

Portable ultrasonic flow measurement of 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/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 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 (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
- Measurement is unaffected by fluid density, viscosity and solid content (max. 10 % of volume)

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 F608



Measurement with transducers mounted with the portable Variofix VP



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

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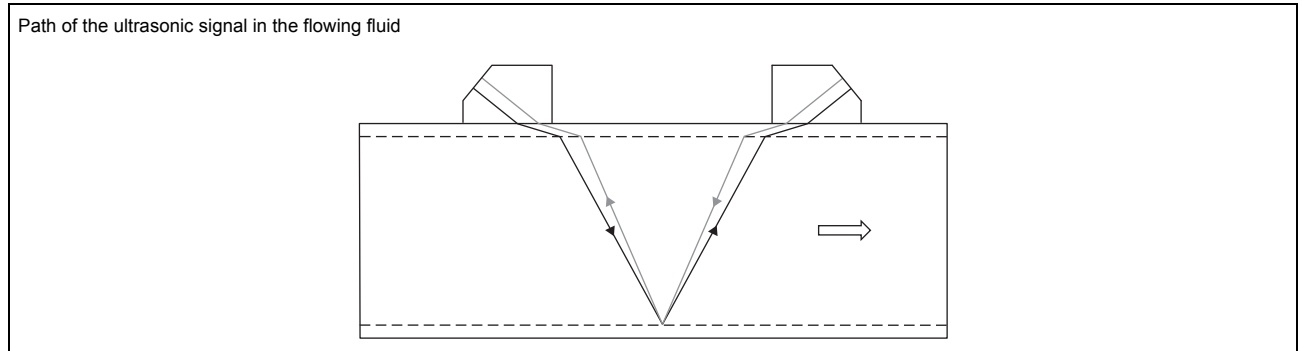
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Function

Measurement principle

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

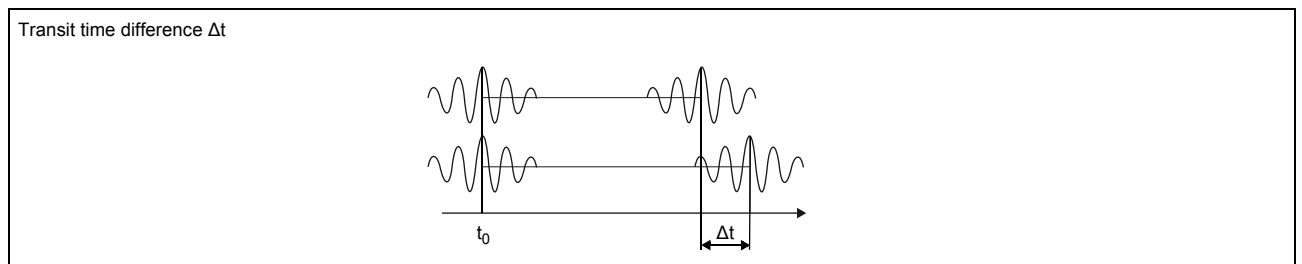


Transit time difference principle

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

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

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



HybridTrek

If the gaseous or solid content in the fluid 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.

Calculation of volumetric flow rate

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

where

- \dot{V} - volumetric flow rate
- k_{Re} - fluid mechanics calibration factor
- A - cross-sectional pipe area
- k_a - acoustical calibration factor
- Δt - transit time difference
- t_y - average of transit times in the fluid

Number of sound paths

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

- **reflection arrangement**

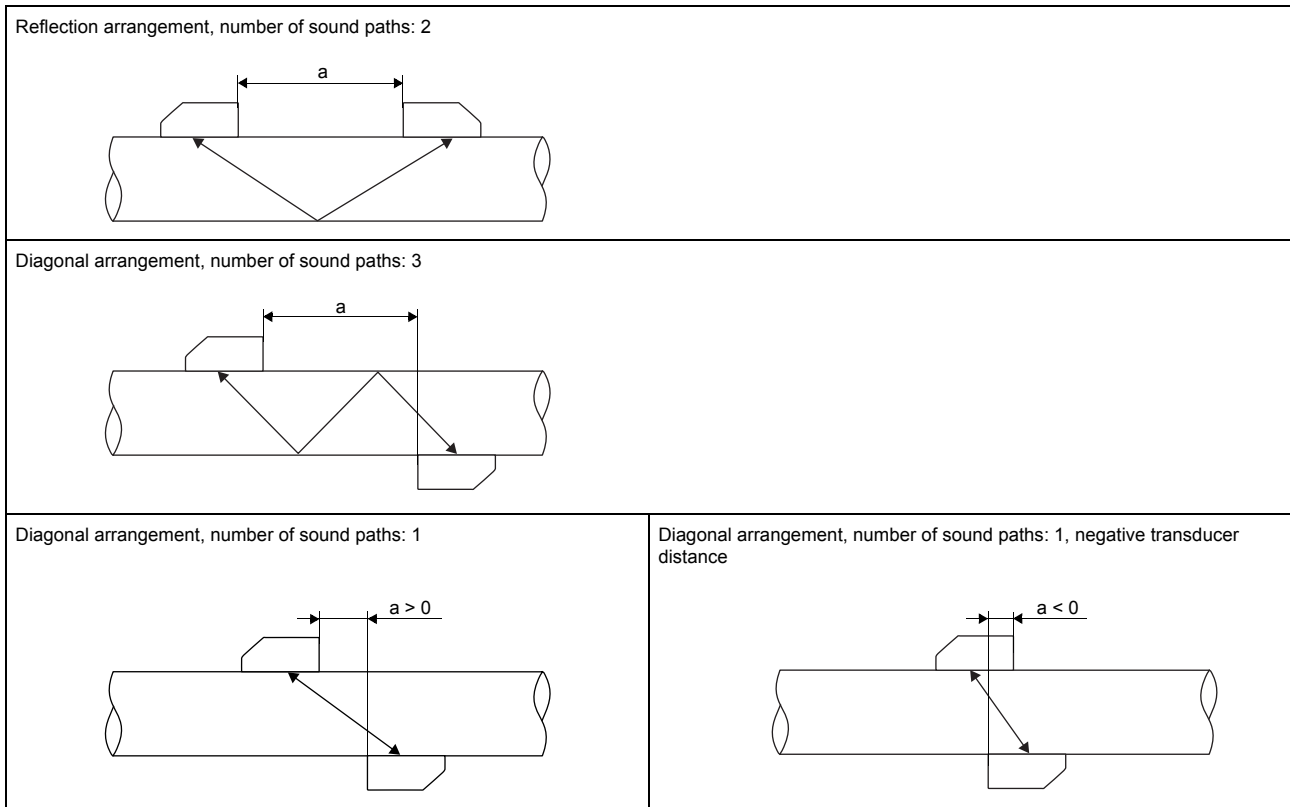
The number of sound paths is even. The transducers are mounted on the same side of the pipe. Correct positioning of the transducers is easier.

