

### 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 (NEMA 4) 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



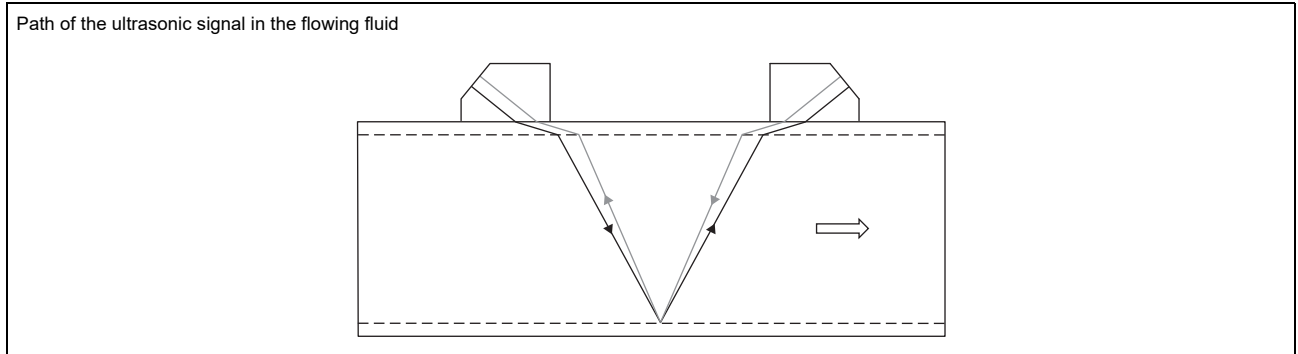
Measurement with the flow transmitter fixed to the pipe with the QuickFix pipe mounting fixture

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## Function

### Measurement principle

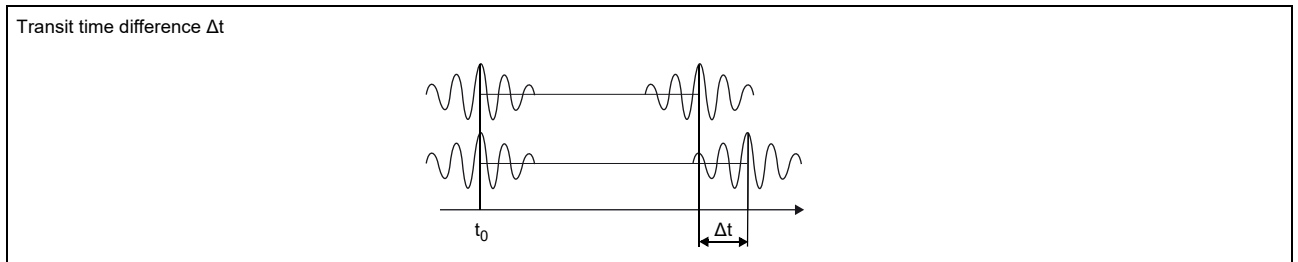
The transducers are mounted on the pipe which is completely filled with the fluid. The ultrasonic signals are emitted alternately by a transducer and received by the other. The physical quantities are determined from the transit times of the ultrasonic signals.



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

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

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



### Calculation of volumetric flow rate

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

where

- $\dot{V}$  - volumetric flow rate
- $k_{Re}$  - fluid mechanics calibration factor
- $A$  - cross-sectional pipe area
- $k_a$  - acoustical calibration factor
- $\Delta t$  - 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:

- **reflect arrangement**

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

- **diagonal arrangement**

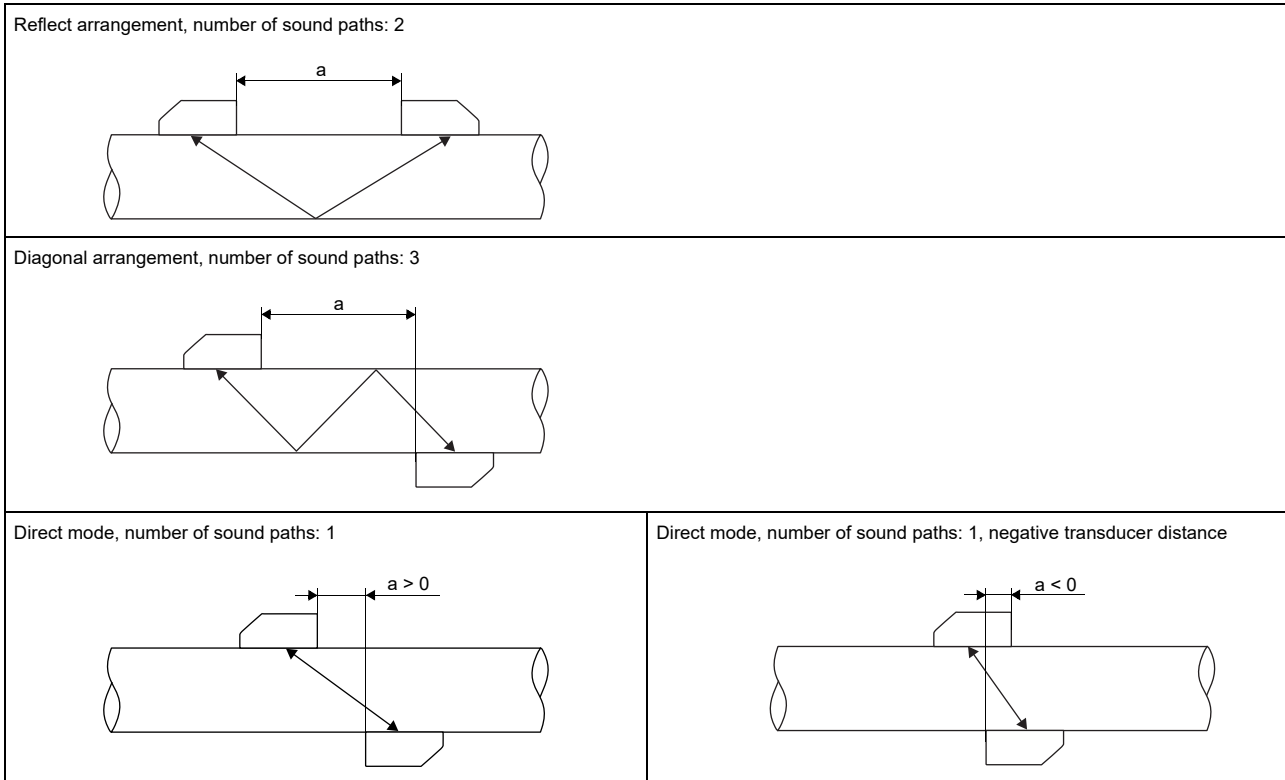
The number of sound paths is odd. The transducers are mounted on opposite sides of the pipe.

