

Portable Ultrasonic Flow Measurement of Gas

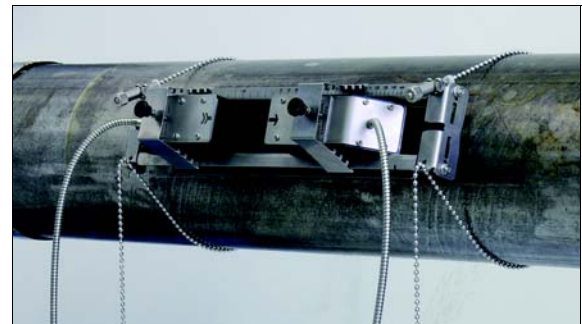
Portable instrument for non-invasive, quick ultrasonic flow measurement with clamp-on technology for all types of piping

Features

- Precise bi-directional and highly dynamic flow measurement with the non-intrusive clamp-on technology
- High precision at fast and slow flow rates, high temperature and zero point stability
- Portable, easy-to-use flow transmitter with 2 flow channels, multiple inputs/outputs, an integrated data logger with a serial interface
- Water and dust-tight (NEMA 4); 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 (0.3...63 in) and fluid temperatures (-40...+392 °F)
- Probe for wall thickness measurement available
- Robust, water-tight (NEMA 6) transport case with comprehensive accessories
- QuickFix for fast mounting of the flow transmitter in difficult conditions



FLUXUS G601 supported by handle



Measurement with transducers mounted by the portable Variofix VP

Applications

Designed for industrial use in harsh environments, in gas processing and natural gas extraction, chemical industry and in the petroleum industry. Practical applications:

- Measurement on natural gas pipelines and in natural gas storage installations
- Measurement of synthesized gas and injection gas
- Measurement for the gas supply industry
- Supervision of permanently installed meters, service and maintenance



Measurement equipment in transport case

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Function

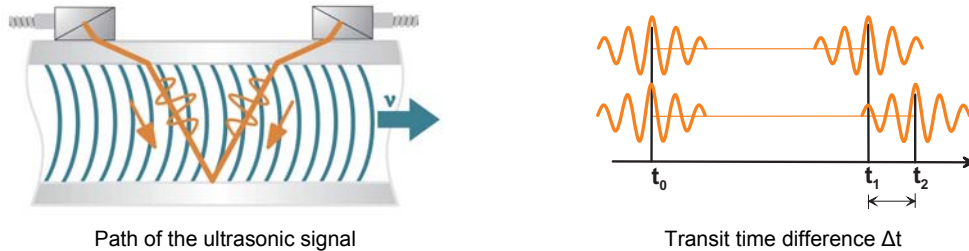
Measurement Principle

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

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

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_{fl} = transit time in the medium

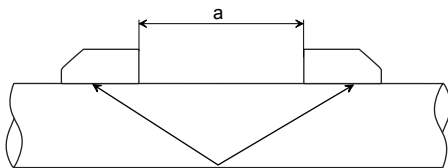
Number of Sound Paths

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:

- **reflect 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.
- **direct mode**
Diagonal mode with 1 sound path. This should be used in the case of a high signal attenuation by the medium, pipe or coatings.

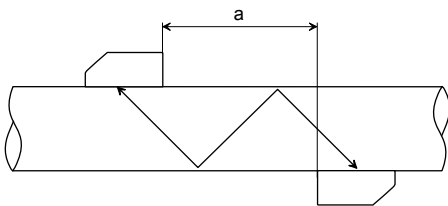
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

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

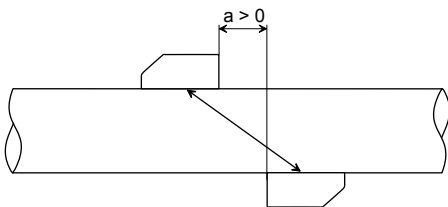


Reflect mode, number of sound paths: 2

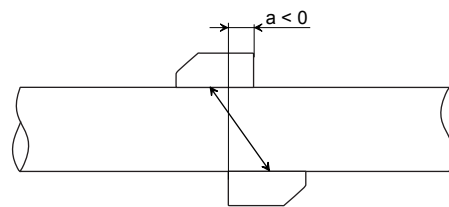
a = transducer distance



Diagonal mode, number of sound paths: 3

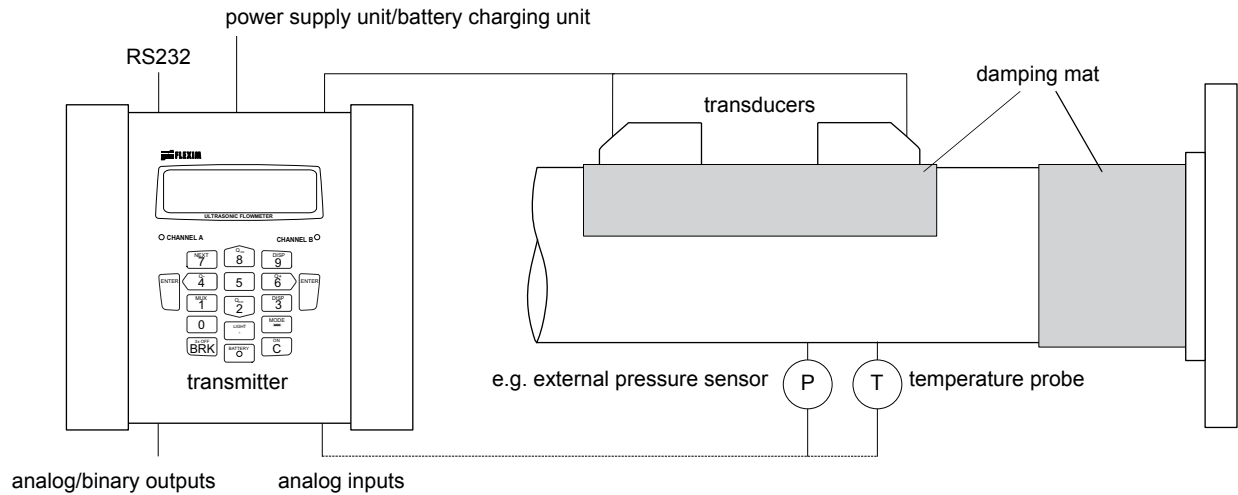


Direct mode, number of sound paths: 1



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

Typical Measurement Setup



Example of a measurement setup in reflect mode with connection of the inputs to an external process pressure and process temperature measurement for standard volumetric flow rate calculation

