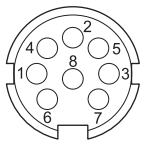
transducer frequency	F, G, H, K			M, P			Q			S			
connection system NL													
transducers technical type		x	y	l	x	y	l	x	y	l	x	y	l
*(DR)***51	m	2	3	≤ 10	2	2	≤ 10	2	1	≤ 10	1	1	≤ 10
option LC: *(LT)***51	m	2	7	≤ 10	7	2	≤ 10	8	1	≤ 10	1	1	≤ 10

x, y - transducer cable length

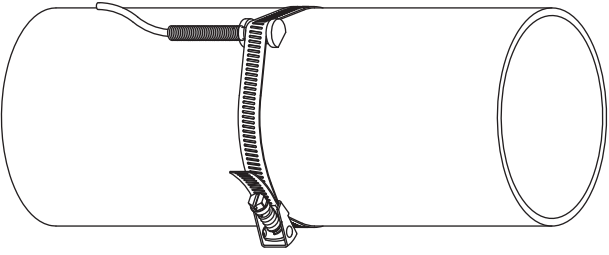
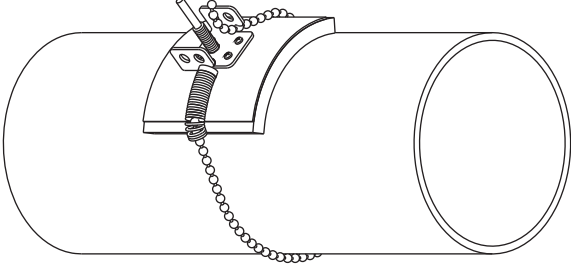
l - max. length of extension cable

Clamp-on temperature probe (optional)

Technical data

PT12N			
design	clamp-on with connector		
type	Pt100		
connection	4-wire		
measuring range	°C -30...+250		
accuracy T	±(0.15 °C + 2 · 10 ⁻³ · T [°C]) class A		
accuracy ΔT (2x Pt matched according to EN 1434-1)	≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1		
response time	s	50	
housing	aluminum		
degree of protection	IP66		
dimensions			
length l	mm	20	
width b	mm	15	
height h	mm	13	
dimensional drawing			
weight	kg	0.25 (without connector)	
accessories			
thermal conductivity paste 200 °C		x	
thermal conductivity foil 250 °C		x	
Connection system			
direct connection/connection with extension cable			
			
Connection			
	temperature probe	extension cable	connector
			pin
	red	grey	2
	red/blue	red	6
	white/blue	blue	1
	white	white	7
			
Cable			
	temperature probe	extension cable	
type	4 x 0.25 mm ² black	LIYCY 8 x 0.14 mm ² grey	
standard length	m 3	5/10/25	
max. length	m -	100	
cable jacket	PTFE	PVC	
PT12F			
design	clamp-on short response time, with connector		
type	Pt100		
connection	4-wire		
measuring range	°C -50...+250		
accuracy T	±(0.15 °C + 2 · 10 ⁻³ · T [°C]) class A		
accuracy ΔT (2x Pt matched according to EN 1434-1)	≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1		
response time	s	8	
housing	PEEK, stainless steel 304 (1.4301), copper		
degree of protection	IP66		
dimensions			
length l	mm	14	
width b	mm	30	
height h	mm	27	
dimensional drawing			
weight	kg	0.32 (without connector)	
accessories			
thermal conductivity paste 200 °C		x	
thermal conductivity foil 250 °C		x	
plastic protection plate, insulation foam		x	
Connection system			
direct connection/connection with extension cable			
			
Connection			
	temperature probe	extension cable	connector
			pin
	red	grey	2
	red/blue	red	6
	white/blue	blue	1
	white	white	7
			
Cable			
	temperature probe	extension cable	
type	4 x 0.25 mm ² black	LIYCY 8 x 0.14 mm ² grey	
standard length	m 3	5/10/25	
max. length	m -	100	
cable jacket	PTFE	PVC	

Fixation

<p>tension strap PT12N</p>  <p>A technical line drawing showing a cylindrical component with a tension strap (PT12N) attached to its side. The strap is made of a woven material and is secured with a metal buckle and a locking mechanism.</p>	<p>material: stainless steel 301 (1.4310), 410 (1.4006)</p>
<p>ball chain PT12F</p>  <p>A technical line drawing showing a cylindrical component with a ball chain (PT12F) attached to its side. The chain is made of stainless steel and is secured with a metal bracket and a locking mechanism.</p>	<p>material: stainless steel 316L (1.4404) length: 1 m</p>

Wall thickness measurement (optional)

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

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

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

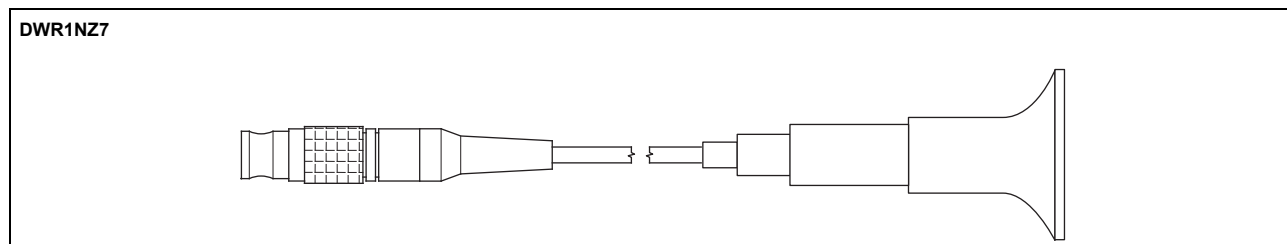
Technical data

DWR1NZ7		
measuring range ¹	mm	1...250
resolution	mm	0.01
accuracy		1 % ±0.1 mm
fluid temperature	°C	-20...+200, short-time peak max. 500
explosion protection		-
cable		
type		2616
length	m	1.5

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

Cable

2616		
ambient temperature	°C	<200
cable jacket		
material		FEP
outer diameter	mm	5.1
colour		black
shield		x



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