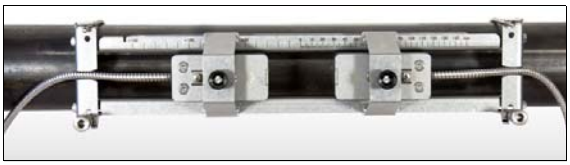
Portable Ultrasonic Flow Measurement of Liquids in Hazardous Areas

Portable instrument for non-intrusive, 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
- Extremely resistant carbon fiber housing
- Covered by ATEX/IECEx zone 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 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 (10...6500 mm) and fluid temperatures (-40...+200 °C)
- Rugged transducers (ATEX/IECEx zone 1 and 2, resistant to rough environments, dust and humidity)
- Robust, water-tight (IP67) transport case with comprehensive accessories
- HybridTrek automatically switches between transit time and NoiseTrek mode of measurement when high particulate flows are encountered
- QuickFix for fast mounting of the flow transmitter in difficult conditions

FLUXUS F608 supported by handle


Measurement with transducers mounted by the portable Variofix VP


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

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)

Table of Contents

Function

Measurement Principle

Transit Time Difference 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.

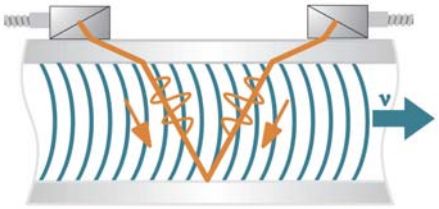
The transit time difference, Δt, is measured and allows the flowmeter to determine the average flow velocity along the propagation path of the ultrasonic signals. A flow profile correction is then performed in order to obtain the area averaged flow velocity, which is proportional to the volumetric flow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

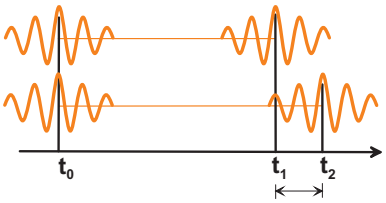
HybridTrek

If the gaseous or solid content in the medium increases occasionally during measurement, a measurement with the transit time difference principle is no longer possible. NoiseTrek mode will then be selected by the flowmeter. This measurement method allows the flowmeter to achieve a stable measurement even with high gaseous or solid content.

The transmitter can switch automatically between transit time and NoiseTrek mode without any changes to the measurement setup.



Path of the ultrasonic signal



Transit time difference Δt

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

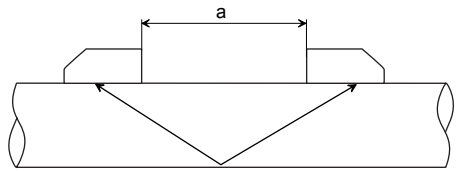
Number of Sound Paths

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:

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

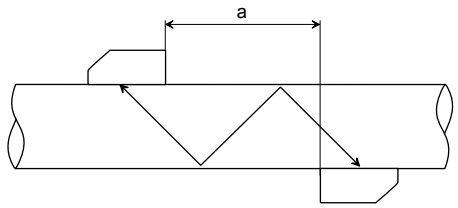
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