Standard Volumetric Flow Rate

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

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

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 = 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.

or:


If inputs are installed (optional), pressure and temperature can be measured by the customer and fed in 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

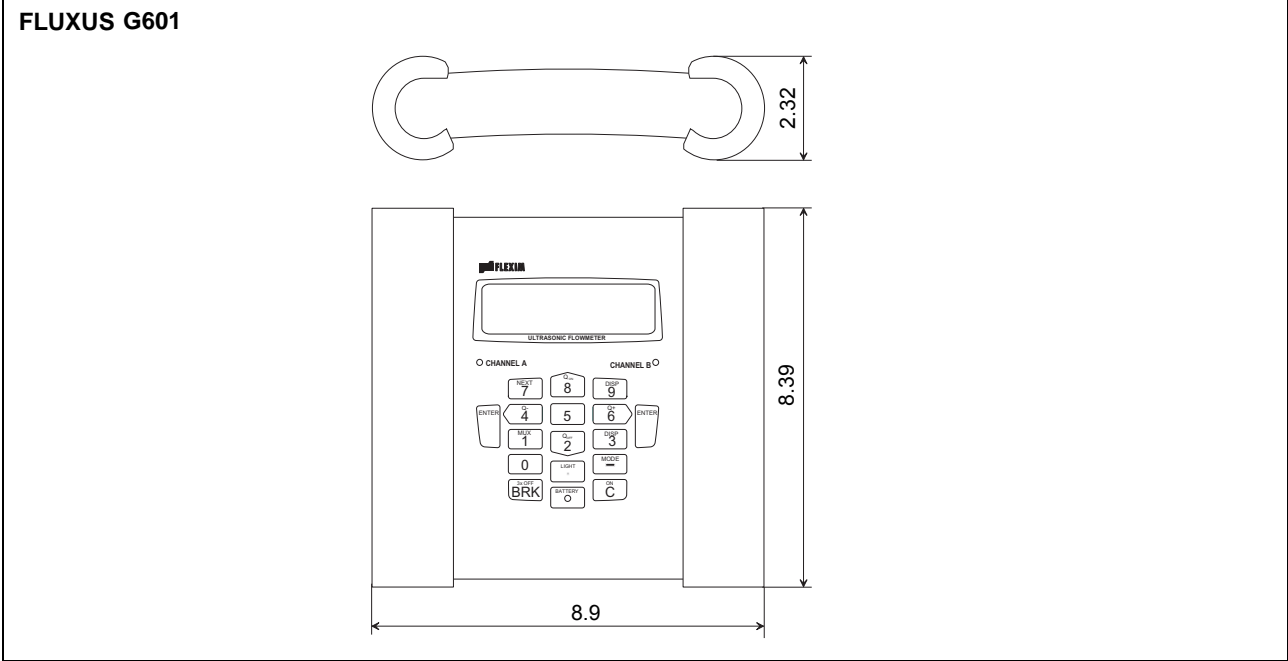
Flow Transmitter

Technical Data

FLUXUS	G601
design	portable
	
measurement	
measurement principle	transit time difference correlation principle
flow velocity	0.03 to 115 ft/s, depending on pipe diameter
repeatability	0.15 % of reading ± 0.03 ft/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 to 3 % of reading ± 0.03 ft/s depending on application ± 0.5 % of reading ± 0.03 ft/s with field calibration
flow transmitter	
power supply	100 to 240 V/50 to 60 Hz (power supply unit), 10.5 to 15 V DC (socket at transmitter), 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 to 100 s, adjustable
measuring cycle (1 channel)	100 to 1000 Hz
response time	1 s (1 channel), option: 70 ms
housing material	PA, TPE, AutoTex, stainless steel
degree of protection	NEMA 4
dimensions	see dimensional drawing
weight	4.2 lb
fixation	QuickFix pipe mounting fixture
operating temperature	14 to 140 °F
display	2 x 16 characters, dot matrix, backlight
menu language	English, German, French, Dutch, Spanish
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, totalized values and diagnostic values
capacity	> 100 000 measured values