- **direct mode**

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

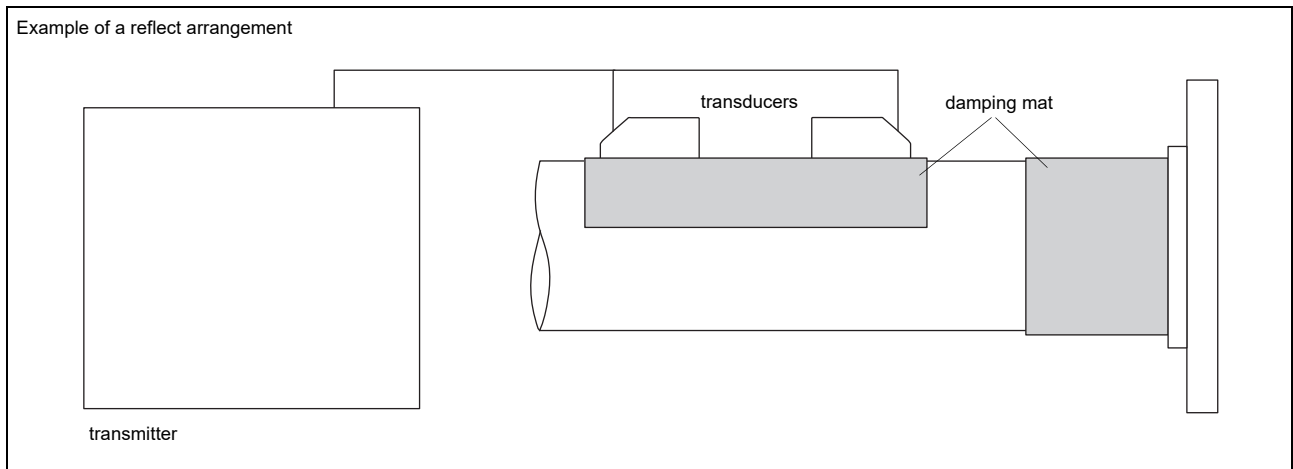
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

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



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
<b>measurement</b>	
measurement principle	transit time difference correlation principle
flow velocity	ft/s 0.03 to 115 ft/s, depending on pipe diameter
repeatability	0.15 % of reading $\pm 0.02$ ft/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
<b>measurement uncertainty (volumetric flow rate)</b>	
measurement uncertainty of measuring system <sup>1</sup>	$\pm 0.3$ % of reading $\pm 0.02$ ft/s includes calibration certificate traceable to NIST
measurement uncertainty at the measuring point	$\pm 1$ to 2 % of reading $\pm 0.02$ ft/s, contact FLEXIM for an application specific uncertainty evaluation
<b>transmitter</b>	
power supply	<ul style="list-style-type: none"> <li>100 to 230 V/50 to 60 Hz (power supply unit, outside of explosive atmosphere)</li> <li>10.5 to 15 V DC (socket at transmitter)</li> <li>integrated battery</li> </ul>
integrated battery	Li-Ion, 7.2 V/6.2 Ah
operating time	<ul style="list-style-type: none"> <li>&gt; 14 h (without inputs and backlight)</li> <li>&gt; 25 h (1 measuring channel, ambient temperature &gt; 50 °F, without inputs and backlight)</li> </ul>
power consumption	W < 6 (with inputs and backlight), charging: 18
number of measuring channels	2
damping	s 0 to 100 (adjustable)
measuring cycle	Hz 100 to 1000 (1 channel)
response time	s 1 (1 channel), option: 0.07
housing material	PA, TPS, PC, Polyester, stainless steel
degree of protection	NEMA 4
dimensions	in see dimensional drawing
weight	lb 4.9
fixation	QuickFix pipe mounting fixture
ambient temperature	°F 14 to 140
display	2 x 16 characters, dot matrix, backlight
menu language	English, German, French, Dutch, Spanish
<b>explosion protection</b>	
• FM	
marking	 NI/Cl. I /Div. 2/ GP. A,B,C,D / T5 Ta = 60 °C
<b>measuring functions</b>	
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
<b>communication interfaces</b>	
service interfaces	<ul style="list-style-type: none"> <li>RS232</li> <li>USB (with adapter)</li> </ul>
<b>accessories</b>	
serial data kit	
• cable	RS232
• adapter	RS232 - USB
software	<ul style="list-style-type: none"> <li>FluxDiagReader: download of measured values and parameters, graphical presentation</li> <li>FluxDiag (optional): download of measurement data, graphical presentation, report generation</li> <li>FluxSubstanceLoader: upload of fluid data sets</li> </ul>
adapter	• input adapter (if number of inputs > 2)
transport case	dimensions: 19.7 x 15.7 x 7.5 in
<b>data logger</b>	
loggable values	all physical quantities, totalized values and diagnostic values
capacity	> 100 000 measured values