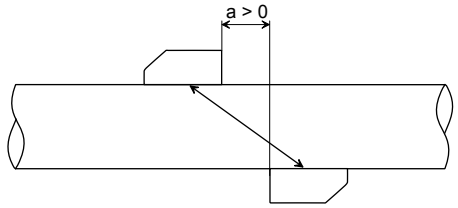


Reflection arrangement, number of sound paths: 2

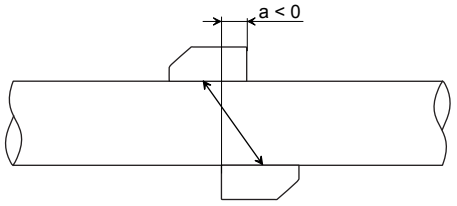
a - transducer distance



Diagonal arrangement, number of sound paths: 3



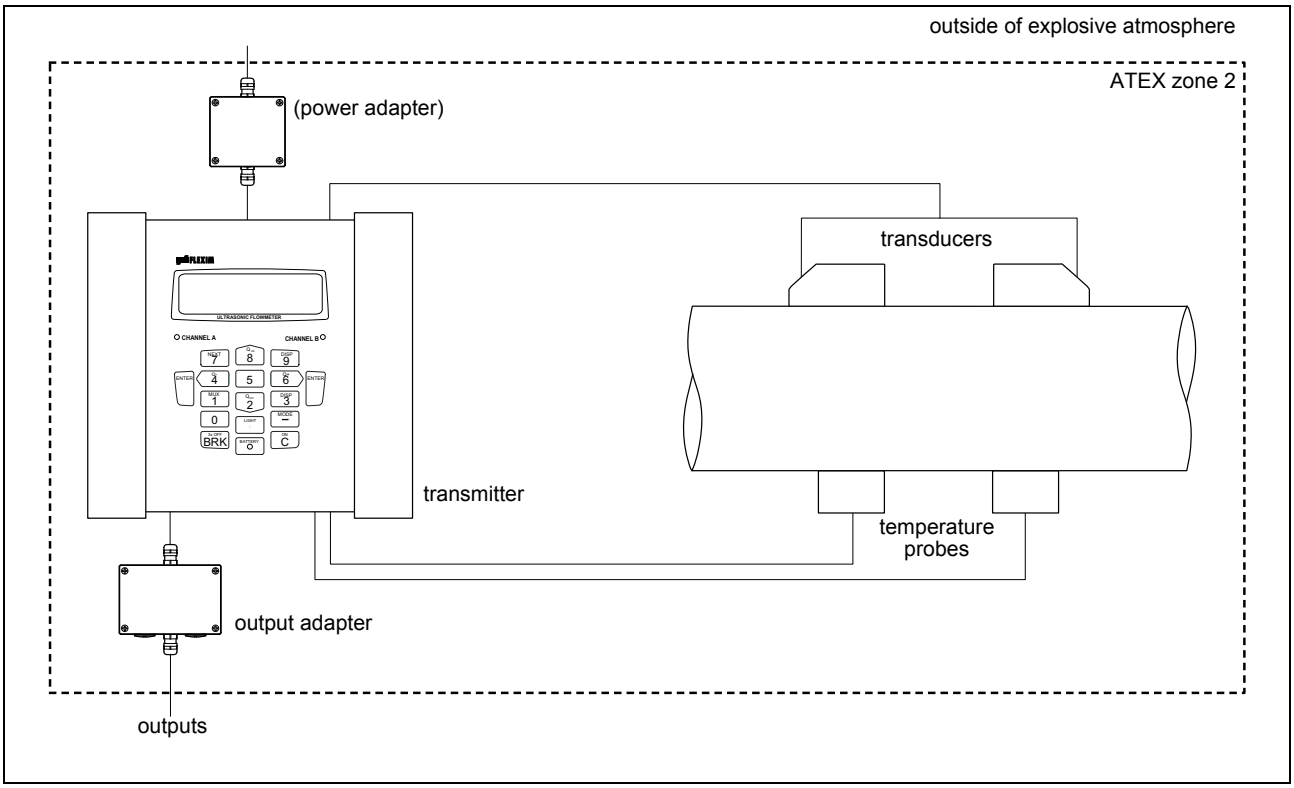
Diagonal arrangement, number of sound paths: 1



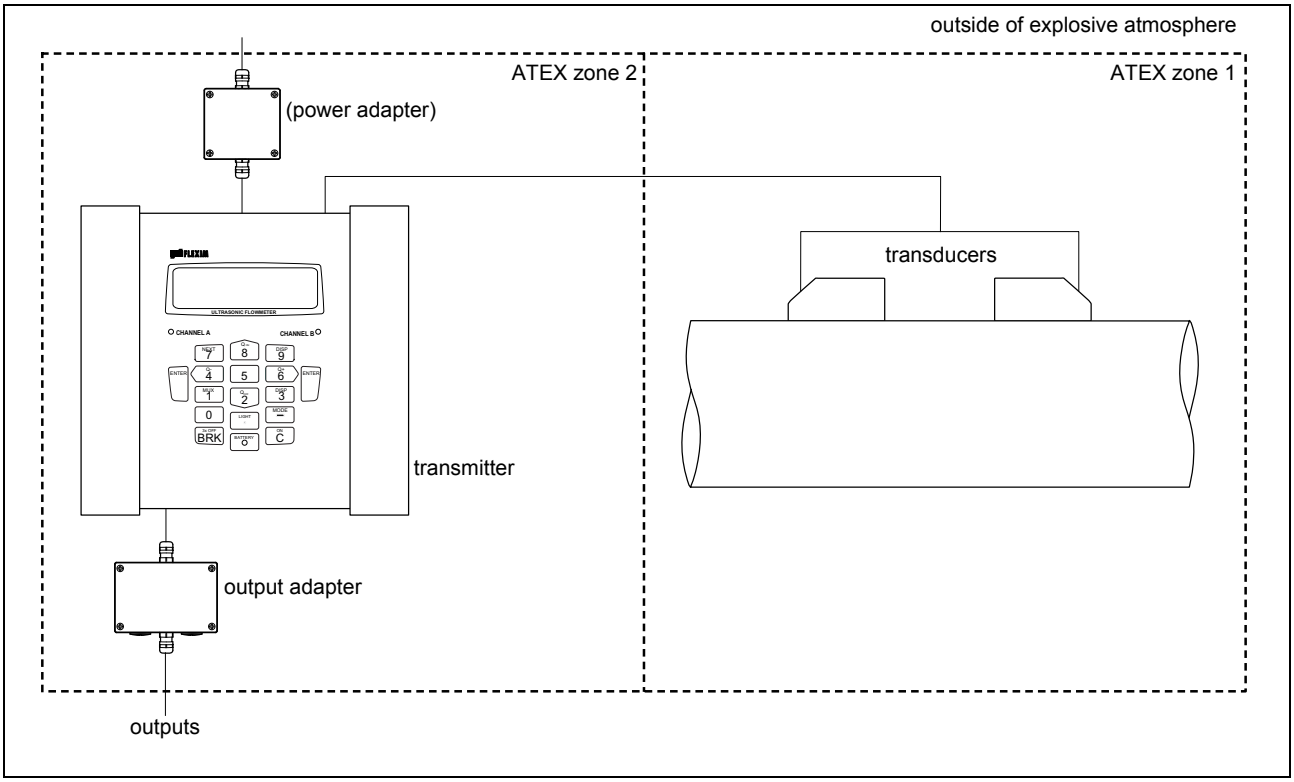
Diagonal arrangement, number of sound paths: 1, negative transducer distance