- **diagonal arrangement**

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

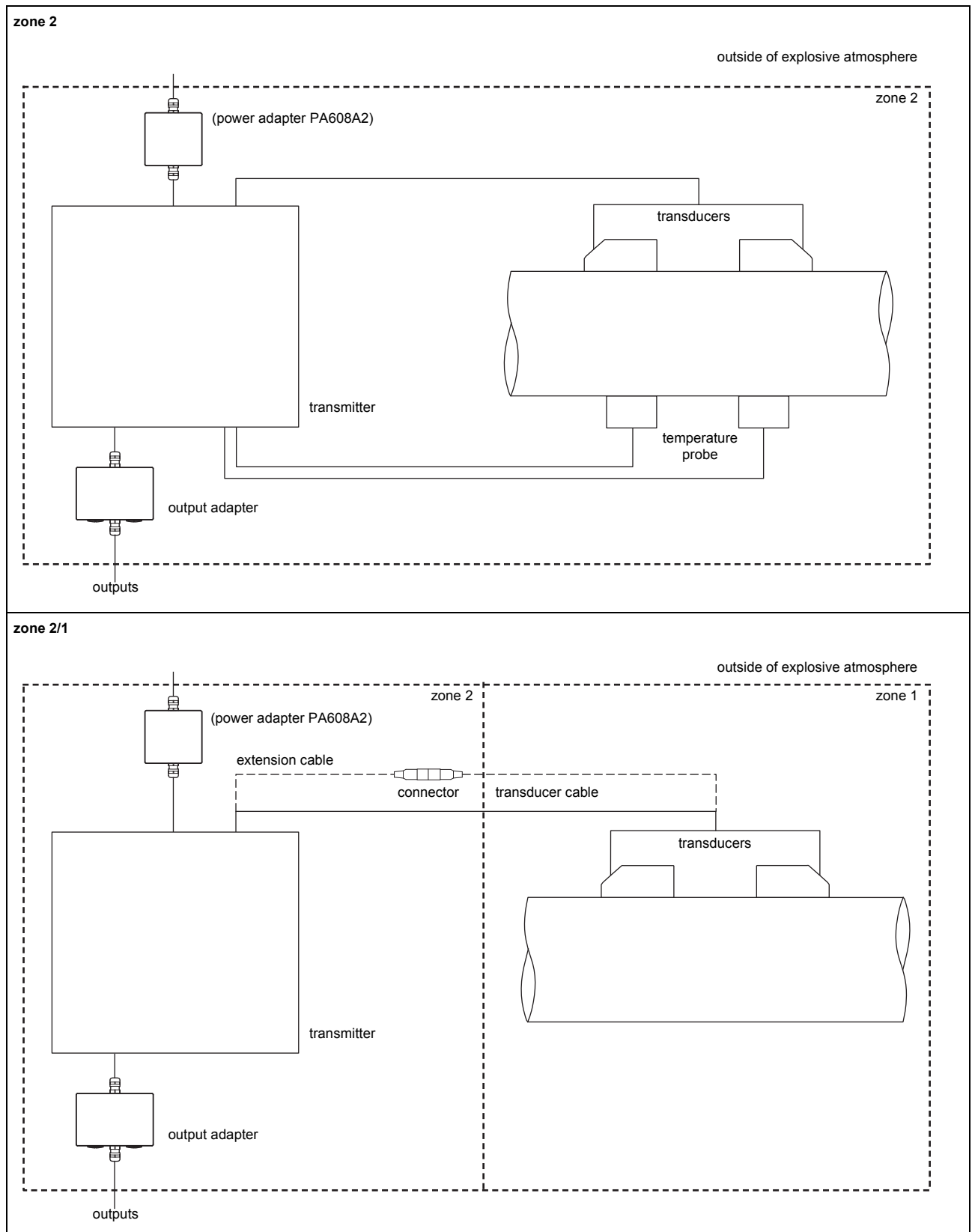
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

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




a - transducer distance

Typical measurement setup



Transmitter

Technical data

FLUXUS F608**-A2	
	
design	portable, zone 2
measurement	
measurement principle	transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content
flow velocity	m/s 0.01...25
repeatability	0.15 % of reading ± 0.005 m/s
fluid	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
measurement uncertainty (volumetric flow rate)	
measurement uncertainty of measuring system ¹	± 0.3 % of reading ± 0.005 m/s
measurement uncertainty at the measuring point ²	± 1 % of reading ± 0.005 m/s
transmitter	
power supply	<ul style="list-style-type: none"> • 100...230 V/50...60 Hz (power supply unit, outside of explosive atmosphere) • 10.5...15 V DC (socket at transmitter, with power adapter PA608A2 (optional) and power connection adapter PA608NN (optional)) • integrated battery
integrated battery • operating time	Li-Ion, 7.2 V/6.2 Ah <ul style="list-style-type: none"> • > 14 h (without outputs, inputs and backlight) • > 25 h (1 measuring channel, ambient temperature > 10 °C, without outputs, inputs and backlight)
power consumption	< 6 (with outputs, inputs and backlight), charging: 18
number of measuring channels	2
damping	s 0...100 (adjustable)
measuring cycle	Hz 100...1000 (1 channel)
response time	s 1 (1 channel), option: 0.07
housing material	PA, TPS, PC, Polyester, stainless steel
degree of protection	IP65
dimensions	mm see dimensional drawing
weight	kg 2.2
fixation	QuickFix pipe mounting fixture
ambient temperature	°C -10...+60
display	2 x 16 characters, dot matrix, backlight
menu language	English, German, French, Dutch, Spanish
explosion protection	
• ATEX/IECEX	
marking	<p>CE 0637 (Ex) II3G II2D Ex nA nC ic [ic] IIC (T6)T4 Gc T_a -10...+(50)60 °C Ex tb IIIC T100 °C Db</p>
certification ATEX	IBExU10ATEX1067
certification IECEX	IECEX IBE 12.0006
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
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
communication interfaces	
service interfaces	<ul style="list-style-type: none"> • RS232 • USB (with adapter)