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

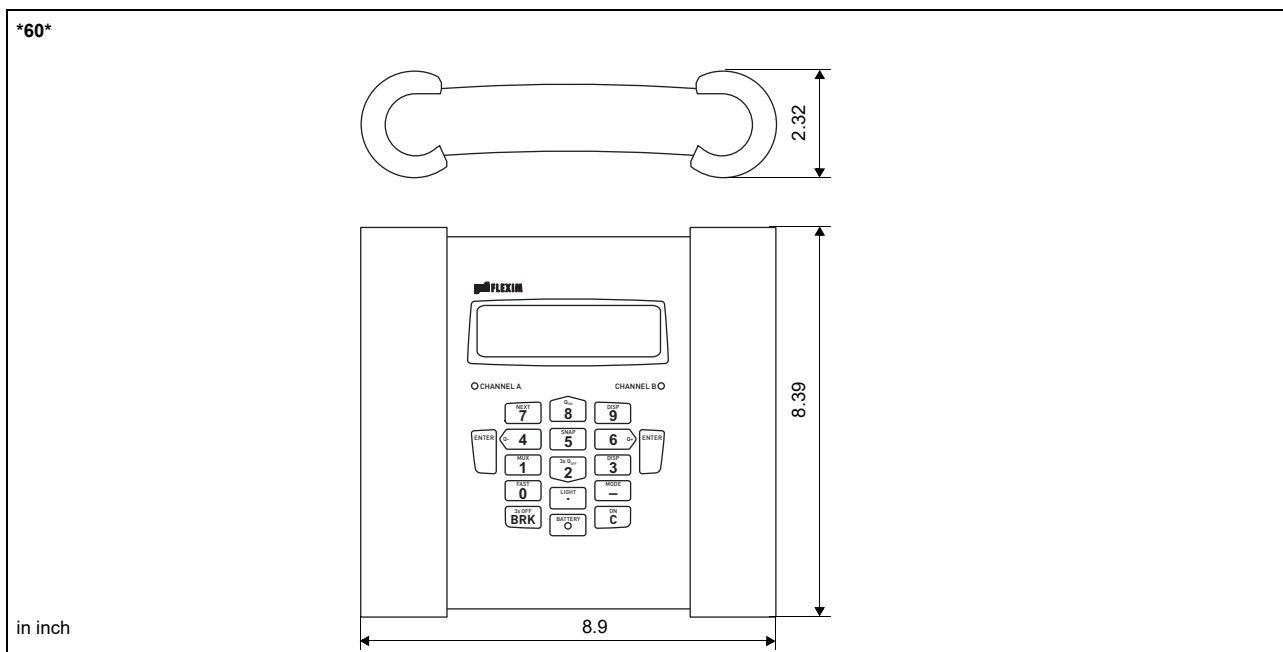
For the technical data in the flow measurement of liquids mode see Technical specification TSFLUXUS\_F608xx-F2V\*.\*.

<b>FLUXUS G608**-F2</b>	
<b>inputs</b>	
	The inputs are galvanically isolated from the transmitter.
number	max. 4
<b>• temperature input</b>	
type	Pt100/Pt1000
connection	4-wire
range	°F -238 to +1040
resolution	K 0.01
accuracy	±0.01 % of reading ±0.03 K

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

For the technical data in the flow measurement of liquids mode see Technical specification TSFLUXUS\_F608xx-F2V\*-\*.

## Dimensions

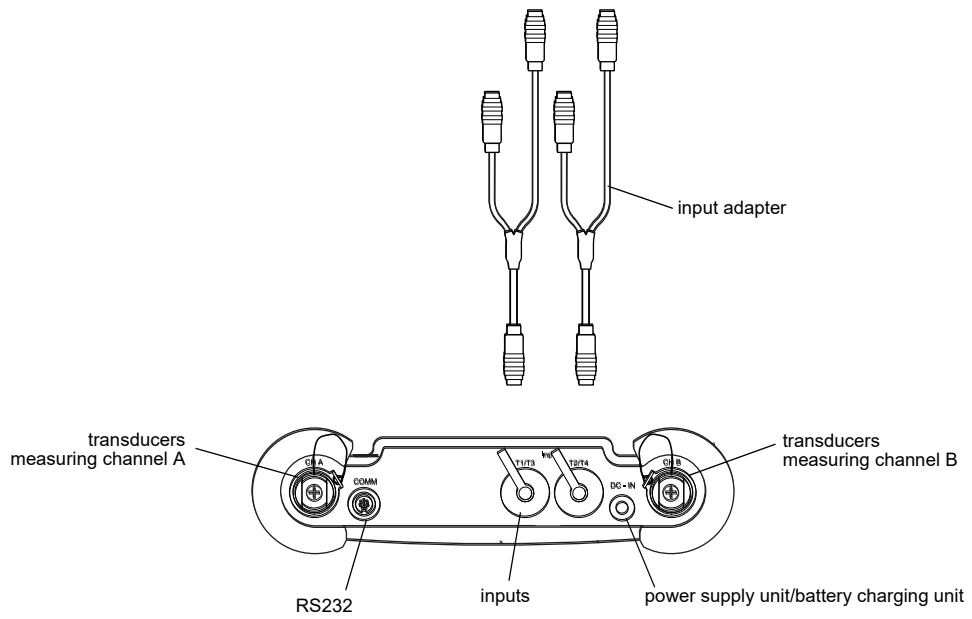


## Standard scope of supply

	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 thermal energy computer for monitoring of energy flows
<b>inputs</b>		
temperature input	-	4
<b>accessories</b>		
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



