FLEXIM

Technical specification

FLUXUS F808

Ultrasonic flowmeters for liquids for permanent installation in hazardous areas

Especially designed for the stationary use in explosive atmosphere

Features

- Instrument with one measuring channel for exact and reliable flow measurement
- 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
- Transmitter housing:
  - Robust and non-corrosive
  - Transmitter F808**-A1 in a flameproof housing (degree of protection IP66)
  - Transmitter F808**-F* in an explosionproof housing (NEMA 4X)
- Certification:
  - F808**-A1: ATEX/IECEx
  - F808**-F1: FM Class I Div. 1
  - F808**-F2: FM Class I Div. 2
- The transmitter can be operated by a magnet pen without opening the housing
- 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
- Communication interfaces Modbus RTU and HART available
- Transducers available for a wide range of inner pipe diameters and fluid temperatures (-200...+600 °C)
- ATEX/IECEx, FM Class I Div. 1/Div. 2 approved transducers for hazardous areas available
- HybridTrek automatically switches between transit time and NoiseTrek mode of measurement when high particulate flows are encountered
- Measurement is unaffected by fluid density, viscosity and solid content (max. 10 % of volume)
- Product variant FLUXUS XLF is especially suited for precise and reliable flow measurement applications with very low flow velocities (e.g. chemical injection in oil and gas extraction)

Applications

Designed for industrial use in harsh environments, especially for oil extraction and processing in the petrochemical and chemical industry.

- Chemical industry
- Petrochemical industry
- Oil extraction and exploration
- Refineries

FLUXUS F808

Variofix C

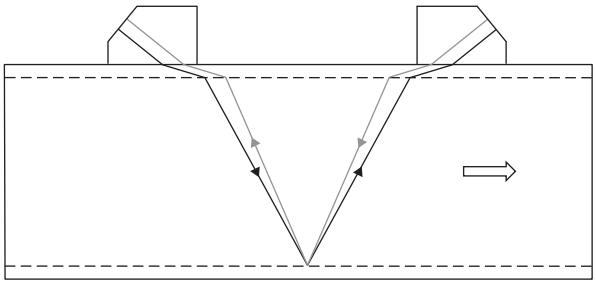
PermaFiX

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.

Path of the ultrasonic signal in the flowing fluid



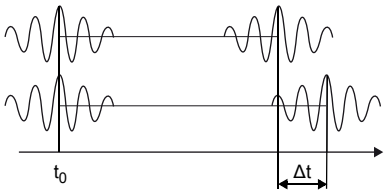
Transit time difference principle

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.

Transit time difference Δt



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

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

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_γ - average of transit times in the fluid

Number of sound paths

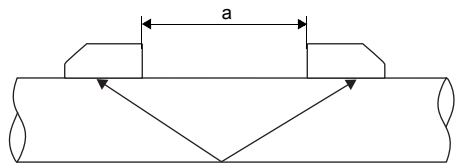
The number of sound paths is the number of transits of the ultrasonic signal through the fluid in the pipe. Depending on the number of sound paths, the following methods of installation exist:

- **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.

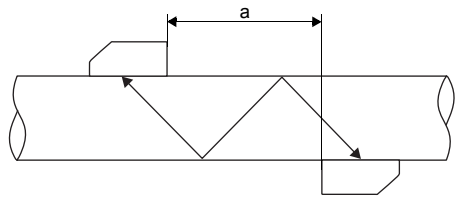
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

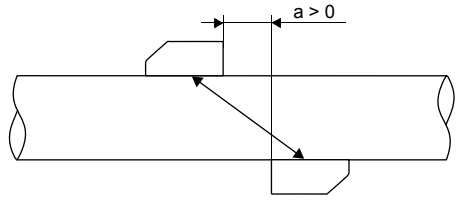
Reflection arrangement, number of sound paths: 2



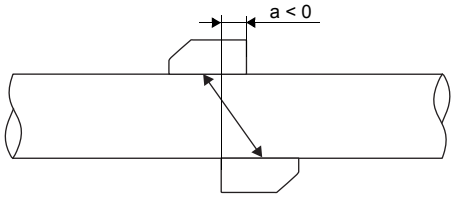
Diagonal arrangement, number of sound paths: 3