¹ with aperture calibration of the transducers

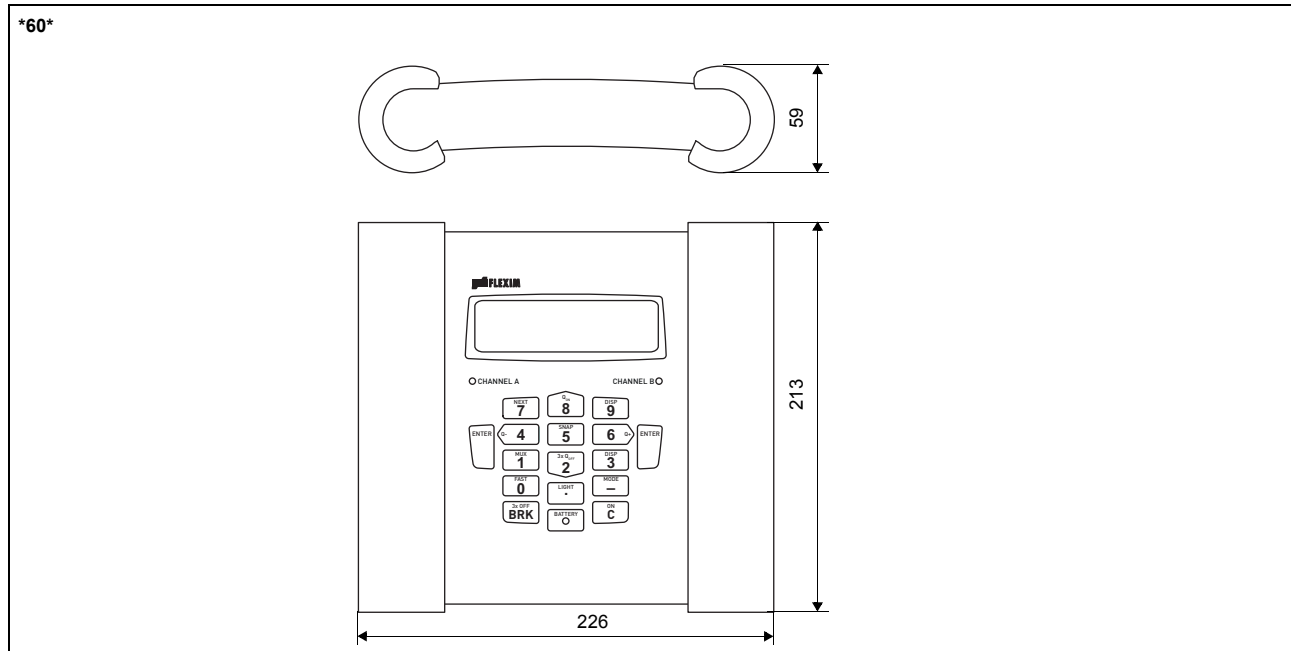
² for transit time difference principle and reference conditions

FLUXUS F608**-A2	
accessories	
serial data kit	
• cable	RS232
• adapter	RS232 - USB
software	<ul style="list-style-type: none"> • FluxDiagReader: download of measured values and parameters, graphical presentation • FluxDiag (optional): download of measurement data, graphical presentation, report generation • FluxSubstanceLoader: upload of fluid data sets
adapter	<ul style="list-style-type: none"> • output adapter (necessary, option) • input adapter (if number of inputs > 2)
transport case	dimensions: 500 x 400 x 190 mm
data logger	
loggable values	all physical quantities, totalized values and diagnostic values
capacity	> 100 000 measured values
outputs	
	The outputs are galvanically isolated from the transmitter.
number	analog outputs: max. 4 <ul style="list-style-type: none"> • 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 binary outputs: max. 4
• current output	
range	mA 0/4...20
accuracy	0.1 % of reading ±15 µA
active output	$R_{ext} < 200 \Omega$
passive output	$U_{ext} = 4...9 \text{ V}$, depending on R_{ext} ($R_{ext} < 200 \Omega$ at 9 V)
• frequency output	
range	kHz 0...5
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	
• functions	mainly for totalizing
• pulse value	units 0.01...1 000
• pulse width	ms 1...1 000
inputs	
	The inputs are galvanically isolated from the transmitter.
number	max. 4
• temperature input	
	intrinsic safety
type	Pt100/Pt1000
connection	4-wire
range	°C -150...+560
resolution	K 0.01
accuracy	±0.01 % of reading ±0.03 K

¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

Dimensions



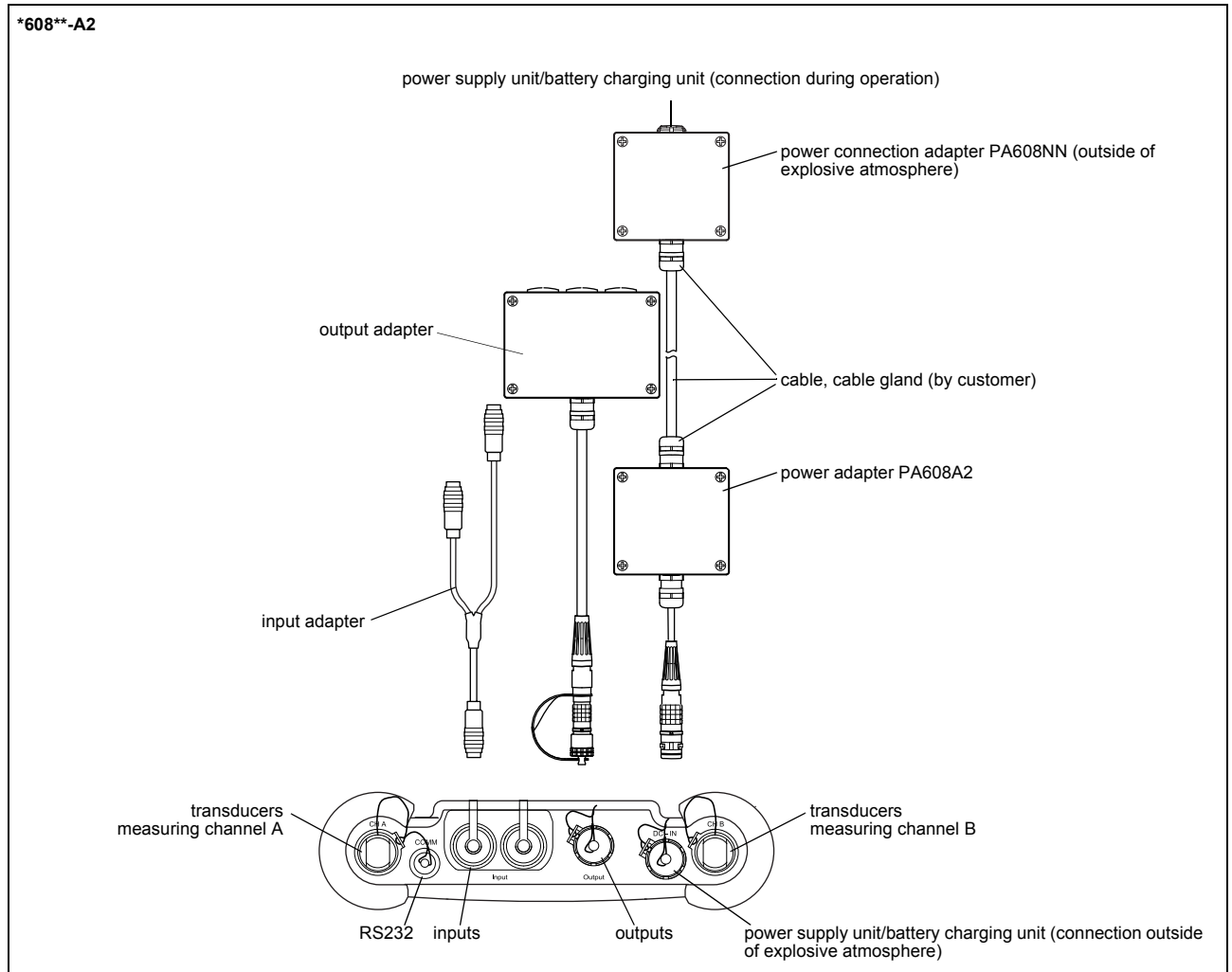
in mm

Standard scope of supply

	F608 Standard	F608 Energy	F608 Double Energy
application	flow measurement of 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 PA608A2 ¹	-	-	-
power connection adapter PA608NN 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