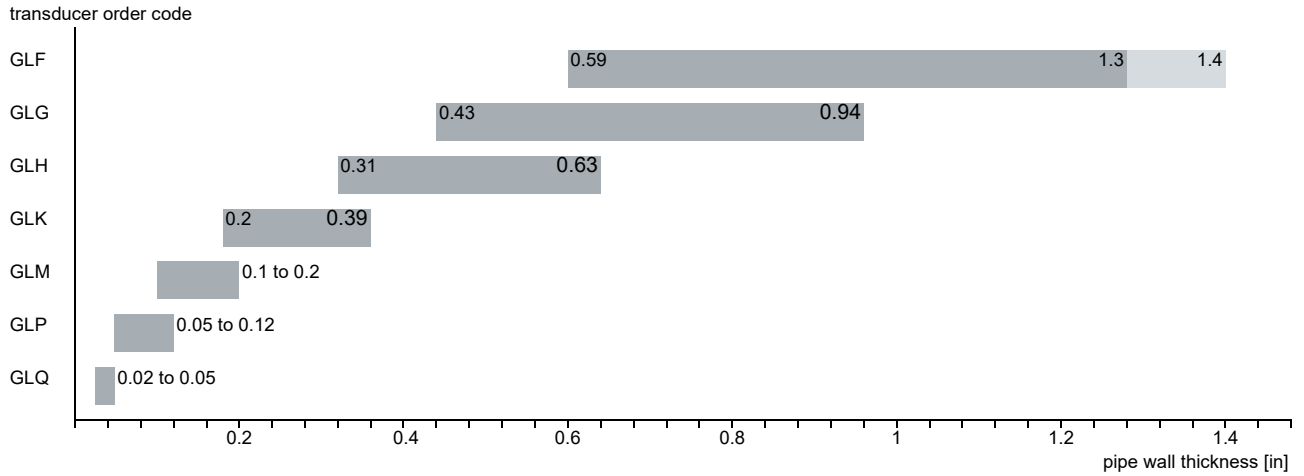


# Transducers

## Transducer selection

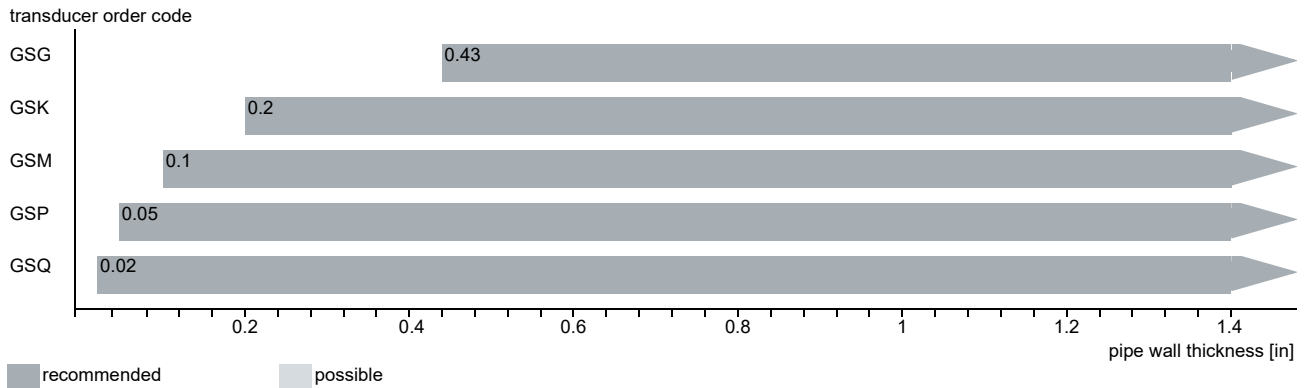
### Step 1a

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

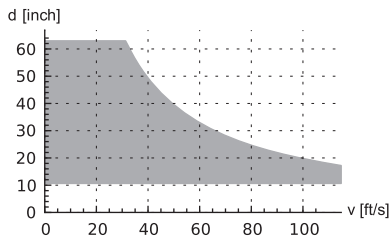
inner pipe diameter  $d$  dependent on the flow velocity  $v$  of the fluid in the pipe

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.

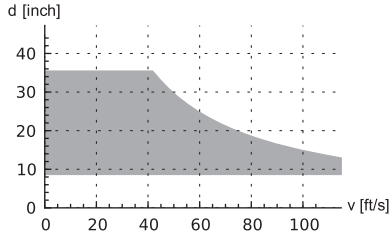
Lamb wave transducers: If the values  $d$  and  $v$  are not in the range, the diagonal arrangement with 1 sound path may be used, i.e. the same characteristics can be used with doubling the inner pipe diameter. If the values are still not in the range, shear waves transducers regarding the pipe wall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