Diagonal arrangement, number of sound paths: 1



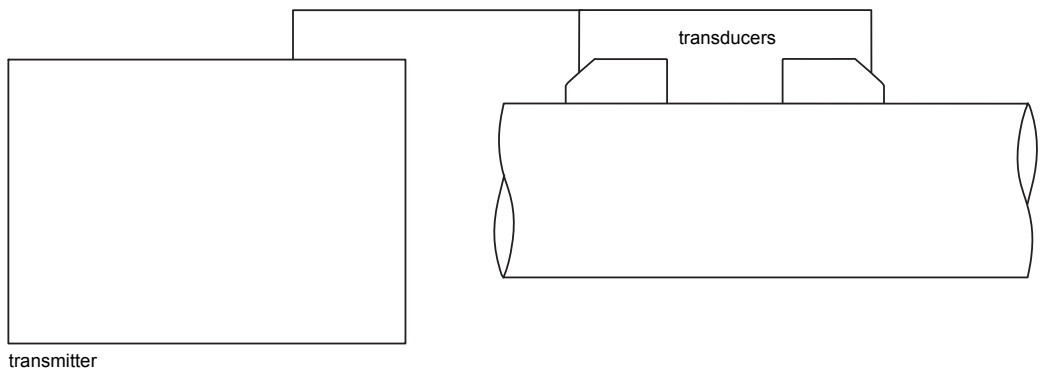
Diagonal arrangement, number of sound paths: 1, negative transducer distance



a - transducer distance

Typical measurement setup

Example of a reflection arrangement



Transmitter

Technical data

		FLUXUS F808**-A1	FLUXUS F808**-F1	FLUXUS F808**-F2
				
design		explosion proof field device 1 measuring channel zone 1	explosion proof field device 1 measuring channel FM Class I Div. 1	explosion proof field device 1 measuring channel FM Class I Div. 2
transducers		C****81, C****LI1, C***2E85	C**1N62	C****53
supported transducer frequencies		K, M, P, Q on request: G	K, M, P, Q on request: G	K, M, P, Q, S on request: G
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 ±0.01 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		
accuracy[1]				
with standard calibration		±1.6 % of reading ±0.01 m/s		
with advanced calibration (optional)		±1.2 % of reading ±0.01 m/s		
with field calibration[2]		±0.5 % of reading ±0.01 m/s		
transmitter				
power supply		• 100...230 V/50...60 Hz or • 20...32 V DC		
power consumption	W	< 8		
number of measuring channels		1		
damping	s	0...100 (adjustable)		
measuring cycle	Hz	100...1000		
response time	s	1, option: 0.07		
housing material		cast aluminum, special heavy-duty coating		
degree of protection		IP66		
dimensions	mm	see dimensional drawing		
weight	kg	5		
fixation		wall mounting, 2" pipe mounting		
ambient temperature	°C	-30...+60 °C (< -20 °C without operation of the display)	-25...+60 °C (< -20 °C without operation of the display)	
display		2 x 16 characters, dot matrix, backlight		
menu language		English, German, French, Dutch, Spanish		
explosion protection				
• **ATEX/IECEx**				
marking		CE 0637 Ex II2G II2D Ex db eb IIC T6 Gb Ex tb IIIC T 100 °C Db T_a -40...+60 °C	-	-
certification ATEX		IBExU11ATEX1022 X	-	-
certification IECEx		IECEx IBE 11.0006X	-	-
• **FM**				
marking		-	FM APPROVED Cl. I, II, III/Div. 1/ GP. A, B, C, D, E, F, G/ For Group A, conduit seal of connection compartment is required within 18 inches. FM APPROVED Cl. I, II, III/Div. 1/ GP. B, C, D, E, F, G T5 Ta = 60 °C	FM APPROVED Cl. I,II,III/Div. 2/ GP. A,B,C,D,E,F,G/ T5 Ta = 60 °C

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

[2] reference uncertainty < 0.2 %

[3] connection of the interface RS232 outside of explosive atmosphere (housing cover open)