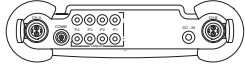
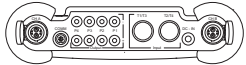
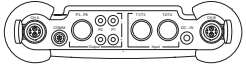
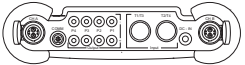
FLUXUS	G601
communication	
interface	RS232/USB
serial data kit	
software (all Windows™ versions)	- FluxData: download of measurement data, graphical presentation, conversion to other formats (e.g. for Excel™) - FluxKoeff: creating medium data sets
cable	RS232
adapter	RS232 - USB
transport case	
dimensions	19.7 x 15.7 x 7.5 in
outputs	
	The outputs are galvanically isolated from the transmitter.
number	see standard scope of supply on page 9, max. on request
accessories	output adapter (if number of outputs > 4)
current output	
range	0/4 to 20 mA
accuracy	0.1 % of reading ±15 µA
active output	$R_{ext} < 200 \Omega$
passive output	$U_{ext} = 4 \text{ to } 16 \text{ V}$, depending on R_{ext} $R_{ext} < 500 \Omega$
frequency output	
range	0 to 5 kHz
open collector	24 V/4 mA
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 to 1000 units 1 to 1000 ms
inputs	
	The inputs are galvanically isolated from the transmitter.
number	see standard scope of supply on page 9, max. 4
accessories	input adapter (if number of inputs > 2)
temperature input	
type	Pt100/Pt1000
connection	4-wire
range	-238 to +1040 °F
resolution	0.01 K
accuracy	±0.01 % of reading ±0.03 K
current input	
accuracy	0.1 % of reading ±10 µA
passive input	$R_i = 50 \Omega$, $P_i < 0.3 \text{ W}$
- range	-20 to +20 mA
voltage input	
range	0 to 1 V
accuracy	0.1 % of reading ±1 mV
internal resistance	$R_i = 1 \text{ M}\Omega$

Dimensions

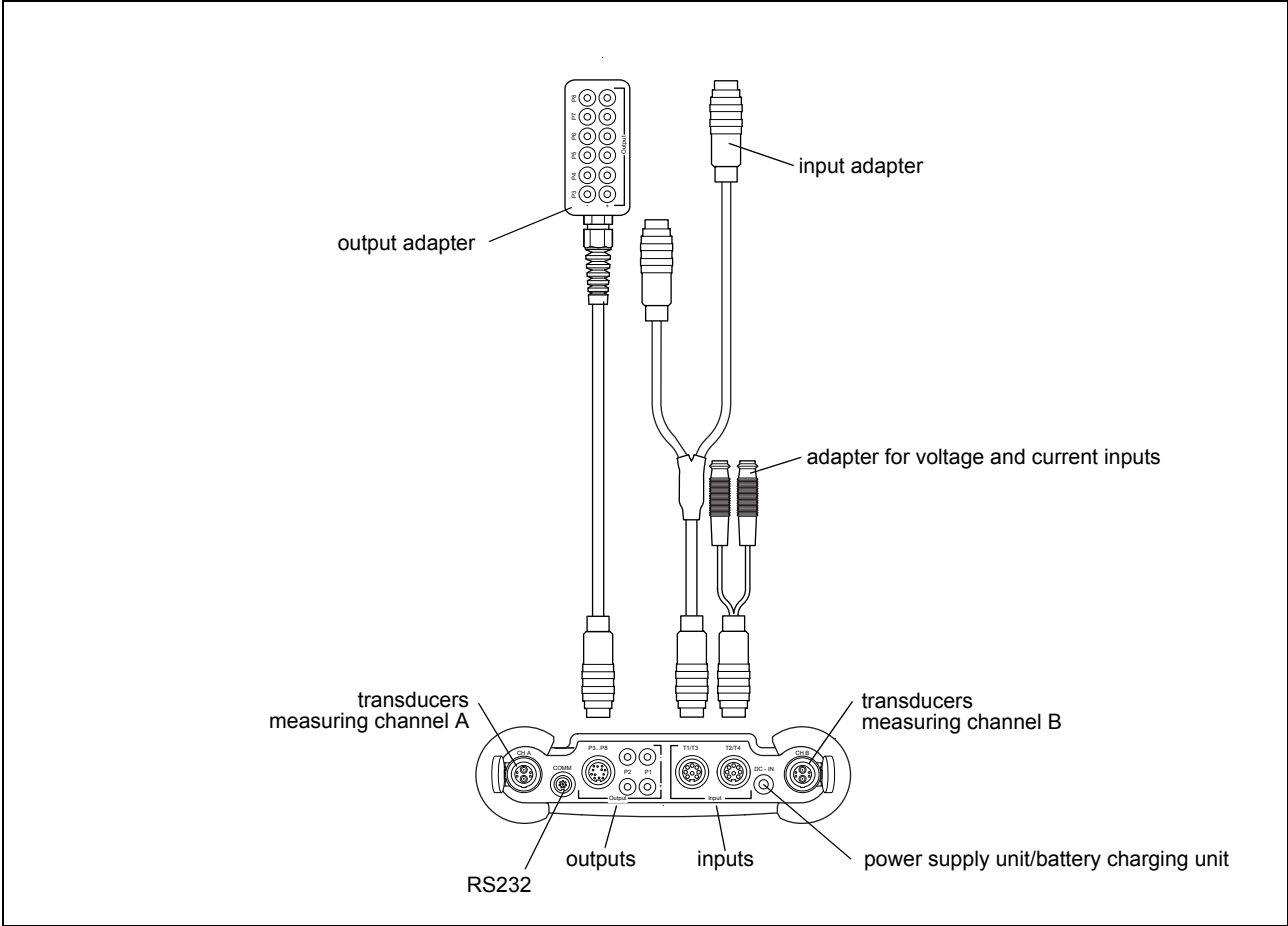


in inch

Standard Scope of Supply

	G601 Standard	G601 Extended Standard	G601 Multifunctional	G601 CA-Energy
application	flow measurement on gas			flow measurement on 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 pressure and temperature values		
transducer frequency	G, H, K, M, P			K, M, P, Q, S
outputs				
passive current output	2	2	2	2
binary output	2	1	2	2
frequency output	-	1	1	-
inputs				
temperature input	-	-	1	2
passive current input	-	2	2	2
voltage input	-	-	1	-
accessories				
transport case	x	x	x	x
power supply unit, mains cable	x	x	x	x
battery	x	x	x	x
output adapter	-	-	x	-
input adapter	-	2	2	2
adapter for voltage and current inputs	-	-	3	2
QuickFix pipe mounting fixture for transmitter	x	x	x	x
serial data kit	x	x	x	x
measuring tape	x	x	x	x
damping mats with installation kit	x	-	x	x
wall thickness probe	-	-	x	x
user manual, Quick Start Guide	x	x	x	x
connector board at the upper side of the transmitter				