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

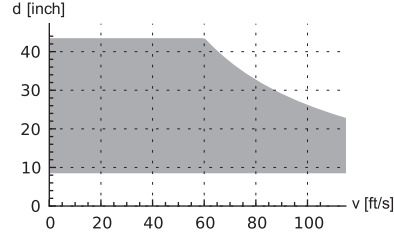
**shear wave transducer<sup>1</sup>**



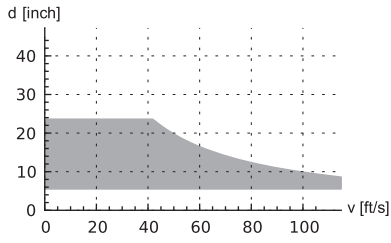
GLF



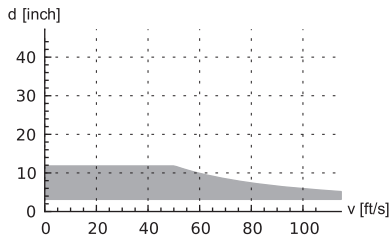
GLG



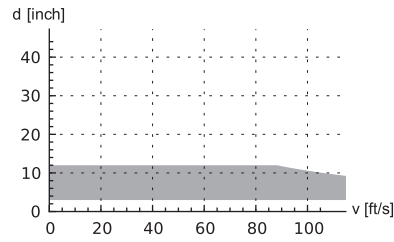
GSG



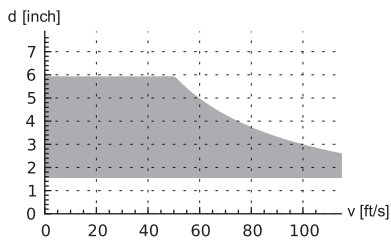
GLH



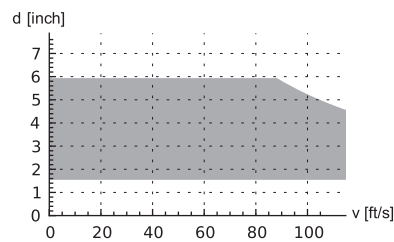
GLK



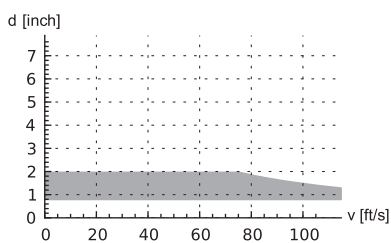
GSK



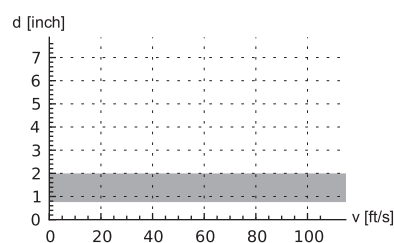
GLM



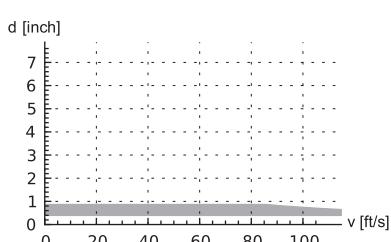
GSM



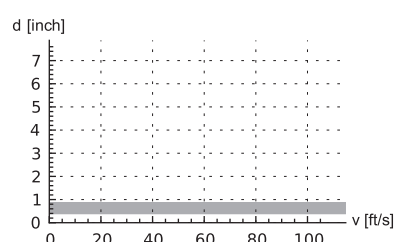
GLP



GSP



GLQ



GSQ

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

### Step 3

min. fluid pressure

Lamb wave transducer			
transducer or- der code	fluid pressure <sup>1</sup> [psi]		
	metal pipe		plastic pipe
	min.	min. extended	min.
GLF	218	145	15
GLG	218	145	15
GLH	218	145	15
GLK	218 (d > 4.7 in) 145 (d < 4.7 in)	145 (d > 4.7 in) 44 (d < 4.7 in)	15
GLM	145 (d > 2.4 in) 73 (d < 2.4 in)	44 (d < 2.4 in)	15
GLP	145 (d > 1.4 in) 73 (d < 1.4 in)	44 (d < 1.4 in)	15
GLQ	145 (d > 0.59 in) 73 (d < 0.59 in)	44 (d < 0.59 in)	15

shear wave transducer			
transducer or- der code	fluid pressure <sup>1</sup> [psi]		
	metal pipe		plastic pipe
	min.	min. extended	min.
GSG	435	290	15
GSK	435	290	15
GSM	435	290	15
GSP	435	290	15
GSQ	435	290	15

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

d = inner pipe diameter

### Example

step					
1	pipe wall thickness	in	0.56	0.34	1.5
	selected transducer		GLG or GLH	GLH or GLK	GS
2	inner pipe diameter	in	22.9	3.8	5.6
	max. flow velocity	ft/s	49	98	98
	selected transducer		GLG	GLK	GSK
3	min. fluid pressure	psi	290	218	580
	selected transducer		GLG	GLK	GSK

### Step 4

for the characters 4 to 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 to 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

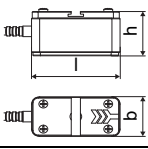
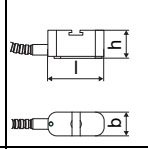

### Shear wave transducers (FM Class I Div. 2, NL)

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
<b>fluid pressure<sup>1</sup></b>						
min. extended	psi	metal pipe: 290				
min.	psi	metal pipe: 435, plastic pipe: 15				
<b>inner pipe diameter d<sup>2</sup></b>						
min. extended	in	7.1	2.4	1.2	0.59	0.28
min. recommended	in	8.7	3.1	1.6	0.79	0.39
max. recommended	in	35.4	11.8	5.9	2	0.87
max. extended	in	43.3	14.2	7.1	2.4	1.2
<b>pipe wall thickness</b>						
min.	in	0.43	0.2	0.1	0.05	0.02
<b>material</b>						
housing		PEEK with stainless steel cap 304		stainless steel 304		
contact surface		PEEK		PEEK		
degree of protection		NEMA 6		NEMA 6		
<b>transducer cable</b>						
type		1699				
length	ft	16		13		9
length (**-*****/LC)	ft	29				
<b>dimensions</b>						
length l	in	5.1	4.98	2.36	1.67	
width b	in	2.01	2.01	1.18	0.71	
height h	in	2.64	2.66	1.32	0.85	
dimensional drawing						
weight (without cable)	lb	1	0.79	0.08	0.02	
<b>pipe surface temperature</b>						
min.	°F	-40				
max.	°F	+266				
<b>ambient temperature</b>						
min.	°F	-40				
max.	°F	+266				
temperature compensation		x				
<b>explosion protection</b>						
• FM						
pipe surface temperature (Ex)						
• min.	°F	-40				
• max.	°F	+257				
degree of protection		IP66				
marking		 NI/Cl. I, II, III/Div. 2 / GP A, B, C, D, E, F, G/ Temp. Codes dwg 3860				

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

<sup>2</sup> shear wave transducer:  
 typical values for natural gas, nitrogen, oxygen, pipe diameters for other fluids on request  
 inner pipe diameter max. recommended/max. extended: in reflect arrangement and for a flow velocity of 49 ft/s

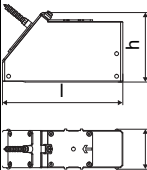
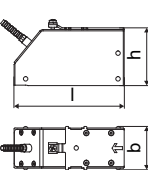
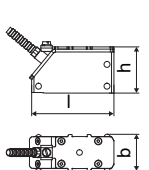