		FLUXUS F808**-A1	FLUXUS F808**-F1	FLUXUS F808**-F2
measuring functions				
physical quantities		volumetric flow rate, mass flow rate, flow velocity		
totalizer		volume, mass		
diagnostic functions		sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times		
communication interfaces				
service interfaces		• RS232[3] • USB (with adapter)[3]		
process interfaces		max. 1 option: • RS485 (ASCII sender) • Modbus RTU • HART		max. 1 option: • RS485 (ASCII sender) • Modbus RTU
accessories				
serial data kit • cable • adapter		 RS232 RS232 - USB		
software		• 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		
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		• current output: 1 binary output: 1 or • current output: 1 Modbus or • current output: 1/HART binary output: 1		• current output: 1 binary output: 1 or • current output: 1 Modbus
• current output				
range	mA	0/4...20		
accuracy		0.1 % of reading ±15 µA		
active output		R_{ext} < 500 Ω		
passive output		U_{ext} = 4...26.4 V, depending on R_{ext} (R_{ext} < 1 kΩ at 26.4 V)		
current output in HART mode • range • active output • passive output	 mA	 4...20 U_{int} = 24 V U_{ext} = 7...30 V DC		 - - -
• binary output				
open collector		24 V/4 mA optional (in combination with HART only): • 30 V/100 mA or • 8.2 V DIN EN 60947-5-6 (NAMUR)		24 V/4 mA
binary output as alarm output • functions		 limit, change of flow direction or error		
binary output as pulse output • functions • pulse value • pulse width	 units ms	 mainly for totalizing 0.01...1000 80...1000		

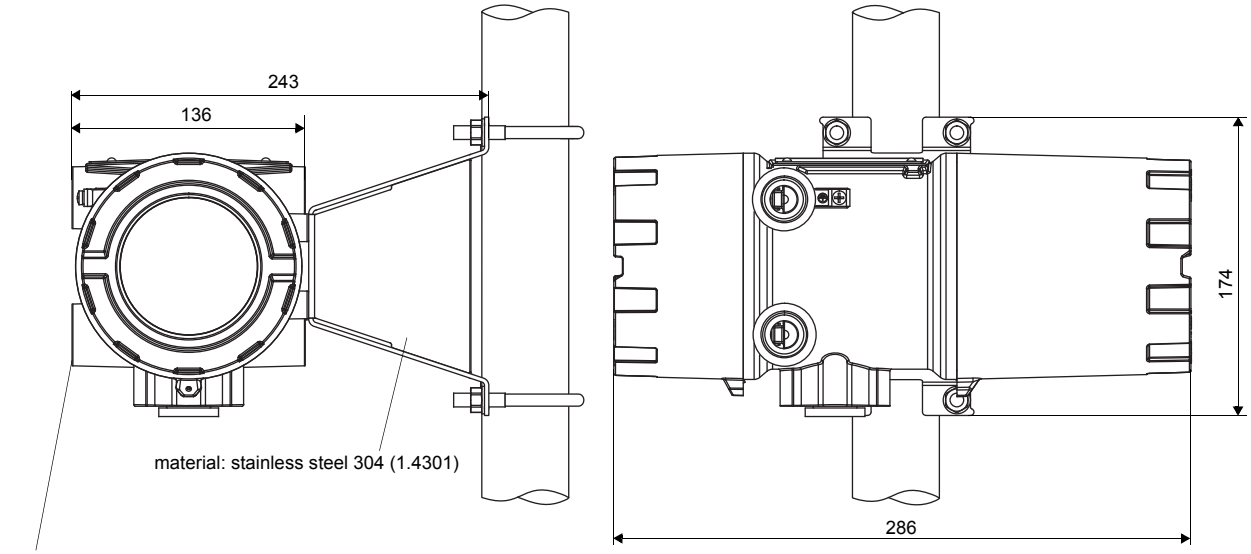
[1] for transit time difference principle, reference conditions and v > 0.15 m/s

[2] reference uncertainty < 0.2 %

[3] connection of the interface RS232 outside of explosive atmosphere (housing cover open)

Dimensions

***808**

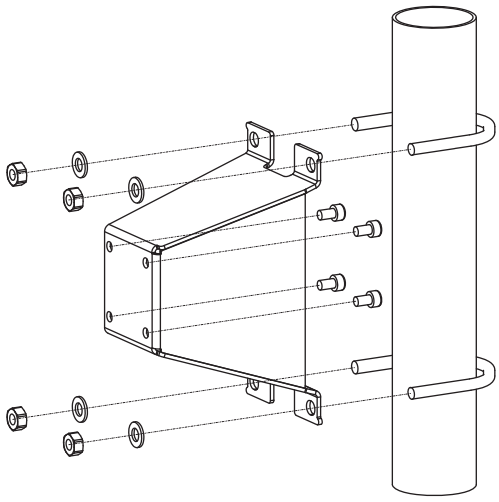


F808**-A1, F808**-F2: thread, cable gland: 4x M20 x 1.5
F808**-F1: thread: 4x NPT 3/4