Connection of Adapters



Example for the Equipment of a Transport Case

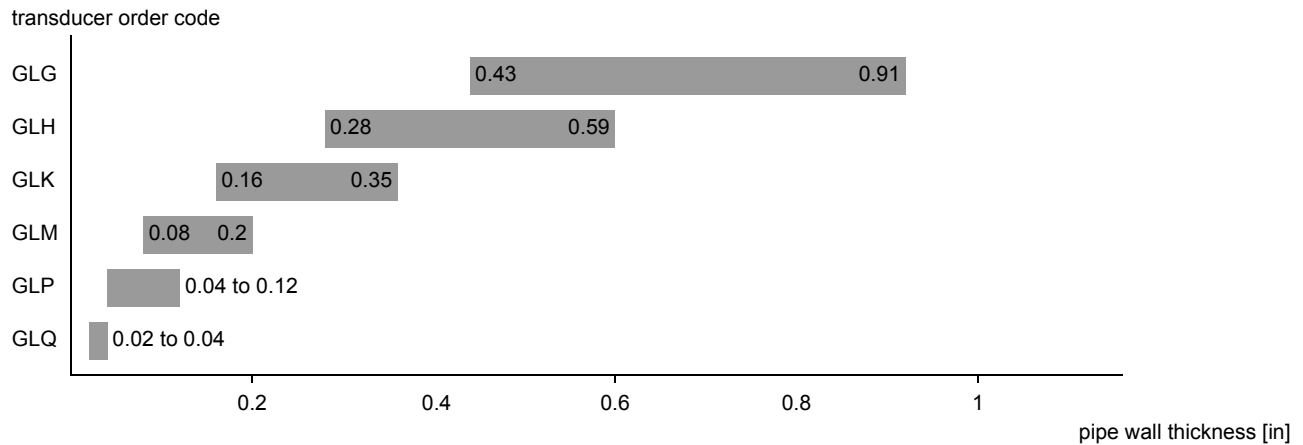


Transducers

Transducer Selection

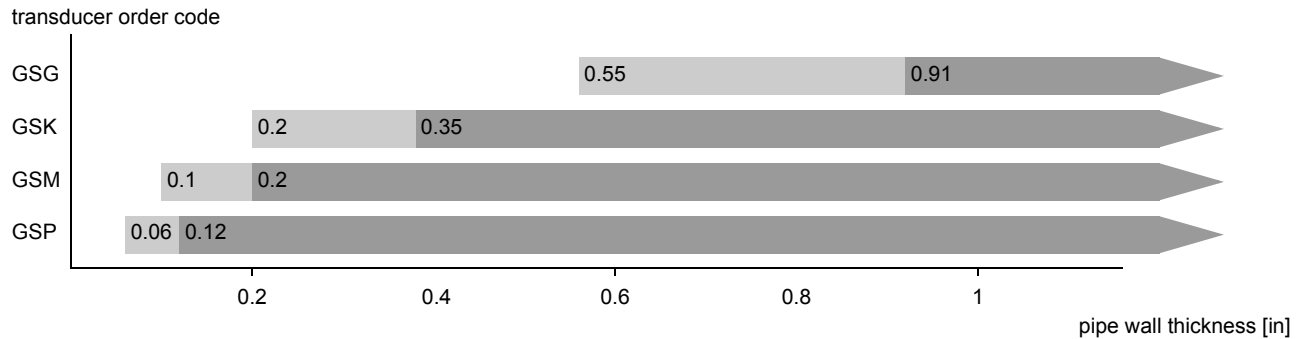
Step 1a

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:



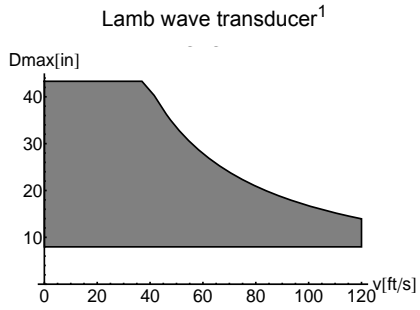
recommended
 possible

Step 2

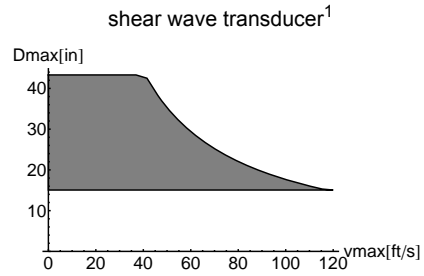
inner pipe diameter d dependent on the flow velocity v of the medium in the pipe

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.