**Shear wave transducers (FM Class I Div. 2, NL, extended temperature range)**

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
<b>fluid pressure<sup>1</sup></b>				
min. extended	psi	metal pipe: 290		
min.	psi	metal pipe: 435, plastic pipe: 15		
<b>inner pipe diameter d<sup>2</sup></b>				
min. extended	in	1.2	0.59	0.28
min. recommended	in	1.6	0.79	0.39
max. recommended	in	5.9	2	0.87
max. extended	in	7.1	2.4	1.2
<b>pipe wall thickness</b>				
min.	in	0.1	0.05	0.02
<b>material</b>				
housing		stainless steel 304		
contact surface		Sintimid		
degree of protection		NEMA 4		
<b>transducer cable</b>				
type		1699		
length	ft	13		9
length (***/*****/LC)	ft	29		
<b>dimensions</b>				
length l	in	2.36		1.67
width b	in	1.18		0.71
height h	in	1.32		0.85
dimensional drawing				
weight (without cable)	lb	0.09		0.02
<b>pipe surface temperature</b>				
min.	°F	-22		
max.	°F	+392		
<b>ambient temperature</b>				
min.	°F	-22		
max.	°F	+392		
temperature compensation		X		
<b>explosion protection</b>				
• FM				
pipe surface temperature (Ex)				
• min.	°F	-40		
• max.	°F	+374		
degree of protection		IP66		
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

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

<sup>2</sup> shear wave transducer:  
 typical values for natural gas, nitrogen, oxygen, pipe diameters for other fluids on request  
 inner pipe diameter max. recommended/max. extended: in reflect arrangement and for a flow velocity of 49 ft/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
<b>fluid pressure<sup>1</sup></b>							
min. extended	psi	metal pipe: 145		metal pipe: 145 (d > 4.7 in) 44 (d < 4.7 in)	metal pipe: 44 (d < 2.4 in)	metal pipe: 44 (d < 1.4 in)	metal pipe: 44 (d < 0.59 in)
min.	psi	metal pipe: 218 plastic pipe: 15		metal pipe: 218 (d > 4.7 in) 145 (d < 4.7 in) plastic pipe: 15	metal pipe: 145 (d > 2.4 in) 73 (d < 2.4 in) plastic pipe: 15	metal pipe: 145 (d > 1.4 in) 73 (d < 1.4 in) plastic pipe: 15	metal pipe: 145 (d > 0.59 in) 73 (d < 0.59 in) plastic pipe: 15
<b>inner pipe diameter d<sup>2</sup></b>							
min. extended	in	8.7	7.1	4.3	2.4	1.2	0.59
min. recommended	in	10.6	8.7	5.5	3.1	1.6	0.79
max. recommended	in	47.2	35.4	23.6	11.8	5.9	2
max. extended	in	63	55.1	39.4	14.2	7.1	2.4
<b>pipe wall thickness</b>							
min.	in	0.59	0.43	0.31	0.2	0.1	0.05
max.	in	1.3	0.94	0.63	0.39	0.2	0.12
max. extended		1.4	-	-	-	-	-
<b>material</b>							
housing		PPSU with stainless steel cap 316Ti	PPSU with stainless steel cap 304				
contact surface		PPSU					
degree of protection		NEMA 4			NEMA 6		
<b>transducer cable</b>							
type		1699					
length	ft	16			13		9
length (**-****/LC)	ft	29					
<b>dimensions</b>							
length l	in	6.42		5.06		2.91	
width b	in	2.13		2.01		1.26	
height h	in	3.59		2.66		1.59	
dimensional drawing							
weight (without cable)	lb	2.1		1		0.17	
<b>pipe surface temperature</b>							
min.	°F	-40					
max.	°F	+266					
<b>ambient temperature</b>							
min.	°F	-40					
max.	°F	+266					
temperature compensation		x					
<b>explosion protection</b>							
<b>• FM</b>							
pipe surface temperature (Ex)							
• min.	°F	-40					
• max.	°F	+329					
degree of protection		IP66					
marking		 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860					

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

<sup>2</sup> Lamb wave transducer:

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

inner pipe diameter max. recommended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 49 ft/s (98 ft/s)

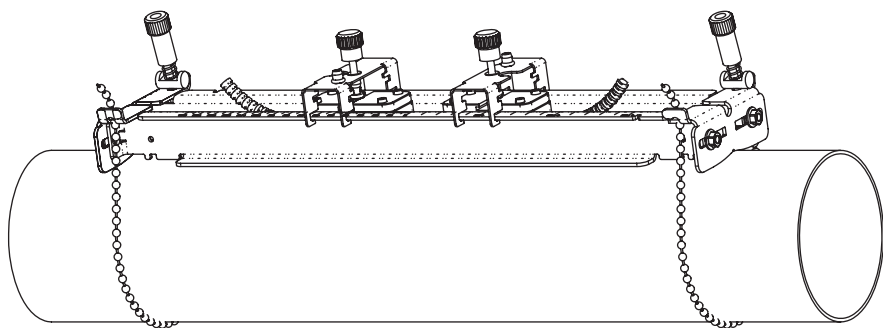
inner pipe diameter max. extended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 39 ft/s (82 ft/s)

# Transducer mounting fixture

## Order code

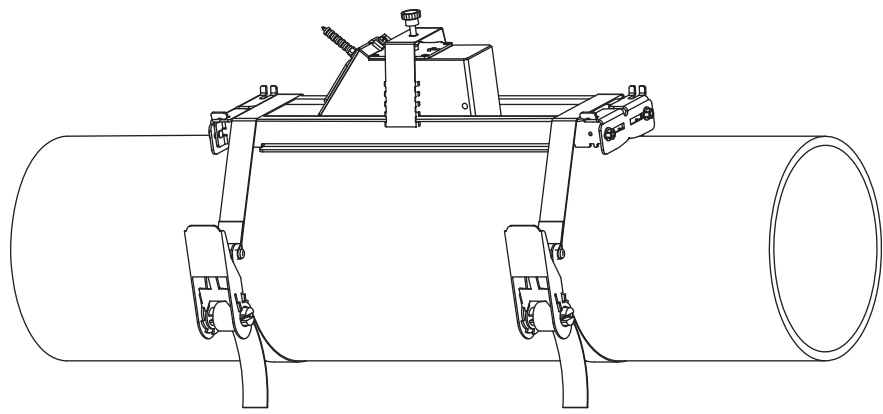
1, 2	3	4	5	6	7 to 9	no. of character
transducer mounting fixture	transducer	measurement arrangement	size	fixation	outer pipe diameter	description
VP						portable Variofix
	A					all transducers
		D				reflect arrangement or diagonal arrangement/direct mode
		R				reflect arrangement
			M			medium
				C		chains
				G		tension belts
				N		without fixation
					055	0.39 to 21.7 in