Typical Measurement Setup

ATEX zone 2



ATEX zone 2/ATEX zone 1



Flow Transmitter

Technical Data

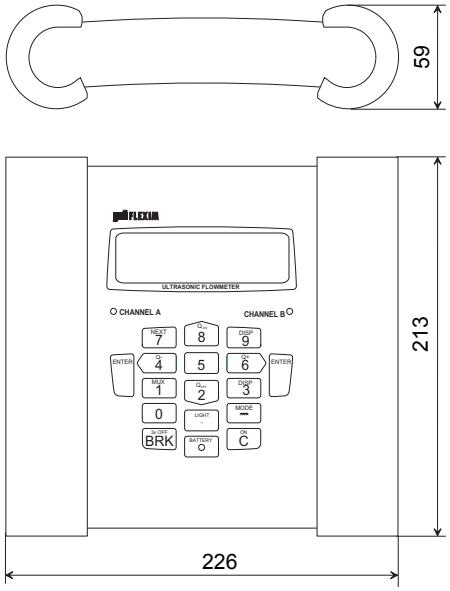
FLUXUS		F608**-A2
design		portable, ATEX zone 2
		
measurement		
measurement principle		transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content
flow velocity		0.01...25 m/s
repeatability		0.15 % of reading ±0.01 m/s
medium		all acoustically conductive liquids with < 10 % gaseous or solid content in volume (transit time difference principle)
temperature compensation		corresponding to the recommendations in ANSI/ASME MFC-5.1-2011
accuracy[1]		
with standard calibration with advanced calibration (optional) with field calibration[2]		±1.6 % of reading ±0.01 m/s ±1.2 % of reading ±0.01 m/s ±0.5 % of reading ±0.01 m/s
flow transmitter		
power supply		100...240 V/50...60 Hz (power supply unit, outside of explosive atmosphere), 10.5...15 V DC (socket at transmitter, with power adapter (optional)), integrated battery
battery		Li-Ion, 7.2 V/4.5 Ah operating time (without outputs, inputs and backlight): > 14 h
power consumption		< 6 W
number of flow measuring channels		2
signal attenuation		0...100 s, adjustable
measuring cycle (1 channel)		100...1000 Hz
response time		1 s (1 channel), option: 70 ms
housing material		PA, TPS, PC, Polyester, stainless steel
degree of protection according to IEC/EN 60529		IP65
dimensions		see dimensional drawing
weight		1.9 kg
fixation		QuickFix pipe mounting fixture
ambient temperature		-10...+60 °C
display		2 x 16 characters, dot matrix, backlight
menu language		English, German, French, Dutch, Spanish
explosion protection		
ATEX / IECEx	category EPL zone	gas: 3G dust: 2D Gc Db 2 21
	marking	CE 0637 Ex II3G II2D Ex nA nC [ic] IIC (T6)T4 Gc Ex tb IIIC T 100 °C Db T_a -10...+(50)60 °C
	certification ATEX	IBExU10ATEX1067
	certification IECEx	IECEx IBE 12.0006
	type of protection	gas: non sparking dust: protection by enclosure temperature inputs: intrinsic safety
	intrinsic safety parameters	U_m = 16 V DC intrinsically safe inputs: U_o = 22 V, I_o = 6 mA, P_o = 33 mW, C_o = 450 nF, L_o = 10 mH, C_i = 1.8 nF, L_i = 10 µH

[1] for transit time difference principle, reference conditions and v > 0.15 m/s

[2] reference uncertainty < 0.2 %

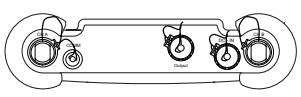
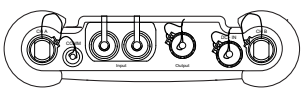
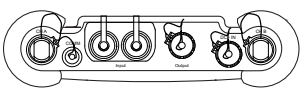
FLUXUS	F608**-A2
measuring functions	
physical quantities	volumetric flow rate, mass flow rate, flow velocity, heat flow (if temperature inputs are installed)
totalizer	volume, mass, optional: heat quantity
calculation functions	average, difference, sum
diagnostic functions	sound speed, signal amplitude, 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
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™) - FluxKoef: creating medium data sets - FluxSubstanceLoader: upload of medium data sets
cable	RS232
adapter	RS232 - USB
transport case	
dimensions	500 x 400 x 190 mm
outputs	
	The outputs are galvanically isolated from the transmitter.
number - analog outputs - binary outputs	 max. 4 0, 2 or 4 active current outputs or passive current outputs or frequency outputs or 2 active current outputs and 2 passive current outputs or 2 active current outputs and 2 frequency outputs or 2 passive current outputs and 2 frequency outputs max. 4
accessories	output adapter (necessary, option)
	current output
range	0/4...20 mA
accuracy	0.1 % of reading ±15 µA
active output	R_{ext} < 200 Ω
passive output	U_{ext} = 4...9 V, depending on R_{ext} R_{ext} < 200 Ω
	frequency output
range	0...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...1000 units 1...1000 ms
inputs	
	The inputs are galvanically isolated from the transmitter.
number	max. 4
accessories	input adapter (if number of inputs > 2)
	temperature input (intrinsic safety)
type connection range resolution accuracy	Pt100/Pt1000 4-wire -150...+560 °C 0.01 K ±0.01 % of reading ±0.03 K