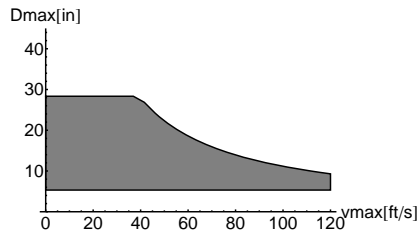
Lamb wave transducers: If the values d and v are not in the range, diagonal mode with 1 sound path may be used, i.e. the same characteristics can be used with doubling the inner pipe diameter. If the values are still not in the range, shear waves transducers regarding the pipe wall thickness have to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



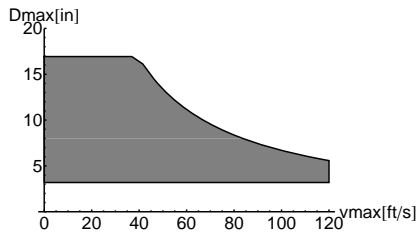
GLG



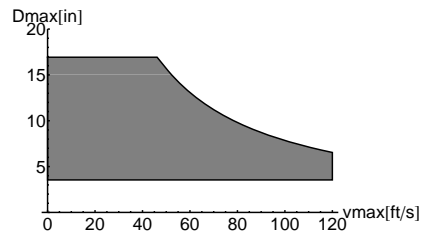
GSG



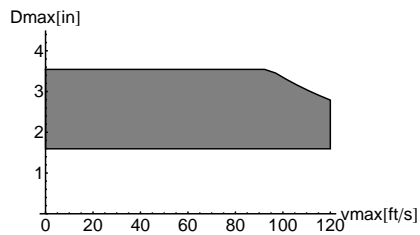
GLH



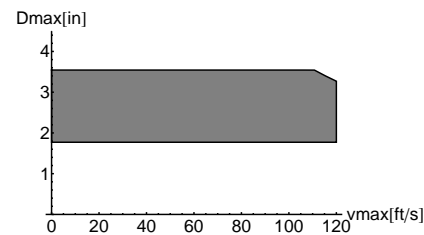
GLK



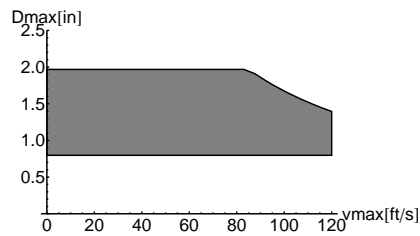
GSK



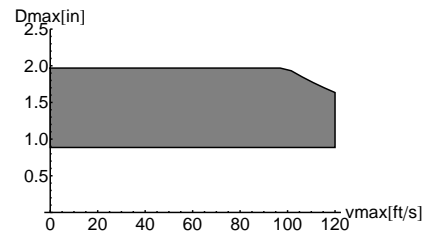
GLM



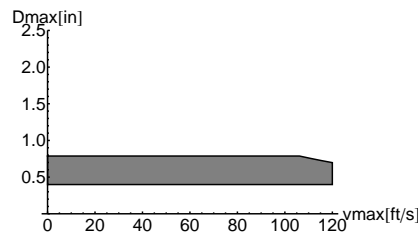
GSM



GLP



GSP



GLQ

¹ inner pipe diameter and max. flow velocity for a typical application with natural gas, nitrogen, oxygen in reflect 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 [psi]		
	metal pipe		plastic pipe
	min.	min. extended	min.
GLG	218	145	15
GLH	218	145	15
GLK	218 (d > 4.7 in) 145 (d < 4.7 in)	145 (d > 4.7 in) 73 (d < 4.7 in)	15
GLM	145 (d > 2.4 in) 73 (d < 2.4 in)	-	15
GLP	145 (d > 1.4 in) 73 (d < 1.4 in)	-	15
GLQ	145 (d > 0.59 in) 73 (d < 0.59 in)	-	15

shear wave transducer			
transducer order code	medium pressure ¹ [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

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	in	0.47 GLG or GLH	0.47 GLG or GLH	0.47 GLG or GLH	1.2 GS
2	inner pipe diameter max. flow velocity selected transducer	in ft/s	31.5 49 GLG	23.6 49 GLG or GLH	31.5 98 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	11.8 49 GSK
3	min. medium pressure selected transducer	psi	247 GLG	247 GLG or GLH influence of acoustic noise is reduced with increased transducer frequency, thus recommended: GLH	247 GLG	508 GSK

Step 4

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

Step 5

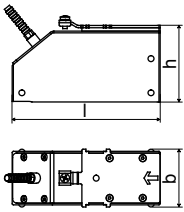
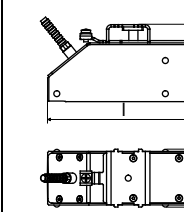
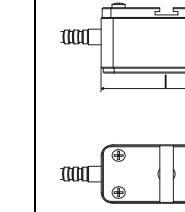
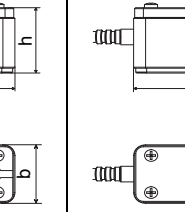
for the technical data of the selected transducer see page 16 et seqq.

Transducer Order Code

1, 2	3	4	5, 6	7, 8	9 to 11	no. of character		
transducer	transducer frequency	-	operating temperature	explosion protection	connection system	-	extension cable	
							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)	
				NN			not explosion proof	
					NL		with Lemo connector	
						XXX	cable length in m, for max. length of extension cable see page 24	
example								
GL	K	-	N	NN	NL	-	000	Lamb wave transducer 0.5 MHz, normal temperature range, connection system NL with Lemo connector
		-				-		

Technical Data

Shear Wave Transducers

technical type		GDG1NZ7	GDK1NZ7	GDM1NZ7	GDP1NZ7	
order code		GSG-NNNNL	GSK-NNNNL	GSM-NNNNL	GSP-NNNNL	
transducer frequency		MHz 0.2	0.5	1	2	
medium pressure¹						
min. extended		psi	metal pipe: 290	metal pipe: 290	metal pipe: 290	
min.		psi	metal pipe: 435 plastic pipe: 15	metal pipe: 435 plastic pipe: 15	metal pipe: 435 plastic pipe: 15	
inner pipe diameter d²						
min. extended		in	9.8	2.8	1.2	
min. recommended		in	15	3.1	1.6	
max. recommended		in	31.9	19.7	3.1	
max. extended		in	43.3	28.3	4.7	
pipe wall thickness						
min.		in	0.55	0.2	0.1	
max.		in	-	-	-	
material						
housing			PEEK with stainless steel cap 304	PEEK with stainless steel cap 304	stainless steel 304	
contact surface			PEEK	PEEK	PEEK	
degree of protection			NEMA 6	NEMA 6	NEMA 6	
transducer cable						
type			1699	1699	1699	
length		ft	16	16	13	
dimensions						
length l		in	5.1	4.98	2.36	
width b		in	2.01	2.01	1.18	
height h		in	2.64	2.66	1.32	
dimensional drawing						
operating temperature						
min.		°F	-40	-40	-40	
max.		°F	+266	+266	+266	
temperature compensation			x	x	x	