**portable Variofix VP and chains (optional)**



material: stainless steel 304, 301, 303  
 dimensions: 16.3 x 3.7 x 2.99 in  
 chain length: 6 ft

**portable Variofix VP and tension belts**





## Coupling materials for transducers

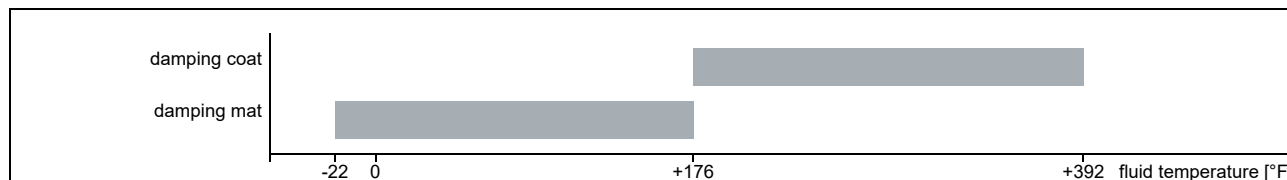
normal temperature range (4th character of transducer order code = N)		extended temperature range (4th character of transducer order code = E)	
< 212 °F	< 338 °F	< 302 °F	< 392 °F
coupling compound type N	coupling compound type E	coupling compound type E	coupling compound type E or H

### Technical data

type	ambient temperature °F
coupling compound type N	-22 to +266
coupling compound type E	-22 to +392
coupling compound type H	-22 to +482

### Damping material (optional)

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

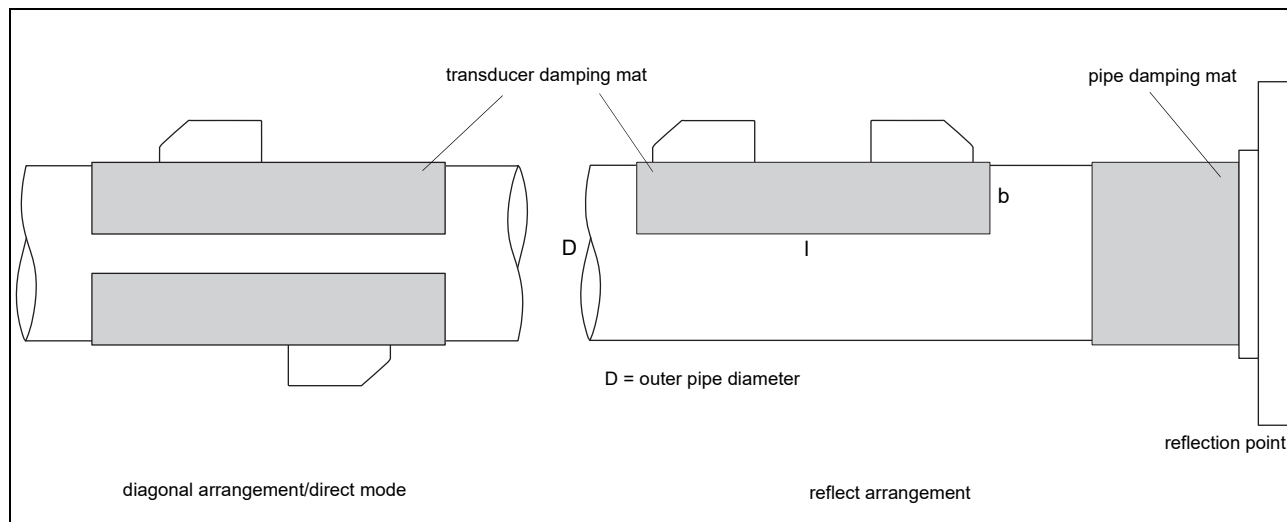


### Damping mats

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 in	dimensions l x b x h in	transducer frequency								technical type	ambient temperature °F	remark
				F	G	H	K	M	P	Q				
<b>transducer damping mat</b>														
D	for temporary installation (multiple use), fixed with coupling compound	< 3.1 ≥ 3.1	17.72 x 4.53 x 0.02	-	-	-	-	x	x	x	D20S3	-13 to +140		
			35.43 x 9.06 x 0.02	-	-	-	x	x	-	D20S2				
			35.43 x 9.06 x 0.05	x	x	x	-	-	-	D50S2				
<b>pipe damping mat</b>														
A	for temporary installation (multiple use), fixed with coupling compound	< 11.8	11.81 x 4.53 x 0.02	x	x	x	x	x	x	x	A20S4	-13 to +140	for quantity see table below	
B	self-adhesive	≥ 11.8	l x 3.94 x 0.04	x	x	x	x	x	x	-	B35R2	-31 to +122	l - see table below	

### Quantity for pipe damping mat - type A

(depending on the outer pipe diameter)

outer pipe diameter D in	transducer frequency	
	F, G, H	K, M, P, Q
3.9	12	6
7.9	24	12
11.8	32	16

### Length of pipe damping mat - type B

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

outer pipe diameter D in	transducer frequency	
	F, G, H ft	K, M, P ft
11.8	39	19
19.7	104	52
39.4	413	206

### 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	gal	1	
properties		heat resistant, inert	

### Dimensioning

transducer	number of packing drums		
	outer pipe diameter		
	≤15.7	≤23.6	≤31.5
	in		
F	1	2	2
G	1	1	2
H	1	1	1
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		
<b>type</b>		<b>1699</b>
weight	lb/ft	0.06
ambient temperature	°F	-67 to +392
<b>cable jacket</b>		
material		PTFE
outer diameter	in	0.11
thickness	in	0.01
color		brown
shield		x
<b>sheath</b>		
material		stainless steel 304
outer diameter	in	0.31

extension cable		
<b>type</b>		<b>1750</b>
standard length	ft	16 32
weight	lb/ft	0.08
ambient temperature	°F	< 144
<b>cable jacket</b>		
material		PE
outer diameter	in	0.24
thickness	in	0.02
color		black
shield		x
<b>sheath</b>		
material		stainless steel 304
outer diameter	in	0.35