Dimensions



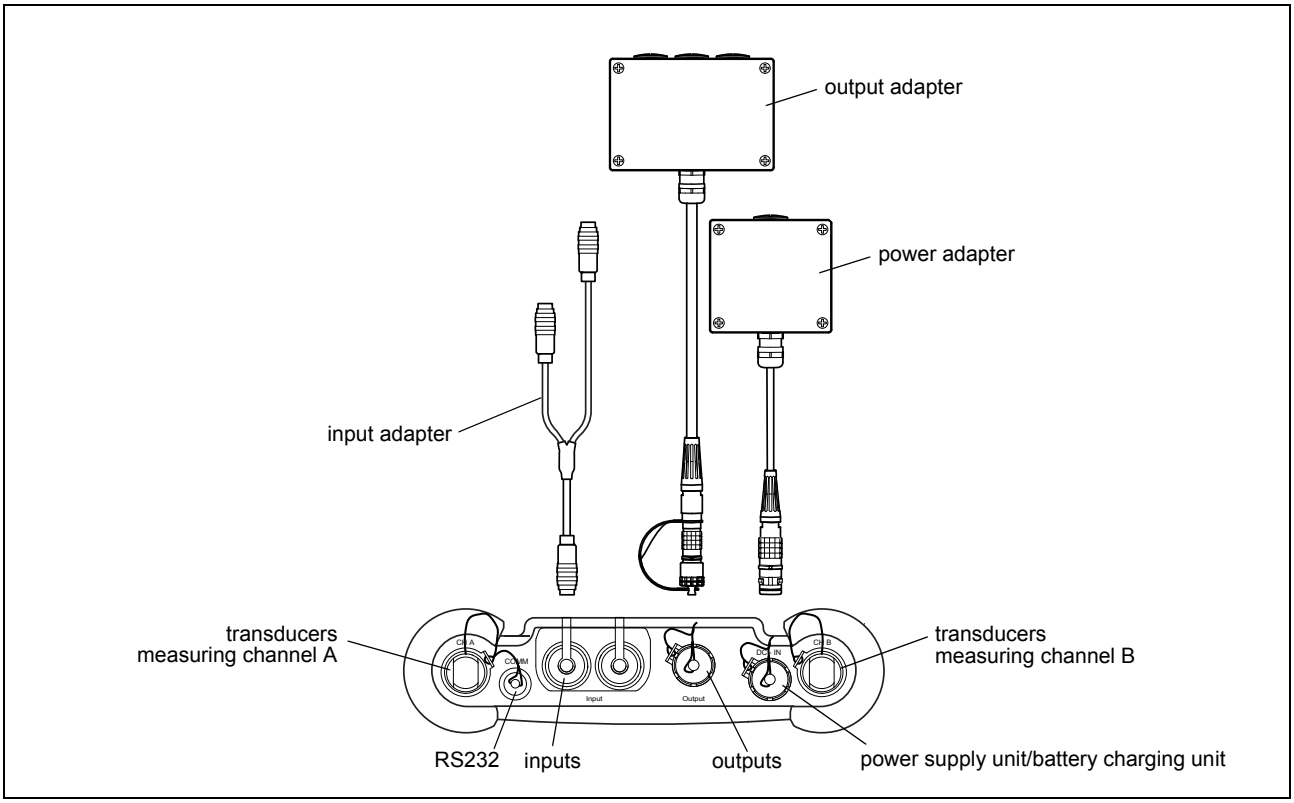
in mm

Standard Scope of Supply

	F608 Standard	F608 Energy	F608 Double Energy
order code	FLUXUS F608ST-A22-3N-NN-2D-II-NN-NN	FLUXUS F608ST-A22-3N-GG-2D-II-NN-NN	FLUXUS F608ST-A22-3N-GG-2D-II-GG-NN
application	flow measurement on liquids		
	2 independent measuring channels		
		temperature-compensated calculation of mass flow rate	
		integrated heat flow computer for monitoring of energy flows	
		simultaneous monitoring of flow and energy flow	simultaneous monitoring of 2 energy flows, e.g. heating systems, heat exchangers)
outputs			
passive current output	2	2	2
binary output	2	2	2
inputs			
temperature input	-	2	4
accessories			
transport case	x	x	x
power supply unit, mains cable	x	x	x
battery	x	x	x
power adapter[1]	-	-	-
output adapter[1]	-	-	-
input adapter	-	-	2
QuickFix pipe mounting fixture for transmitter	x	x	x
serial data kit	x	x	x
measuring tape	x	x	x
user manual, safety instructions, Quick Start Guide	x	x	x
connector board at the upper side of the transmitter			

[1] if required, to be ordered separately

Adapters (optional)