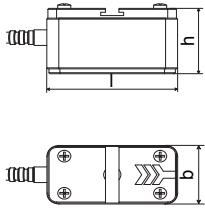
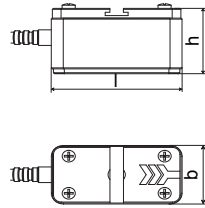
¹ depending on application, typical absolute value for natural gas, nitrogen, compressed air

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 49 ft/s

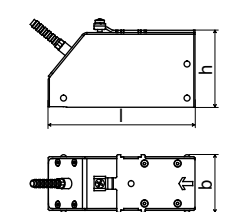
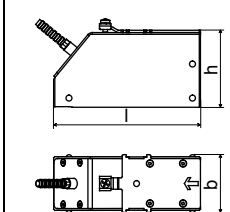
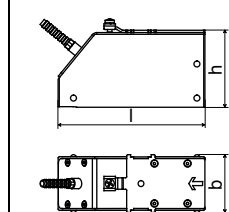
Shear Wave Transducers (extended temperature range)

technical type		GDM1EZ7	GDP1EZ7
order code		GSM-ENNNL	GSP-ENNNL
transducer frequency	MHz	1	2
medium pressure¹			
min. extended	psi	metal pipe: 290	metal pipe: 290
min.	psi	metal pipe: 435 plastic pipe: 15	metal pipe: 435 plastic pipe: 15
inner pipe diameter d²			
min. extended	in	1.2	0.59
min. recommended	in	1.6	0.79
max. recommended	in	3.1	1.6
max. extended	in	4.7	2.4
pipe wall thickness			
min.	in	0.1	0.06
max.	in	-	-
material			
housing		stainless steel 304	stainless steel 304
contact surface		Sintimid	Sintimid
degree of protection		NEMA 4	NEMA 4
transducer cable			
type		1699	1699
length	ft	13	13
dimensions			
length l	in	2.36	2.36
width b	in	1.18	1.18
height h	in	1.32	1.32
dimensional drawing			
operating temperature			
min.	°F	-22	-22
max.	°F	+392	+392
temperature compensation		x	x

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 49 ft/s

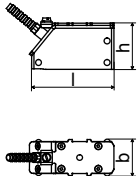
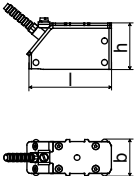
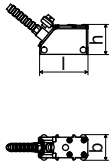
Lamb Wave Transducers

technical type		GRG1NC3	GRH1NC3	GRK1NC3
order code		GLG-NNNNL	GLH-NNNNL	GLK-NNNNL
transducer frequency	MHz	0.2	0.3	0.5
medium pressure¹				
min. extended	psi	metal pipe: 145	metal pipe: 145	metal pipe: 145 (d > 4.7 in) 73 (d < 4.7 in)
min.	psi	metal pipe: 218 plastic pipe: 15	metal pipe: 218 plastic pipe: 15	metal pipe: 218 (d > 4.7 in) 145 (d < 4.7 in) plastic pipe: 15
inner pipe diameter d²				
min. extended	in	7.5	4.7	2.4
min. recommended	in	8.7	5.5	3.1
max. recommended	in	35.4	23.6	11.8
max. extended	in	63	39.4	19.7
pipe wall thickness				
min.	in	0.43	0.28	0.16
max.	in	0.91	0.59	0.35
material				
housing		PPSU with stainless steel cap 304	PPSU with stainless steel cap 304	PPSU with stainless steel cap 304
contact surface		PPSU	PPSU	PPSU
degree of protection		NEMA 4	NEMA 4	NEMA 4
transducer cable				
type		1699	1699	1699
length	ft	16	16	16
dimensions				
length l	in	5.06	5.06	5.06
width b	in	2.01	2.01	2.01
height h	in	2.66	2.66	2.66
dimensional drawing				
operating temperature				
min.	°F	-40	-40	-40
max.	°F	+338	+338	+338
temperature compensation		x	x	x

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 reflect mode and for a flow velocity of 49 ft/s
 pipe diameter max. extended: in diagonal mode and for a flow velocity of 82 ft/s

Lamb Wave Transducers

technical type		GRM1NC3	GRP1NC3	GRQ1NC3
order code		GLM-NNNNL	GLP-NNNNL	GLQ-NNNNL
transducer frequency	MHz	1	2	4
medium pressure¹				
min. extended min.	psi	- 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
inner pipe diameter d²				
min. extended	in	1.2	0.59	0.28
min. recommended	in	1.6	0.79	0.39
max. recommended	in	3.5	2	0.87
max. extended	in	5.9	2.8	1.4
pipe wall thickness				
min.	in	0.08	0.04	0.02
max.	in	0.2	0.12	0.04
material				
housing		PPSU with stainless steel cap 304	PPSU with stainless steel cap 304	PPSU with stainless steel cap 304
contact surface		PPSU	PPSU	PPSU
degree of protection		NEMA 4	NEMA 4	NEMA 4
transducer cable				
type		1699	1699	1699
length	ft	13	13	9
dimensions				
length l	in	2.91	2.91	1.65
width b	in	1.26	1.26	0.87
height h	in	1.59	1.59	1
dimensional drawing				
operating temperature				
min.	°F	-40	-40	-40
max.	°F	+338	+338	+338
temperature compensation		x	x	x
remark				on request