in mm

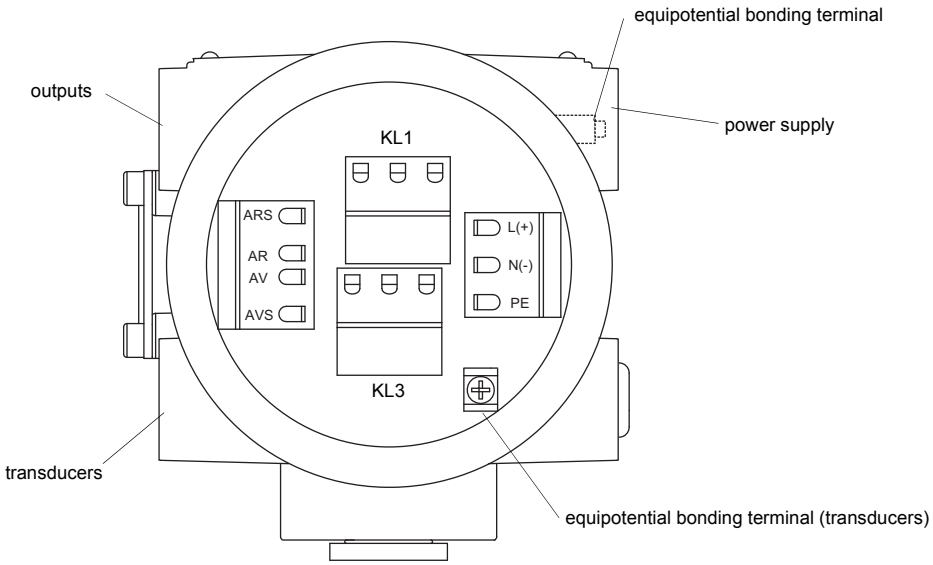
Wall and 2" pipe mounting kit

***808**



Terminal assignment

***808**



power supply[1]			
AC		**DC**	
terminal	**connection**	**terminal**	**connection**
L	phase	L+	+
N	neutral	N-	-
PE	earth	PE	earth

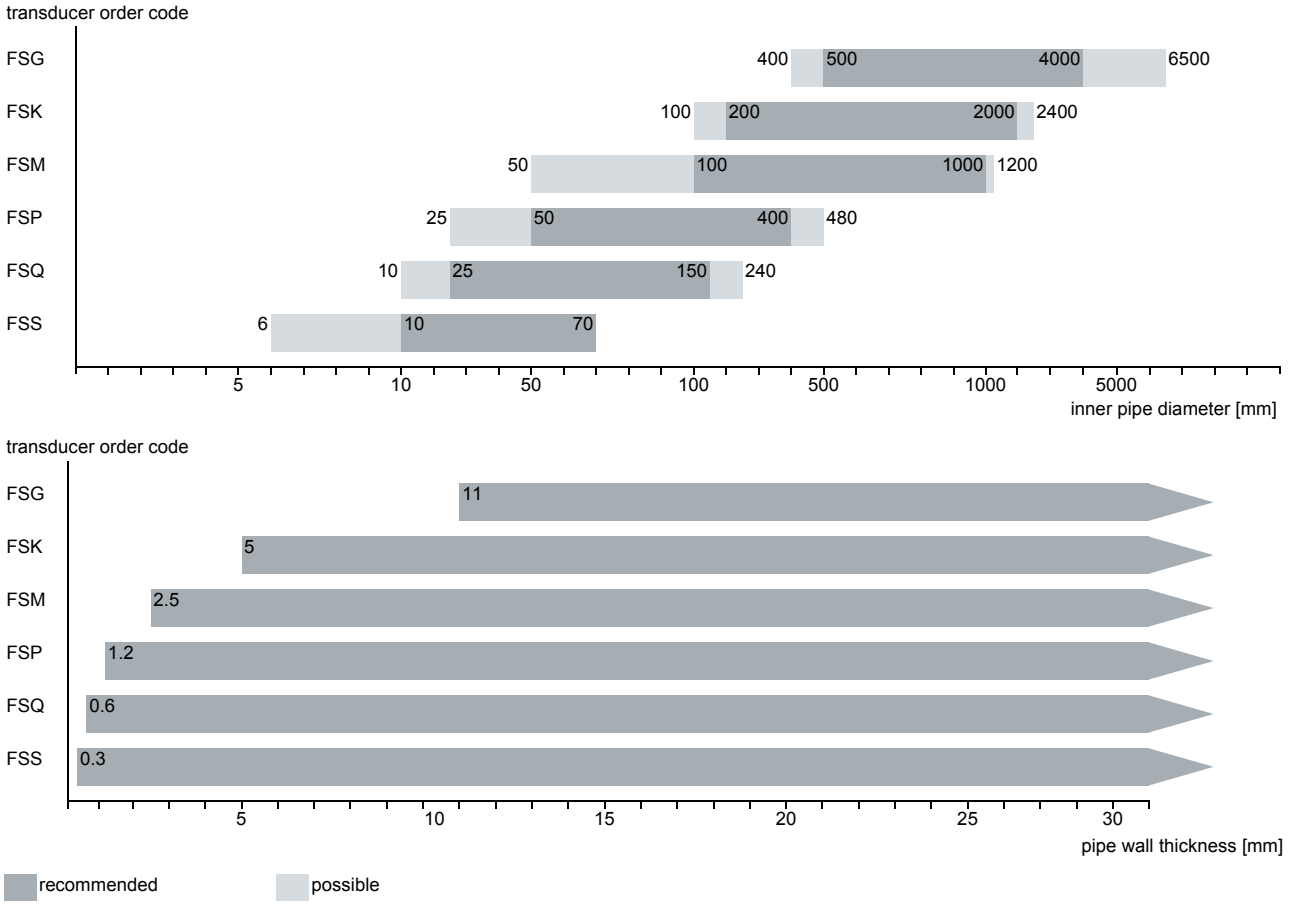
transducers, extension cable		
terminal	**connection**	**transducer**
ARS	internal shield	
AR	signal	
AV	signal	
AVS	internal shield	
cable gland or equipotential bonding terminal (transducers)	external shield	