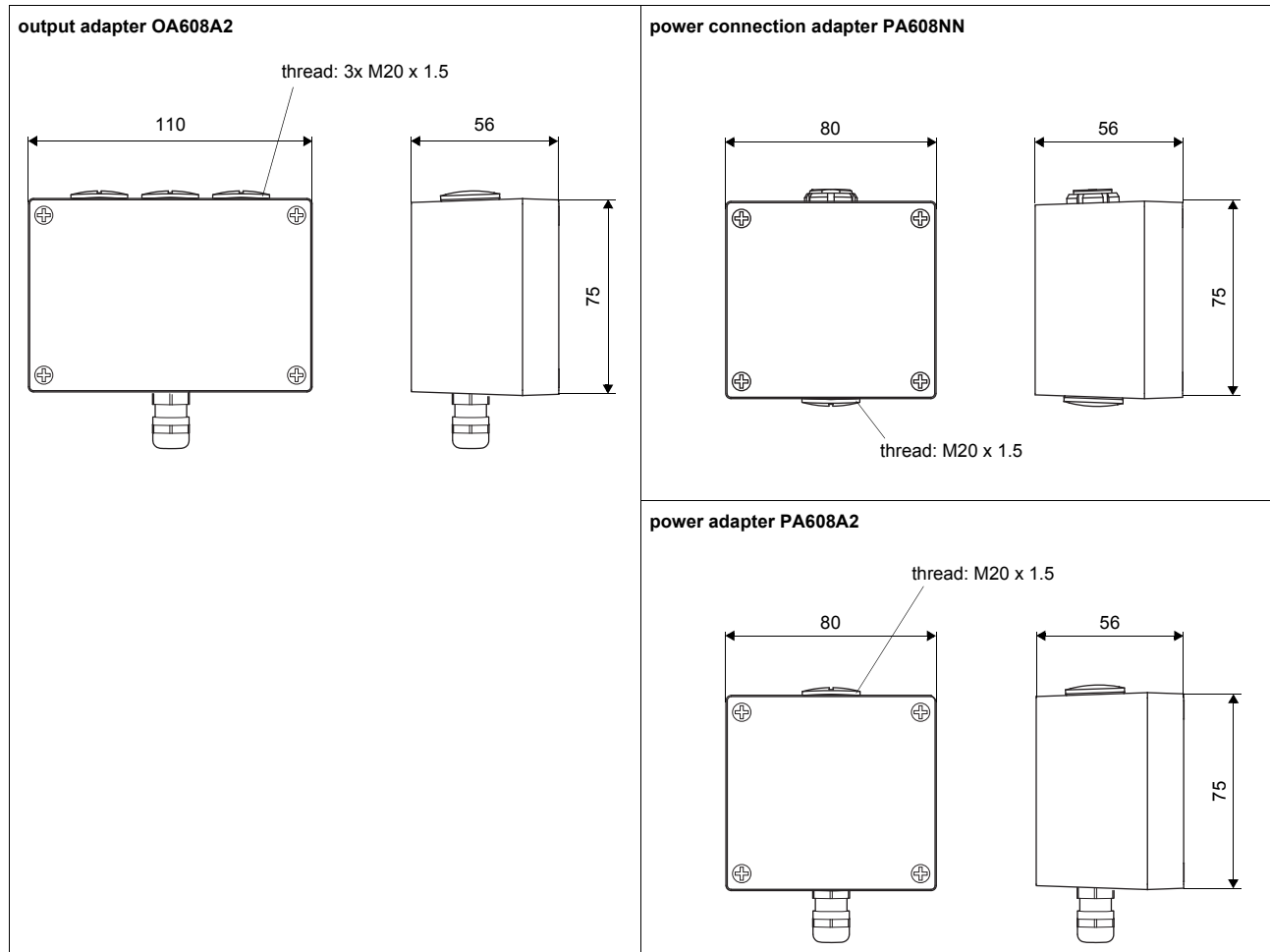
Adapters



Technical data

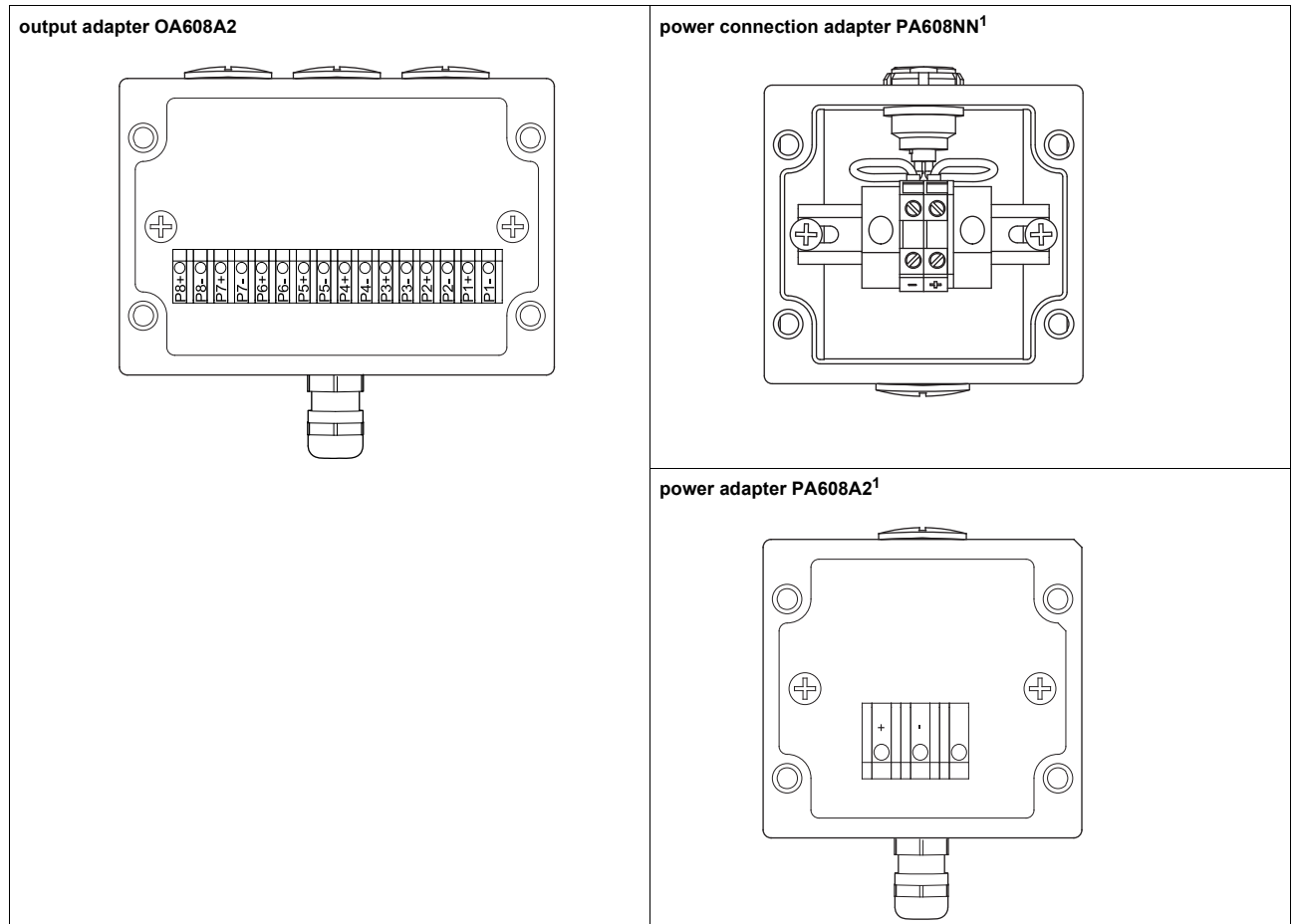
	output adapter	power adapter	power connection adapter
technical type	OA608A2	PA608A2	PA608NN
connection voltage		10.5...15 V DC	
weight	kg 0.26	0.26	0.32
material			
housing	polyester		polyester
gasket	silicone		chloroprene
degree of protection	IP66		IP65
ambient temperature			
min.	°C -20		-10
max.	°C +90		+60
explosion protection			
• ATEX			
marking	CE Ex II3G Ex nA IIC T6 Gc Ta -10...+60 °C		-