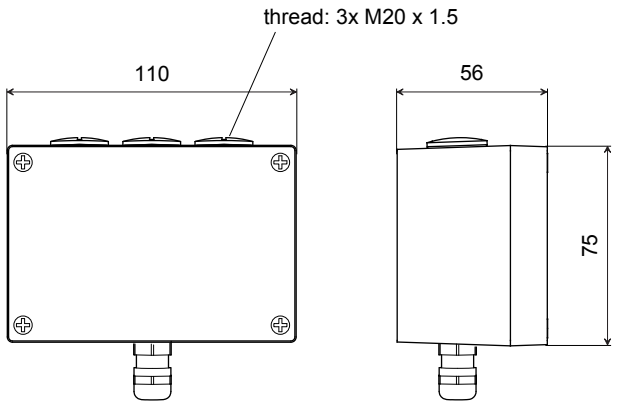


Technical Data

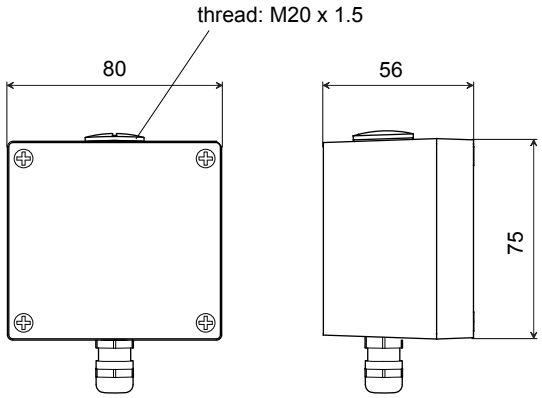
		output adapter	power adapter
technical type		**OA608A2**	**PA608A2**
connection voltage			10.5...15 V DC
dimensions		see dimensional drawing	
weight	kg	0.36	0.29
material			
housing gasket		polyester silicone	
degree of protection according to IEC/ EN 60529		IP66	
ambient temperature			
min. max.	°C °C	-20 +90	
explosion protection			
ATEX zone		2	
ATEX marking		CE Ex II3G Ex nA IIC T6 Gc Ta -10...+60 °C	
ATEX type of protection		non sparking	

Dimensions

output adapter



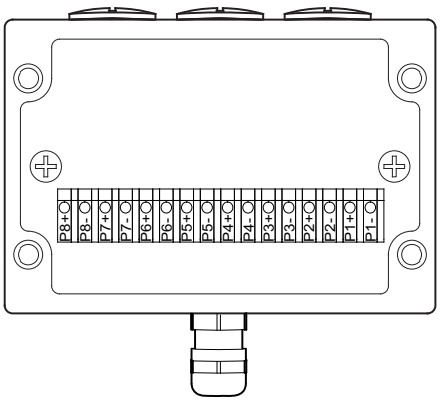
power adapter



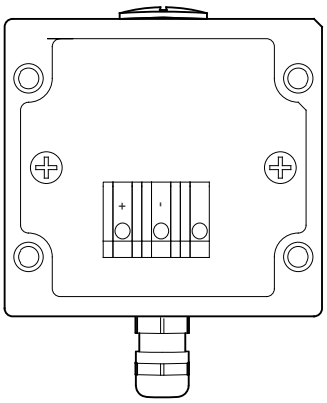
in mm

Terminal Assignment

output adapter

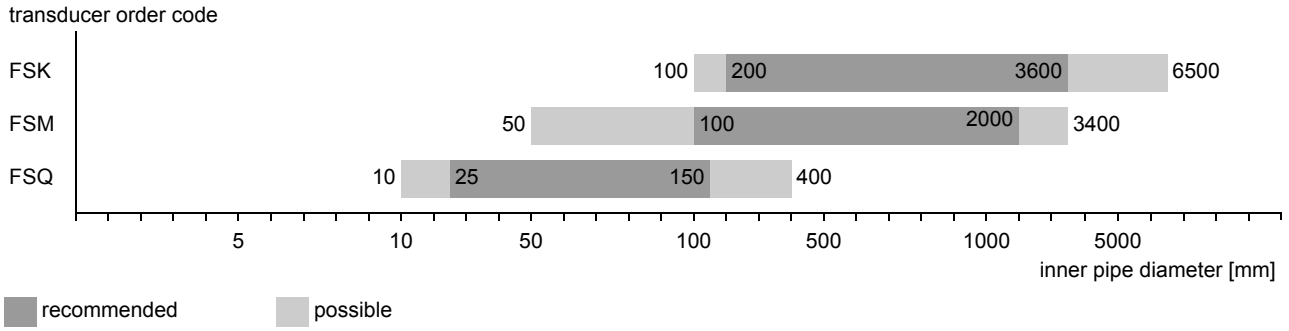


power adapter



Transducers

Transducer Selection

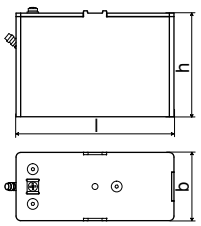
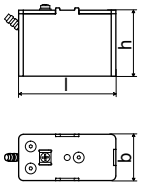
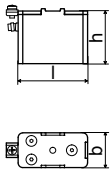


Transducer Order Code

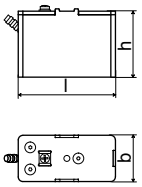
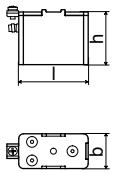
1, 2	3		4	5, 6	7, 8		9...11		12, 13	no. of character
transducer	transducer frequency	-	ambient temperature	explosion protection	connection system	-	extension cable	/	option	description
FS										set of ultrasonic flow transducers for liquids measurement, shear wave
	K									0.5 MHz
	M									1 MHz
	Q									4 MHz
			N							normal temperature range
			E							extended temperature range (shear wave transducers with transducer frequency M, Q)
				A1						ATEX zone 1/IECEx zone 1
				A2						ATEX zone 2/IECEx zone 2
					NL					with Lemo connector
							XXX			cable length in m, for max. length of extension cable see page 19 (connector outside of ATEX zone 1/IECEx zone 1)
									LC	long transducer cable (ATEX zone 2/IECEx zone 2 (only FSK) and ATEX zone 1/IECEx zone 1)
example										
FS	M	-	N	A2	NL	-	010			shear wave transducer 1 MHz, normal temperature range, ATEX zone 2/IECEx zone 2, connection system NL with Lemo connector and extension cable 10 m
		-				-		/		