outputs (options)[1]				
terminal strip	**terminal**			**connection**
KL1	4 GND	6 (+)	5 (-)	binary output B1
KL3	3 GND	2 (+)	1 (-)	active current output I1
terminal strip	**terminal**			**connection**
KL1	4 GND	6 (+)	5 (-)	binary output B1
KL3	3 GND	1 (-)	2 (+)	passive current output I1
terminal strip	**terminal**			**connection**
KL1	1 (S)	2 (A+)	3 (B-)	Modbus
KL3	3 GND	2 (+)	1 (-)	active current output I1
terminal strip	**terminal**			**connection**
KL1	1 (S)	2 (A+)	3 (B-)	Modbus
KL3	3 GND	1 (-)	2 (+)	passive current output I1

[1] cable (by customer): e.g. flexible leads, with insulated wire end ferrules, lead cross sectional area: 0.25...2.5 mm^2

Transducers

Transducer selection



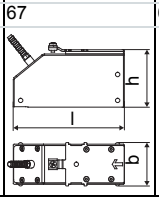
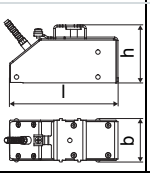
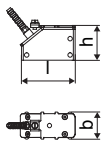
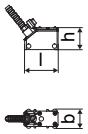
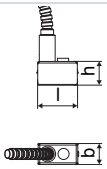
recommended possible

Transducer order code

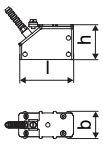
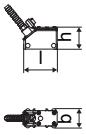
1, 2	3		4	5, 6	7, 8		9...11			no. of character
transducer	**transducer frequency**	**-**	**ambient temperature**	**explosion protection**	**connection system**	**-**	**extension cable**	**/**	**option**	**description**
FS										set of ultrasonic flow transducers for liquids measurement, shear wave
	G									0.2 MHz (on request)
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
	S									8 MHz
			N							normal temperature range
			E							extended temperature range
				A1						ATEX zone 1/IECEx zone 1
				F2						FM Class I Div. 2
				F1						FM Class I Div. 1
					TS					direct connection or connection via junction box
					T1					direct connection
							XXX			0 m: without extension cable > 0 m: with extension cable
									LC	long transducer cable
									IP68	degree of protection IP68
									OS	housing with stainless steel 316