Dimensions



in mm

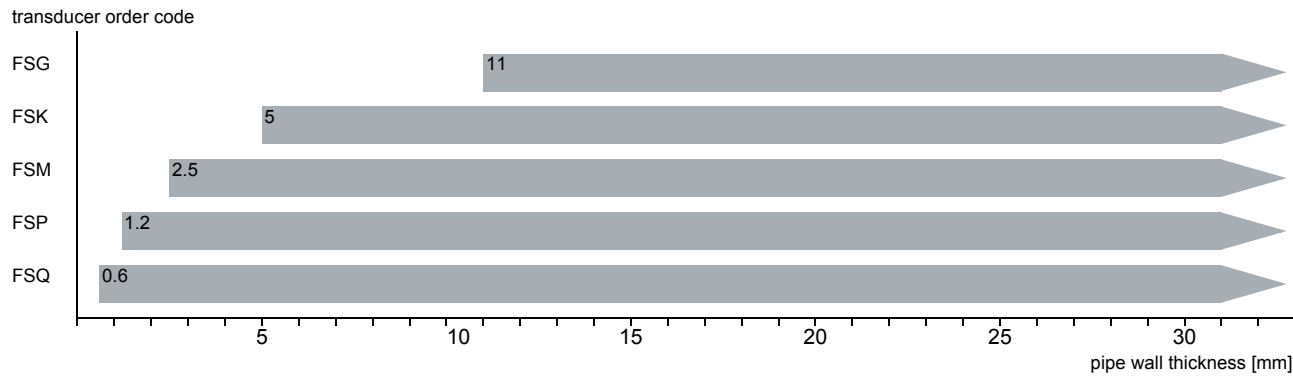
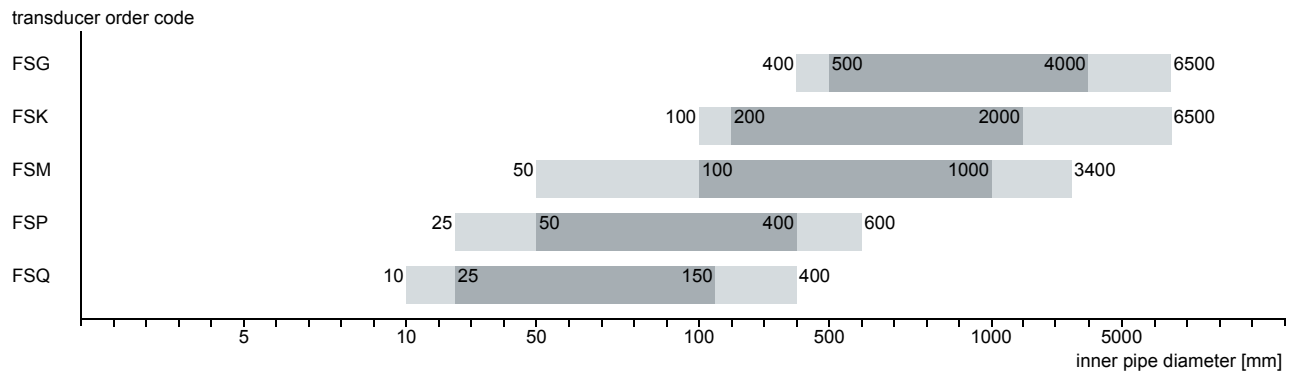
Terminal assignment



¹ cable PA608A2 - PA608NN (by customer):
length: max. 30 m
lead cross sectional area: 1.5...2.5 mm²

Transducers

Transducer selection



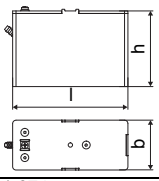
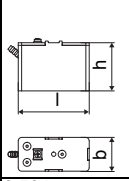
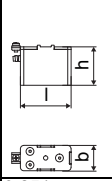
recommended
 possible

Transducer order code

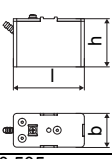
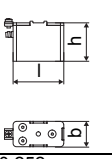

1, 2	3	4	5, 6	7, 8	9...11	no. of character				
transducer	transducer frequency	-	ambient temperature	explosion protection	connection system	-	extension cable	/	option	description
FS										set of ultrasonic flow transducers for liquids measurement, shear wave
	G									0.2 MHz
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
		N								normal temperature range
		E								extended temperature range
			A2							ATEX zone 2/IECEX zone 2
			A1							ATEX zone 1/IECEX zone 1
				NL						with Lemo connector
						XXX				0 m: without extension cable > 0 m: with extension cable (connector outside of ATEX zone 1/IECEX zone 1)
								LC		long transducer cable

Technical data

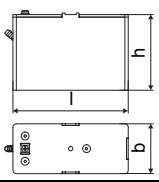
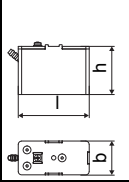
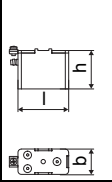

Shear wave transducers (zone 2, NL)

order code	FSG-N*2NL/**	FSK-N*2NL/**	FSM-N*2NL/**	FSP-N*2NL/**	FSQ-N*2NL/**
technical type	C(DL)G1NH1	C(DL)K1NH1	C(DL)M2NH1	C(DL)P2NH1	C(DL)Q2NH1
transducer frequency /MHz	0.2	0.5	1	2	4
inner pipe diameter d					
min. extended	mm 400	100	50	25	10
min. recommended	mm 500	200	100	50	25
max. recommended	mm 4000	2000	1000	400	150
max. extended	mm 6500	6500	3400	600	400
pipe wall thickness					
min.	mm 11	5	2.5	1.2	0.6
material					
housing	PEEK with stainless steel cap and transducer shoe 304 (1.4301)				
contact surface	PEEK				
degree of protection	IP65		IP66		IP65
transducer cable					
type	1699				
length	m 5, ***-*****/LC: 9	4, ***-*****/LC: 9		3, ***-*****/LC: 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					
weight (without cable)	kg 1.674	0.504		0.251	
ambient temperature					
min.	°C -40				
max.	°C +130				
temperature compensation	x				
explosion protection					
• ATEX/IECEX					
order code	FSG-NA2NL/**	FSK-NA2NL/**	FSM-NA2NL/**	FSP-NA2NL/**	FSQ-NA2NL/**
explosion protection temperature (pipe surface)					
• min.	°C -55				
• max.	°C gas: +190, dust: +180				
marking	CE 0637 Ex II 3G II 2D Ex nA IIC T6...T2 Gc Ex tb IIIC TX Db				
certification ATEX	IBExU10ATEX1163 X				
certification IECEX	IECEX IBE 12.0005X				

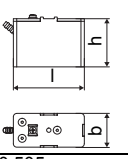
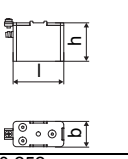
Shear wave transducers (zone 2, NL, extended temperature range)

order code		FSM-E*2NL/**	FSP-E*2NL/**	FSQ-E*2NL/**
technical type		C(DL)M2EH5	C(DL)P2EH5	C(DL)Q2EH5
transducer frequency	MHz	1	2	4
inner pipe diameter d				
min. extended	mm	50	25	10
min. recommended	mm	100	50	25
max. recommended	mm	1000	400	150
max. extended	mm	3400	600	400
pipe wall thickness				
min.	mm	2.5	1.2	0.6
material				
housing		PI with stainless steel cap and transducer shoe 304 (1.4301)		
contact surface		PI		
degree of protection		IP66		IP56
transducer cable				
type		6111		
length	m	4, ***-****/LC: 9		3, ***-****/LC: 9
dimensions				
length l	mm	84		70
width b	mm	40		30
height h	mm	59		47.5
dimensional drawing				
weight (without cable)	kg	0.505		0.252
ambient temperature				
min.	°C	-30		
max.	°C	+200		
temperature compensation		x		
explosion protection				
• ATEX/IECEX				
order code		FSM-EA2NL/**	FSP-EA2NL/**	FSQ-EA2NL/**
explosion protection temperature (pipe surface)				
• min.	°C	-45		
• max.	°C	gas: +235, dust: +225		
marking		CE 0637  II3G II2D Ex nA IIC T6...T2 Gc Ex tb IIIA TX Db		
certification ATEX		IBExU10ATEX1163 X		
certification IECEX		IECEX IBE 12.0005X		