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

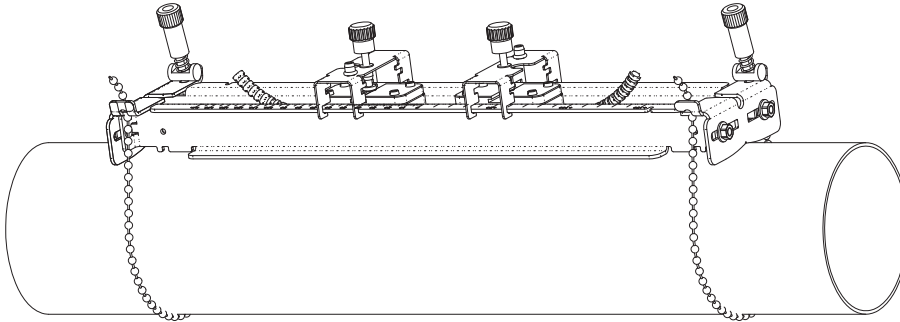
² Lamb wave transducer:
 typical values for natural gas, nitrogen, oxygen, pipe diameters for other gases on request
 pipe diameter min. recommended/max. recommended: in reflect mode and for a flow velocity of 49 ft/s
 pipe diameter max. extended: in diagonal mode and for a flow velocity of 82 ft/s

Transducer Mounting Fixture

Order Code

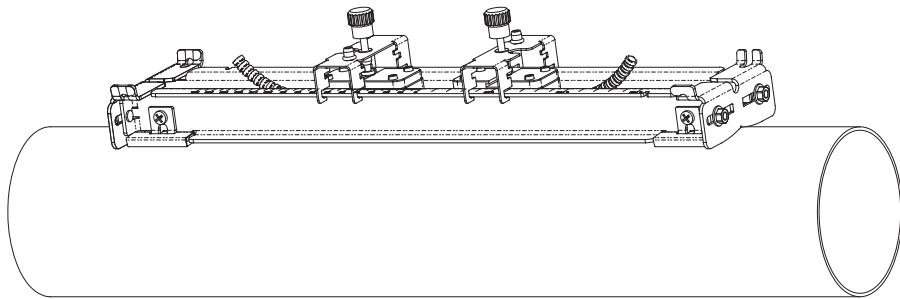
1, 2	3	4	5	6	7 to 9	no. of character		
transducer mounting fixture	transducer	-	measuring mode	size	-	fixation	outer pipe diameter	description
VP								portable Variofix
TB								tension belts
	A							all transducers
			D					reflect mode or diagonal mode/direct mode
			R					reflect mode
				M				medium
						C		chains
						N		without fixation
							055	0.39 to 21.7 in
							150	2 to 59.1 in
							210	2 to 82.7 in
example								
VP	A	-	D	M	-	C	055	portable Variofix and chains
		-			-			

portable Variofix VP and chains (optional)



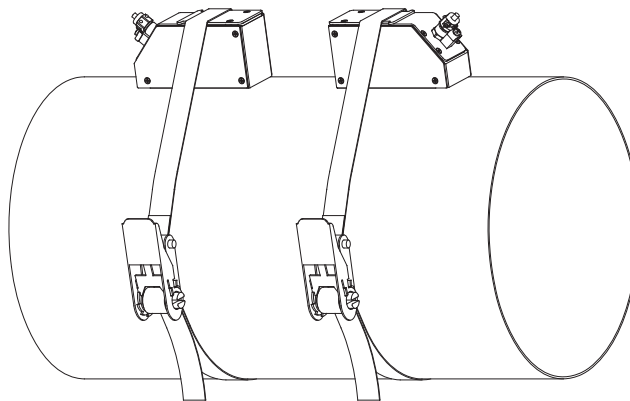
material: stainless steel 304,
301, 303
dimensions:
16.3 x 3.7 x 2.99 in
chain length: 6 ft

portable Variofix VP and magnet (optional)



material: stainless steel 304,
301, 303
dimensions:
16.3 x 3.7 x 1.57 in

tension belts TB (optional)



material: steel, powder coated
and textile tension belt
length: 16/22 ft

operating temperature:
max. 140 °F
outer pipe diameter:
max. 59.1/82.7 in

Coupling Materials for Transducers

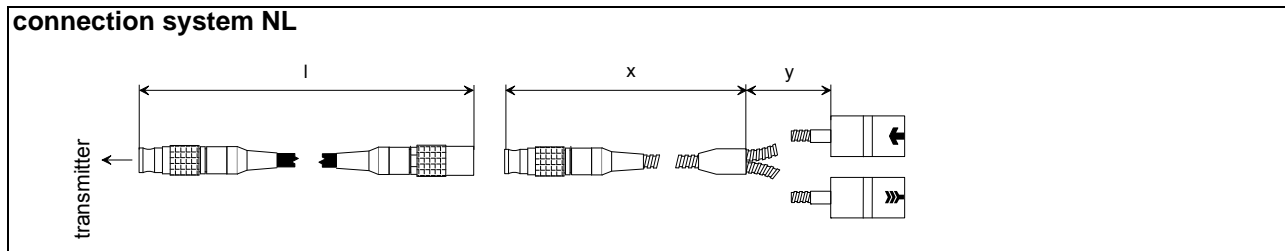
	normal temperature range (4th character of transducer order code = N)		extended temperature range (4th character of transducer order code = E)	
	< 212 °F	212 to 338 °F	< 302 °F	302 to 392 °F
< 2 h	coupling compound type N	coupling compound type E	coupling compound type E	coupling compound type E or H
< 24 h	coupling compound type N	coupling compound type E	coupling compound type E	coupling foil type VT
< 3 months	coupling compound type N	coupling compound type E	coupling foil type VT	coupling foil type VT