Technical data

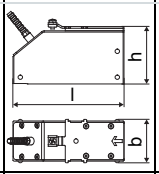
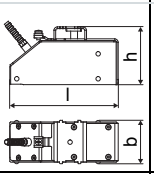
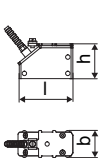
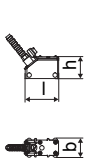
Shear wave transducers (FM Class I Div. 2, T1)

order code		FSG-N**T1/**	FSK-N**T1/**	FSM-N**T1/**	FSP-N**T1/**	FSQ-N**T1/**	FSS-N**T1/**
technical type		C(DL)G1N53	C(DL)K1N53	C(DL)M2N53	C(DL)P2N53	C(DL)Q2N53	CDS1N53
transducer frequency	MHz	0.2	0.5	1	2	4	8
inner pipe diameter d							
min. extended	mm	400	100	50	25	10	6
min. recommended	mm	500	200	100	50	25	10
max. recommended	mm	4000	2000	1000	400	150	70
max. extended	mm	6500	2400	1200	480	240	70
pipe wall thickness							
min.	mm	11	5	2.5	1.2	0.6	0.3
material							
housing		PEEK with stainless steel cap 304 (1.4301), ***-*****/OS: 316L (1.4404)		PEEK with stainless steel cap 304 (1.4301), ***-*****/ OS: 316L (1.4404)			stainless steel 304 (1.4301)
contact surface		PEEK		PEEK			PEI
degree of protection		IP67		IP67			IP65
transducer cable							
type		1699		1699			1699
length	m	5		4		3	2
length (***-*****/LC)	m	9		9		9	-
dimensions							
length l	mm	129.5	126.5	64		40	25
width b	mm	51	51	32		22	13
height h	mm	67	67.5	40.5		25.5	17
dimensional drawing							
weight (without cable)	kg	0.47	0.36	0.066		0.016	0.004
ambient temperature							
min.	°C	-40		-40			-30
max.	°C	+130		+130			+130
temperature com-pensation		x					-
explosion protection							
• **FM**							
order code		FSG-NF2T1/**	FSK-NF2T1/**	FSM-NF2T1/**	FSP-NF2T1/**	FSQ-NF2T1/**	FSS-NF2T1/**
explosion protection temperature							
• min.	°C	-40		-40			-40
• max.	°C	+125		+190			+125
degree of protection		IP66		IP66			IP66
marking		NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860			NI/Cl. I,II,III/ Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860
remark		on request					

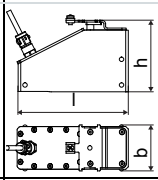
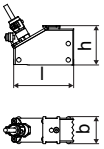
Shear wave transducers (FM Class I Div. 2, T1, extended temperature range)

order code		FSM-E**T1/**	FSP-E**T1/**	FSQ-E**T1/**
technical type		C(DL)M2E53	C(DL)P2E53	C(DL)Q2E53
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	1200	480	240
pipe wall thickness				
min.	mm	2.5	1.2	0.6
material				
housing		PI with stainless steel cap 304 (1.4301), ***-*****/OS: 316L (1.4404)		
contact surface		PI		
degree of protection		IP56		
transducer cable				
type		6111		
length	m	4		3
length (***-*****/LC)	m	9		
dimensions				
length l	mm	64		40
width b	mm	32		22
height h	mm	40.5		25.5
dimensional drawing				
weight (without cable)	kg	0.066		0.017
ambient temperature				
min.	°C	-30		
max.	°C	+200		
temperature compensation		x		
explosion protection				
• **FM**				
order code		FSM-EF2T1/**	FSP-EF2T1/**	FSQ-EF2T1/**
explosion protection temperature				
• min.	°C	-40		
• max.	°C	+235		
degree of protection		IP66		
marking		NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

Shear wave transducers (zone 1, TS)