Shear wave transducers (zone 1, NL)

order code		FSG-N*1NL/**	FSK-N*1NL/**	FSM-N*1NL/**	FSP-N*1NL/**	FSQ-N*1NL/**
technical type		C(DL)G1NW1	C(DL)K1NW1	C(DL)M2NW1	C(DL)P2NW1	C(DL)Q2NW1
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	mm	400	100	50	25	10
min. recommended	mm	500	200	100	50	25
max. recommended	mm	4000	2000	1000	400	150
max. extended	mm	6500	6500	3400	600	400
pipe wall thickness						
min.	mm	11	5	2.5	1.2	0.6
material						
housing		PEEK with stainless steel cap and transducer shoe 304 (1.4301)				
contact surface		PEEK				
degree of protection		IP65	IP66			IP65
transducer cable						
type		1699				
length	m	5, ***_*****/LC: 9		4, ***_*****/LC: 9		3, ***_*****/LC: 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						
weight (without cable)	kg	1.674		0.504	0.251	
ambient temperature						
min.	°C	-40				
max.	°C	+130				
temperature compensation		x				
explosion protection						
• ATEX/IECEx						
order code		FSG-NA1NL/**	FSK-NA1NL/**	FSM-NA1NL/**	FSP-NA1NL/**	FSQ-NA1NL/**
explosion protection temperature (pipe surface)						
• min.	°C	-55				
• max.	°C	+180				
marking		CE 0637  II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db				
certification ATEX		IBExU07ATEX1168 X				
certification IECEx		IECEx IBE 08.0007X				

Shear wave transducers (zone 1, NL, extended temperature range)

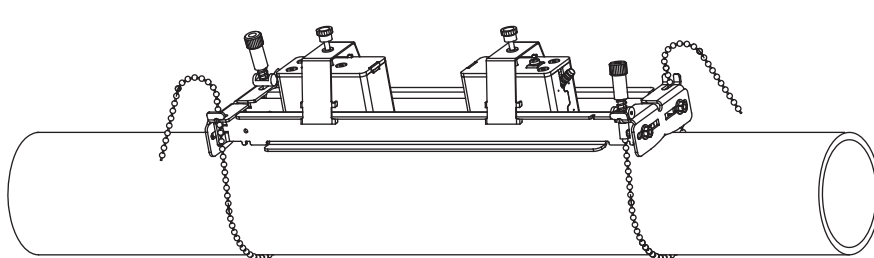
order code		FSM-E*1NL/**	FSP-E*1NL/**	FSQ-E*1NL/**
technical type		C(DL)M2EW5	C(DL)P2EW5	C(DL)Q2EW5
transducer frequency	MHz	1	2	4
inner pipe diameter d				
min. extended	mm	50	25	10
min. recommended	mm	100	50	25
max. recommended	mm	1000	400	150
max. extended	mm	3400	600	400
pipe wall thickness				
min.	mm	2.5	1.2	0.6
material				
housing		PI with stainless steel cap and transducer shoe 304 (1.4301)		
contact surface		PI		
degree of protection		IP66		IP56
transducer cable				
type		6111		
length	m	4, ***-****/LC: 9		3, ***-****/LC: 9
dimensions				
length l	mm	84		70
width b	mm	40		30
height h	mm	59		47.5
dimensional drawing				
weight (without cable)	kg	0.505		0.252
ambient temperature				
min.	°C	-30		
max.	°C	+200		
temperature compensation		x		
explosion protection				
• ATEX/IECEX				
order code		FSM-EA1NL/**	FSP-EA1NL/**	FSQ-EA1NL/**
explosion protection temperature (pipe surface)				
• min.	°C	-45		
• max.	°C	+225		
marking		CE 0637 Ex II 2G II 2D Ex q IIC T6...T2 Gb Ex tb IIIA TX Db		
certification ATEX		IBExU07ATEX1168 X		
certification IECEX		IECEX IBE 08.0007X		

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

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

Connection systems

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

Cable

transducer cable			
type		1699	6111
weight	kg/m	0.094	0.092
ambient temperature	°C	-55...+200	-100...+225
cable jacket			
material		PTFE	PFA
outer diameter	mm	2.9	2.7
thickness	mm	0.3	0.5
colour		brown	white
shield		x	x
sheath			
material		stainless steel 304 (1.4301)	stainless steel 304 (1.4301)
outer diameter	mm	8	8

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

Cable length


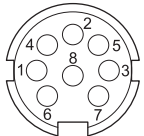
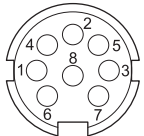
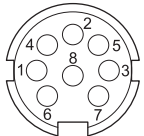
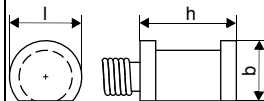
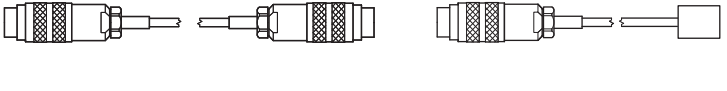
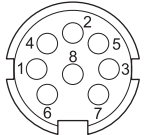
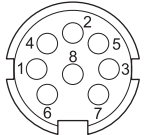
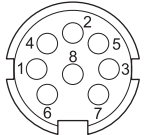
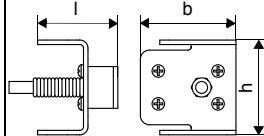
transducer frequency	F, G, H, K				M, P			Q			S		
connection system NL													
transducers technical type		x	y	l	x	y	l	x	y	l	x	y	l
*(DR)***W*	m	2	3	≤ 10	2	2	≤ 10	2	1	≤ 10	-	-	-
*(DR)***H*													
option LC: *(LT)***W*	m	2	7	≤ 10	7	2	≤ 10	8	1	≤ 10	-	-	-
*(LT)***H*													