Technical Data

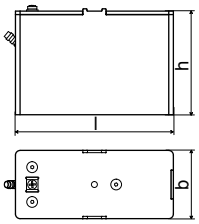
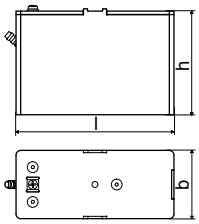
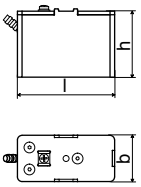
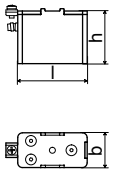
Shear Wave Transducers (zone 1)

technical type		CDK1NW1	CLK1NW1	CDM2NW1	CLM2NW1	CDQ2NW1	CLQ2NW1
order code		**FSK-NA1NL**	**FSK-NA1NL/LC**	**FSM-NA1NL**	**FSM-NA1NL/LC**	**FSQ-NA1NL**	**FSQ-NA1NL/LC**
transducer frequency	MHz	0.5		1		4	
inner pipe diameter d							
min. extended	mm	100		50		10	
min. recommended	mm	200		100		25	
max. recommended	mm	3600		2000		150	
max. extended	mm	6500		3400		400	
pipe wall thickness							
min.	mm	-		-		-	
max.	mm	-		-		-	
material							
housing contact surface		PEEK with stainless steel cap and transducer shoe 304 (1.4301) PEEK		PEEK with stainless steel cap and transducer shoe 304 (1.4301) PEEK		PEEK with stainless steel cap and transducer shoe 304 (1.4301) PEEK	
degree of protection according to IEC/ EN 60529		IP65		IP65		IP65	
transducer cable							
type		1699	1699	1699	1699	1699	1699
length	m	5	9	4	9	3	9
dimensions							
length l	mm	136.5		84		70	
width b	mm	59		40		30	
height h	mm	90.5		59		47.5	
dimensional drawing							
ambient temperature							
min.	°C	-40		-40		-40	
max.	°C	+130		+130		+130	
temperature compensation		x		x		x	
explosion protection							
ATEX / IECEx category EPL zone		gas: 2/3G dust: 2D Gb/Gc Db 1/2 21		gas: 2/3G dust: 2D Gb/Gc Db 1/2 21		gas: 2/3G dust: 2D Gb/Gc Db 1/2 21	
explosion protection temperature (pipe surface)							
min.	°C	-55		-55		-55	
max.	°C	+180		+180		+180	
marking		CE 0637 Ex II2/3G II2D Ex q nA IIC T6...T2 Gb/Gc Ex tb IIIC TX Db		CE 0637 Ex II2/3G II2D Ex q nA IIC T6...T2 Gb/Gc Ex tb IIIC TX Db		CE 0637 Ex II2/3G II2D Ex q nA IIC T6...T2 Gb/Gc Ex tb IIIC TX Db	
certification ATEX		IBExU10ATEX1162 X		IBExU10ATEX1162 X		IBExU10ATEX1162 X	
certification IECEx		IECEx IBE 12.0004X		IECEx IBE 12.0004X		IECEx IBE 12.0004X	
type of protection		gas: powder filling, non sparking dust: protection by enclosure		gas: powder filling, non sparking dust: protection by enclosure		gas: powder filling, non sparking dust: protection by enclosure	

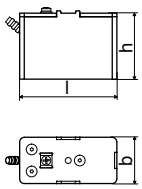
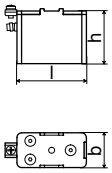
Shear Wave Transducers (zone 1, extended temperature range)

technical type		CDM2EW5	CLM2EW5	CDQ2EW5	CLQ2EW5	
order code		**FSM-EA1NL**	**FSM-EA1NL/LC**	**FSQ-EA1NL**	**FSQ-EA1NL/LC**	
transducer frequency	MHz	1		4		
inner pipe diameter d						
min. extended	mm	50		10		
min. recommended	mm	100		25		
max. recommended	mm	2000		150		
max. extended	mm	3400		400		
pipe wall thickness						
min.	mm	-		-		
max.	mm	-		-		
material						
housing contact surface		PI with stainless steel cap and transducer shoe 304 (1.4301) PI		PI with stainless steel cap and transducer shoe 304 (1.4301) PI		
degree of protection according to IEC/ EN 60529		IP56		IP56		
transducer cable						
type		6111	6111	6111	6111	
length	m	4	9	3	9	
dimensions						
length l	mm	84		70		
width b	mm	40		30		
height h	mm	59		47.5		
dimensional drawing						
ambient temperature						
min.	°C	-30		-30		
max.	°C	+200		+200		
temperature compensation		x		x		
explosion protection						
ATEX/IECEx	category EPL zone		gas: 2/3G dust: 2D Gb/Gc Db 1/2 21		gas: 2/3G dust: 2D Gb/Gc Db 1/2 21	
ATEX/IECEx	**explosion protection temperature (pipe surface)**					
ATEX/IECEx	min.	°C	-45		-45	
ATEX/IECEx	max.	°C	+225		+225	
ATEX/IECEx	marking		CE 0637 Ex II2/3G II2D Ex q nA IIC T6...T2 Gb/Gc Ex tb IIIA TX Db		CE 0637 Ex II2/3G II2D Ex q nA IIC T6...T2 Gb/Gc Ex tb IIIA TX Db	
ATEX/IECEx	certification ATEX		IBExU10ATEX1162 X		IBExU10ATEX1162 X	
ATEX/IECEx	certification IECEx		IECEx IBE 12.0004X		IECEx IBE 12.0004X	
ATEX/IECEx	type of protection		gas: powder filling, non sparking dust: protection by enclosure		gas: powder filling, non sparking dust: protection by enclosure	