Technical Data

type	order code	operating temperature °F	material	remark
coupling compound type N	990739-1	-22 to +266	mineral grease paste	
coupling compound type E	990739-2	-22 to +392	silicone paste	
coupling compound type H	990739-3	-22 to +482	fluoropolymer paste	
coupling foil type VT	990739-0	14 to 302, short-time peak max. 392	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

coupling foil not to be used for transducer mounting fixture with magnets

Connection Systems



transducer frequency (3d character of transducer order code)		G, H, K			M, P			Q			S		
N	cable length ft	x	y	l¹	x	y	l¹	x	y	l¹	x	y	l
L		6	9	≤ 82	6	6	≤ 82	6	3	≤ 82	3	3	≤ 65

¹ > 82 to 328 ft on request

x, y = transducer cable length

l = max. length of extension cable

Transducer Cable

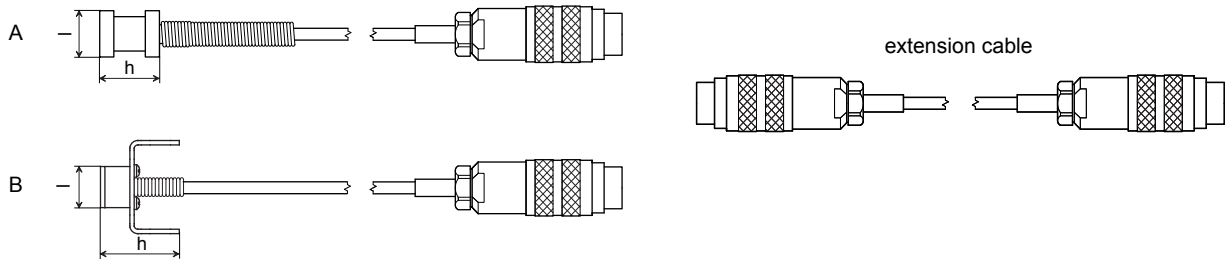
Technical Data

		transducer cable	extension cable
type		1699	2551
standard length	ft	see table above	16 32
max. length	ft	-	see table above
operating temperature	°F	-67 to +392	-13 to +176
sheath			
material		stainless steel 304	-
outer diameter	in	0.31	-
cable jacket			
material		PTFE	TPE-O
outer diameter	in	0.11	0.31
thickness	in	0.01	
color		brown	black
shield		x	x

Clamp-on Temperature Probe (optional)

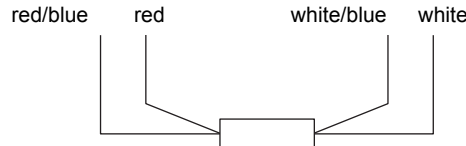
Technical Data

technical type		PT13N	PT13N	PT13F	PT13F
order code		670413-1	670412-1	670413-2	670412-2
design		short response time			
type		Pt1000	Pt1000 matched according to EN 1434-1	Pt1000	Pt1000 matched according to EN 1434-1
connection		4-wire		4-wire	
measuring range		°F -22 to +482		-58 to +482	
accuracy T		$\pm(0.27\text{ }^\circ\text{F} + 2 \cdot 10^{-3} \cdot (T\text{ [}^\circ\text{F]} - 32\text{ }^\circ\text{F}))$, class A		$\pm(0.27\text{ }^\circ\text{F} + 2 \cdot 10^{-3} \cdot (T\text{ [}^\circ\text{F]} - 32\text{ }^\circ\text{F}))$, 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, copper	
degree of protection		NEMA 4		NEMA 4	
weight (without connector)		lb 0.6	1.1	0.7	1.4
fixation		clamp-on		clamp-on	
accessories		-		plastic protection plate, insulation foam	
dimensions					
length l	in	0.59		0.55	
width b	in	0.59		1.18	
height h	in	0.79		1.06	
dimensional drawing		A		B	



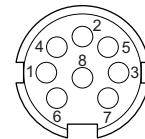
Connection

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	ft	9	16/32/82
max. length	ft	-	656
cable jacket		PTFE	PVC

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.

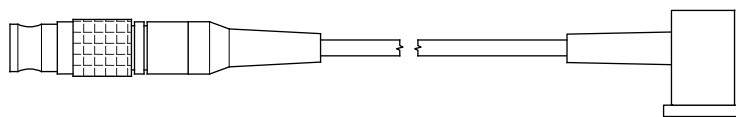


Wall thickness measurement

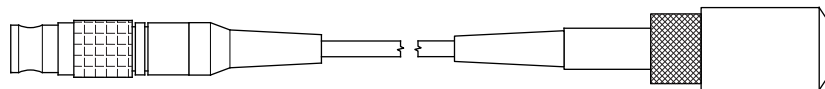
Technical Data

technical type		DWQ1xZ7	DWP1EZ7
		reverse polarity protected	
measuring range ¹	in	0.04 to 7.9	
resolution	in	0.0004	
accuracy		1 % ± 0.02 in	
operating temperature	°F	-4 to +140	-4 to +392, short-time peak max. 1004
cable length	ft	4	3

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.



DWQ1xZ7



DWP1EZ7



FLEXIM AMERICAS Corporation
Edgewood, NY 11717
USA
Tel.: (631) 492-2300
Fax: (631) 492-2117

internet: www.flexim.com
e-mail: usinfo@flexim.com
1-888-852-7473

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