x, y - transducer cable length

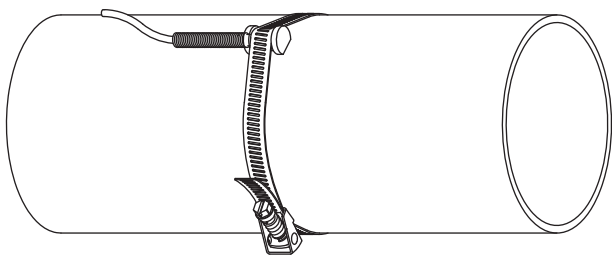
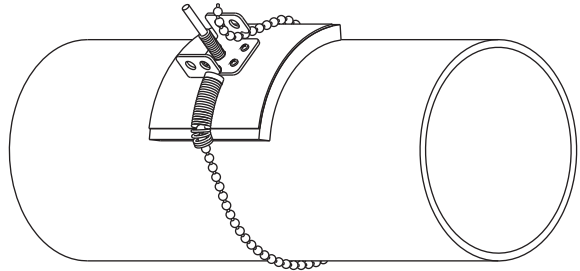
l - max. length of extension cable

Clamp-on temperature probe (optional)

Technical data

PT12N			connection system																																								
type		Pt100	direct connection/connection with extension cable 																																								
connection		4-wire																																									
measuring range	°C	-30...+250																																									
accuracy T		$\pm(0.15 \text{ °C} + 2 \cdot 10^{-3} \cdot T \text{ [°C]})$ class A																																									
accuracy ΔT (2x Pt matched according to EN 1434-1)		$\leq 0.1 \text{ K}$ ($3 \text{ K} < \Delta T < 6 \text{ K}$), more corresponding to EN 1434-1	connection <table border="1"> <thead> <tr> <th rowspan="2"></th> <th rowspan="2">temperature probe</th> <th rowspan="2">extension cable</th> <th colspan="2">connector</th> </tr> <tr> <th>pin</th> <th rowspan="5">  </th> </tr> </thead> <tbody> <tr> <td></td> <td>red</td> <td>grey</td> <td>2</td> </tr> <tr> <td></td> <td>red/blue</td> <td>red</td> <td>6</td> </tr> <tr> <td></td> <td>white/blue</td> <td>blue</td> <td>1</td> </tr> <tr> <td></td> <td>white</td> <td>white</td> <td>7</td> </tr> </tbody> </table> cable <table border="1"> <thead> <tr> <th></th> <th>temperature probe</th> <th>extension cable</th> </tr> </thead> <tbody> <tr> <td>type</td> <td>4 x 0.25 mm² black</td> <td>LIYCY 8 x 0.14 mm² grey</td> </tr> <tr> <td>standard length</td> <td>m 3</td> <td>5/10/25</td> </tr> <tr> <td>max. length</td> <td>m -</td> <td>100</td> </tr> <tr> <td>cable jacket</td> <td>PTFE</td> <td>PVC</td> </tr> </tbody> </table>				temperature probe	extension cable	connector		pin			red	grey	2		red/blue	red	6		white/blue	blue	1		white	white	7		temperature probe	extension cable	type	4 x 0.25 mm ² black	LIYCY 8 x 0.14 mm ² grey	standard length	m 3	5/10/25	max. length	m -	100	cable jacket	PTFE	PVC
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cable jacket	PTFE	PVC																																									
response time	s	50																																									
housing		aluminum																																									
degree of protection		IP66																																									
dimensions																																											
length l	mm	15																																									
width b	mm	13																																									
height h	mm	20																																									
dimensional drawing																																											
weight	kg	0.25 (without connector)																																									
accessories																																											
thermal conductivity paste 200 °C		x																																									
thermal conductivity foil 250 °C		x																																									
PT12F			connection system																																								
type		Pt100	direct connection/connection with extension cable 																																								
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cable jacket	PTFE	PVC																																									
response time	s	8																																									
housing		PEEK, stainless steel 304 (1.4301), copper																																									
degree of protection		IP66																																									
dimensions																																											
length l	mm	14																																									
width b	mm	30																																									
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plastic protection plate, insulation foam		x																																									

Fixation

<p>tension strap PT12N</p>  <p>A technical line drawing showing a cylindrical object with a tension strap attached to its side. The strap is made of a series of rectangular links and has a hook-like end that is secured to the cylinder with a bolt and nut. The other end of the strap is free and hangs down.</p>	<p>material: stainless steel 301 (1.4310), 410 (1.4006)</p>
<p>ball chain PT12F</p>  <p>A technical line drawing showing a cylindrical object with a ball chain attached to its side. The chain is made of spherical links and is connected to the cylinder via a metal bracket that is bolted to the surface. The chain hangs down from the bracket.</p>	<p>material: stainless steel 316L (1.4404) length: 1 m</p>

Wall thickness measurement (optional)

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

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

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

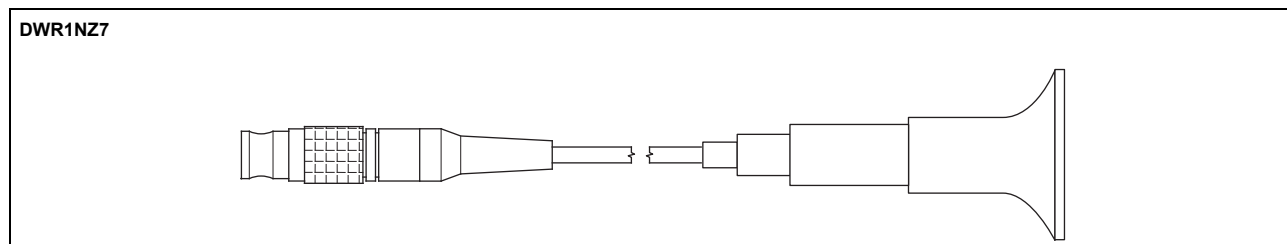
Technical data

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

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

Cable

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



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