Shear Wave Transducers (zone 2)

technical type		CDK1NH1	CLK1NH1	CDM2NH1	CDQ2NH1
order code		**FSK-NA2NL**	**FSK-NA2NL/LC**	**FSM-NA2NL**	**FSQ-NA2NL**
transducer frequency	MHz	0.5	0.5	1	4
inner pipe diameter d					
min. extended	mm	100	100	50	10
min. recommended	mm	200	200	100	25
max. recommended	mm	3600	3600	2000	150
max. extended	mm	6500	6500	3400	400
pipe wall thickness					
min.	mm	-	-	-	-
max.	mm	-	-	-	-
material					
housing		PEEK with stainless steel cap and transducer shoe 304 (1.4301)	PEEK with stainless steel cap and transducer shoe 304 (1.4301)	PEEK with stainless steel cap and transducer shoe 304 (1.4301)	PEEK with stainless steel cap and transducer shoe 304 (1.4301)
contact surface		PEEK	PEEK	PEEK	PEEK
degree of protection according to IEC/ EN 60529		IP65	IP65	IP65	IP65
transducer cable					
type		1699	1699	1699	1699
length	m	5	9	4	3
dimensions					
length l	mm	136.5	136.5	84	70
width b	mm	59	59	40	30
height h	mm	90.5	90.5	59	47.5
dimensional drawing					
ambient temperature					
min.	°C	-40	-40	-40	-40
max.	°C	+130	+130	+130	+130
temperature compensation		x	x	x	x
explosion protection					
ATEX / IECEx category / EPL / zone		gas: 3G Gc 2 dust: 2D Db 21	gas: 3G Gc 2 dust: 2D Db 21	gas: 3G Gc 2 dust: 2D Db 21	gas: 3G Gc 2 dust: 2D Db 21
explosion protection temperature (pipe surface)					
min.	°C	-55	-55	-55	-55
max.	°C	+190	+190	+190	+190
marking		CE 0637 Ex II3G II2D Ex nA IIC T6...T2 Gc X Ex tb IIIC TX Db	CE 0637 Ex II3G II2D Ex nA IIC T6...T2 Gc X Ex tb IIIC TX Db	CE 0637 Ex II3G II2D Ex nA IIC T6...T2 Gc X Ex tb IIIC TX Db	CE 0637 Ex II3G II2D Ex nA IIC T6...T2 Gc X Ex tb IIIC TX Db
certification ATEX		IBExU10ATEX1163 X	IBExU10ATEX1163 X	IBExU10ATEX1163 X	IBExU10ATEX1163 X
certification IECEx		IECEx IBE 12.0005X	IECEx IBE 12.0005X	IECEx IBE 12.0005X	IECEx IBE 12.0005X
type of protection		gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure

Shear Wave Transducers (zone 2, extended temperature range)

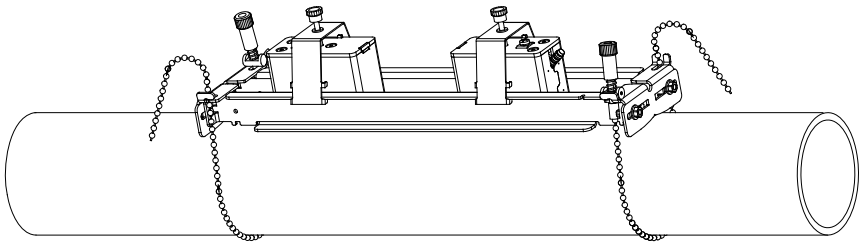
technical type		CDM2EH5	CDQ2EH5
order code		**FSM-EA2NL**	**FSQ-EA2NL**
transducer frequency	MHz	1	4
inner pipe diameter d			
min. extended	mm	50	10
min. recommended	mm	100	25
max. recommended	mm	2000	150
max. extended	mm	3400	400
pipe wall thickness			
min.	mm	-	-
max.	mm	-	-
material			
housing contact surface		PI with stainless steel cap and transducer shoe 304 (1.4301) PI	PI with stainless steel cap and transducer shoe 304 (1.4301) PI
degree of protection according to IEC/ EN 60529		IP56	IP56
transducer cable			
type		6111	6111
length	m	4	3
dimensions			
length l	mm	84	70
width b	mm	40	30
height h	mm	59	47.5
dimensional drawing			
ambient temperature			
min.	°C	-30	-30
max.	°C	+200	+200
temperature compensation		x	x
explosion protection			
ATEX / IECEx category EPL zone		gas: 3G dust: 2D Gc Db 2 21	gas: 3G dust: 2D Gc Db 2 21
explosion protection temperature (pipe surface)			
min.	°C	-45	-45
max.	°C	+235	+235
marking		CE 0637 Ex II3G II2D Ex nA IIC T6...T2 Gc X Ex tb IIIA TX Db	CE 0637 Ex II3G II2D Ex nA IIC T6...T2 Gc X Ex tb IIIA TX Db
certification ATEX		IBExU10ATEX1163 X	IBExU10ATEX1163 X
certification IECEx		IECEx IBE 12.0005X	IECEx IBE 12.0005X
type of protection		gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure

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
	A							all transducers
			D					reflection arrangement or diagonal arrangement
			R					reflection arrangement
				M				medium
						C		chains
						N		without fixation
							055	10...550 mm
example								
VP	A	-	D	M	-	C	055	portable Variofix and chains
		-			-			

portable Variofix VP and chains



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

dimensions:
414 x 94 x 76 mm

chain length: 2 m

Coupling Materials for Transducers

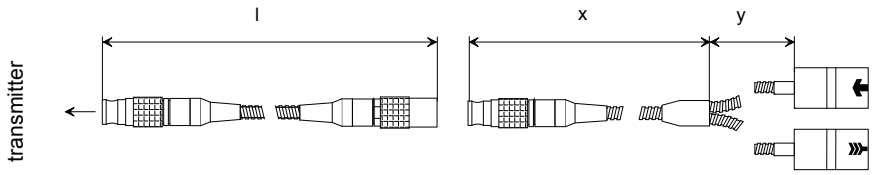
normal temperature range (4th character of transducer order code = N)		extended temperature range (4th character of transducer order code = E)	
< 100 °C	< 170 °C	< 150 °C	< 200 °C
coupling compound type N	coupling compound type E	coupling compound type E	coupling compound type E or H

Technical Data

type	order code	ambient temperature °C	material
coupling compound type N	990739-1	-30...+130	mineral grease paste
coupling compound type E	990739-2	-30...+200	silicone paste
coupling compound type H	990739-3	-30...+250	fluoropolymer paste

Connection Systems

connection system NL



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

x, y - transducer cable length
l - max. length of extension cable

Transducer Cable

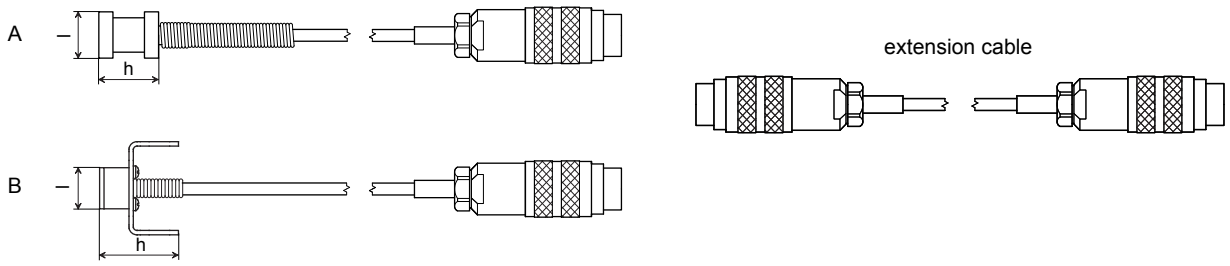
Technical Data

		transducer cable		extension cable
type		1699	6111	1750
standard length	m	see table above		5 10
ambient temperature	°C	-55...+200	-100...+225	< 80
sheath				
material		stainless steel 304 (1.4301)	stainless steel 304 (1.4301)	stainless steel 304 (1.4301)
outer diameter	mm	8	8	9
cable jacket				
material		PTFE	PFA	PE
outer diameter	mm	2.9	2.7	6
thickness	mm	0.3	0.5	0.5
color		brown	white	black
shield		x	x	x

Clamp-on Temperature Probe (optional)

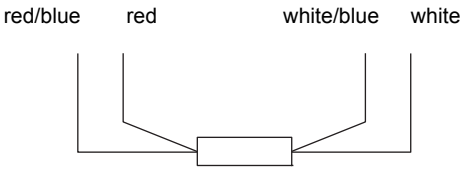
Technical Data

technical type		**PT12N**	**PT12N**	**PT12F**	**PT12F**
order code		**670415-1**	**670414-1**	**670415-2**	**670414-2**
design		short response time			
type		Pt100	2x Pt100 matched according to EN 1434-1	Pt100	2x Pt100 matched according to EN 1434-1
connection		4-wire		4-wire	
measuring range	°C	-30...+250		-50...+250	
accuracy T		±(0.15 °C + 2 · 10^{-3} · |T [°C]|), class A		±(0.15 °C + 2 · 10^{-3} · |T [°C]|), class A	
accuracy ΔT		-	≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1	-	≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1
response time	s	50		8	
housing		aluminum		PEEK, stainless steel 304 (1.4301), copper	
degree of protection according to IEC/ EN 60529		IP66		IP66	
weight (without connector)	kg	0.25	0.5	0.32	0.64
fixation		clamp-on		clamp-on	
accessories					
thermal conductivity paste 200 °C		x		x	
thermal conductivity foil 250 °C		x		x	
plastic protection plate, insulation foam		-		x	
dimensions					
length l	mm	15		14	
width b	mm	15		30	
height h	mm	20		27	
dimensional drawing		A		B	



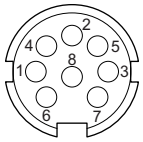
Connection

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 mm² black or white	LIYCY 8 x 0.14 mm² gray
standard length	m	3	5/10/25
max. length	m	-	100
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.

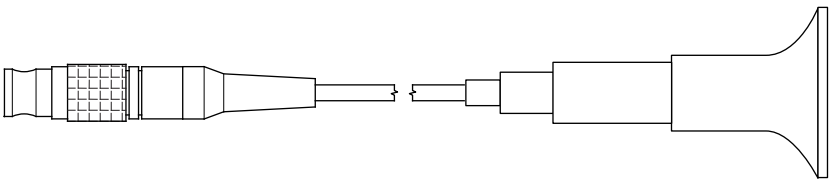
Technical Data

technical type		DWR1NZ7
measuring range[1]	mm	1...250
resolution	mm	0.01
accuracy		1 % ± 0.1 mm
medium 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

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



DWR1NZ7

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TSFLUXUS_F608xx-A2V1-5-1EN_Leu, 2014-03-20