### Cable length

transducer frequency		F, G, H, K			M, P			Q			S		
connection system NL		x	y	l	x	y	l	x	y	l	x	y	l
transducers technical type													
*(DR)***51	ft	6	9	≤ 32	6	6	≤ 32	6	3	≤ 32	3	3	≤ 32
option LC: *(LT)***51	ft	6	22	≤ 32	22	6	≤ 32	26	3	≤ 32	3	3	≤ 32

x, y = transducer cable length

l = max. length of extension cable

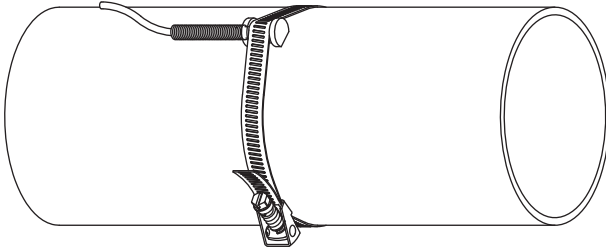
# Clamp-on temperature probe (optional)

## Technical data

PT13N			
design	clamp-on with connector		
type	Pt1000		
connection	4-wire		
measuring range	°F -40 to +392		
accuracy T	±(0.27 °F + 2 · 10 <sup>-3</sup> · ( T [°F]  - 32 °F)) class A		
accuracy ΔT (2x Pt matched according to EN 1434-1)	≤ 0.03 °F (at 50 °F)		
housing	360 brass alloy		
degree of protection	NEMA 4		
<b>dimensions</b>			
length l	in	0.79	
width b	in	0.59	
height h	in	0.49	
dimensional drawing			
weight	lb	0.437 (without connector)	
<b>accessories</b>			
thermal conductivity foil 482 °F	x		
<b>Connection system</b>			
<b>direct connection/connection with extension cable</b>			
<b>Connection</b>			
	<b>temperature probe</b>	<b>extension cable</b>	<b>connector</b>
	red	black	2
	red	green	6
	white	white	1
	white	red	7
<b>Cable</b>			
	<b>temperature probe</b>	<b>extension cable</b>	
type	4 x 24 AWG	4 x 18 AWG	
standard length	ft 20	-	
max. length	ft -	656	
cable jacket	PTFE	LS PVC	
PT13F			
design	clamp-on short response time, with connector		
type	Pt1000		
connection	4-wire		
measuring range	°F -58 to +482		
accuracy T	±(0.27 °F + 2 · 10 <sup>-3</sup> · ( T [°F]  - 32 °F)) 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, copper		
degree of protection	NEMA 4		
<b>dimensions</b>			
length l	in	0.55	
width b	in	1.18	
height h	in	1.06	
dimensional drawing			
weight	lb	0.7 (without connector)	
<b>accessories</b>			
thermal conductivity paste 392 °F	x		
thermal conductivity foil 482 °F	x		
plastic protection plate, insulation foam	x		
<b>Connection system</b>			
<b>direct connection/connection with extension cable</b>			
<b>Connection</b>			
	<b>temperature probe</b>	<b>extension cable</b>	<b>connector</b>
	red	black	2
	red/blue	green	6
	white/blue	white	1
	white	red	7
<b>Cable</b>			
	<b>temperature probe</b>	<b>extension cable</b>	
type	4 x 0.25 mm <sup>2</sup> black	4 x 18 AWG	
standard length	ft 9	-	
max. length	ft -	328	
cable jacket	PTFE	LS PVC	

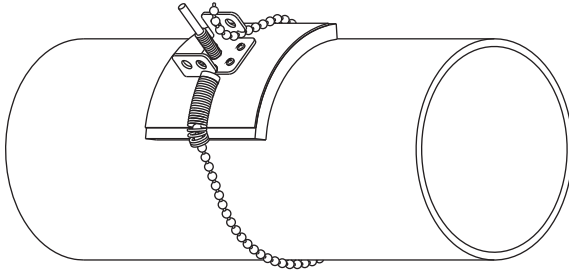
## Fixation

**tension strap PT13N**



material: stainless steel 301, 410

**ball chain PT13F**



material: stainless steel 316L  
length: 3 ft

## 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.

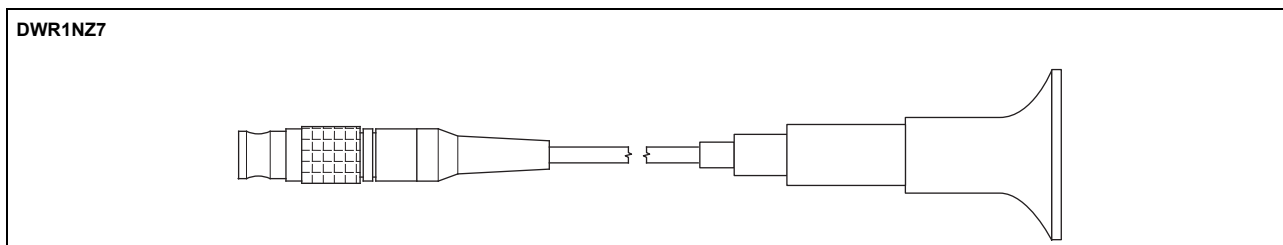
### Technical data

		DWR1NZ7
measuring range <sup>1</sup>	in	0.04 to 9.8
resolution	in	0.0004
accuracy		1 % ±0.004 in
fluid temperature	°F	-4 to +392, short-time peak max. 932
explosion protection		-
<b>cable</b>		
type		2616
length	ft	4

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

### Cable

		2616
ambient temperature	°F	<392
<b>cable jacket</b>		
material		FEP
outer diameter	in	0.2
color		black
shield		x



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