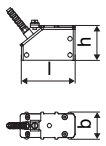
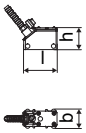
order code		FSG-N*1TS/**	FSK-N*1TS/**	FSM-N*1TS/**	FSP-N*1TS/**	FSQ-N*1TS/**
technical type		C(DL)G1N81	C(DL)K1N81	C(DL)M2N81	C(DL)P2N81	C(DL)Q2N81
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	mm	400	100	50	25	10
min. recommended	mm	500	200	100	50	25
max. recommended	mm	4000	2000	1000	400	150
max. extended	mm	6500	2400	1200	480	240
pipe wall thickness						
min.	mm	11	5	2.5	1.2	0.6
material						
housing		PEEK with stainless steel cap 304 (1.4301), ***-*****/OS: 316L (1.4404)				
contact surface		PEEK				
degree of protection		IP65	IP66			IP65
transducer cable						
type		1699				
length	m	5		4		3
length (***-*****/LC)	m	9				
dimensions						
length l	mm	129.5	126.5	64		40
width b	mm	51	51	32		22
height h	mm	67	67.5	40.5		25.5
dimensional drawing						
weight (without cable)	kg	0.47	0.36	0.066		0.016
ambient temperature						
min.	°C	-40				
max.	°C	+130				
temperature compensation		x				
explosion protection						
• **ATEX/IECEx**						
order code		FSG-NA1TS/**	FSK-NA1TS/**	FSM-NA1TS/**	FSP-NA1TS/**	FSQ-NA1TS/**
explosion protection temperature (pipe surface)						
• min.	°C	-55				
• max.	°C	+180				
marking		CE 0637 Ex II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db				
certification ATEX		IBExU07ATEX1168 X				
certification IECEx		IECEx IBE 08.0007X				
remark		on request				

Shear wave transducers (zone 1, TS, IP68)

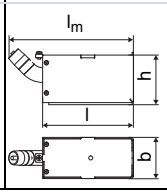
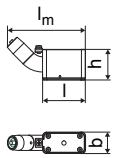
order code		FSG-N*1TS/IP68	FSK-N*1TS/IP68	FSM-N*1TS/IP68	FSP-N*1TS/IP68
technical type		CDG1LI1	CDK1LI1	CDM2LI1	CDP2LI1
transducer frequency	MHz	0.2	0.5	1	2
inner pipe diameter d					
min. extended	mm	400	100	50	25
min. recommended	mm	500	200	100	50
max. recommended	mm	4000	2000	1000	400
max. extended	mm	6500	2400	1200	480
pipe wall thickness					
min.	mm	11	5	2.5	1.2
material					
housing		PEEK with stainless steel cap 316Ti (1.4571)			
contact surface		PEEK			
degree of protection		IP68[1]			
transducer cable					
type		2550			
length	m	12			
dimensions					
length l	mm	130		72	
width b	mm	54		32	
height h	mm	83.5		46	
dimensional drawing					
weight (without cable)	kg	0.43		0.085	
ambient temperature					
min.	°C	-40			
max.	°C	+100			
temperature compensation		x			
explosion protection					
• **ATEX/IECEx**					
order code		FSG-NA1TS/IP68	FSK-NA1TS/IP68	FSM-NA1TS/IP68	FSP-NA1TS/IP68
explosion protection temperature (pipe surface)					
• min.	°C	-55			
• max.	°C	+180			
marking		CE 0637 Ex II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db			
certification ATEX		IBExU07ATEX1168 X			
certification IECEx		IECEx IBE 08.0007X			
remark		on request			

[1] test conditions: 3 months/2 bar (20 m)/20 °C

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

order code		FSM-E*1TS/**	FSP-E*1TS/**	FSQ-E*1TS/**
technical type		C(DL)M2E85	C(DL)P2E85	C(DL)Q2E85
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	1200	480	240
pipe wall thickness				
min.	mm	2.5	1.2	0.6
material				
housing		PI with stainless steel cap 304 (1.4301), ***-*****/OS: 316L (1.4404)		
contact surface		PI		
degree of protection		IP66		IP56
transducer cable				
type		6111		
length	m	4		3
length (***-*****/LC)	m	9		
dimensions				
length l	mm	64		40
width b	mm	32		22
height h	mm	40.5		25.5
dimensional drawing				
weight (without cable)	kg	0.066		0.017
ambient temperature				
min.	°C	-30		
max.	°C	+200		
temperature compensation		x		
explosion protection				
• **ATEX/IECEx**				
order code		FSM-EA1TS/**	FSP-EA1TS/**	FSQ-EA1TS/**
explosion protection temperature (pipe surface)				
• min.	°C	-45		
• max.	°C	+225		
marking		CE 0637 Ex II2G II2D Ex q IIC T6...T2 Gb Ex tb IIIA TX Db		
certification ATEX		IBExU07ATEX1168 X		
certification IECEx		IECEx IBE 08.0007X		

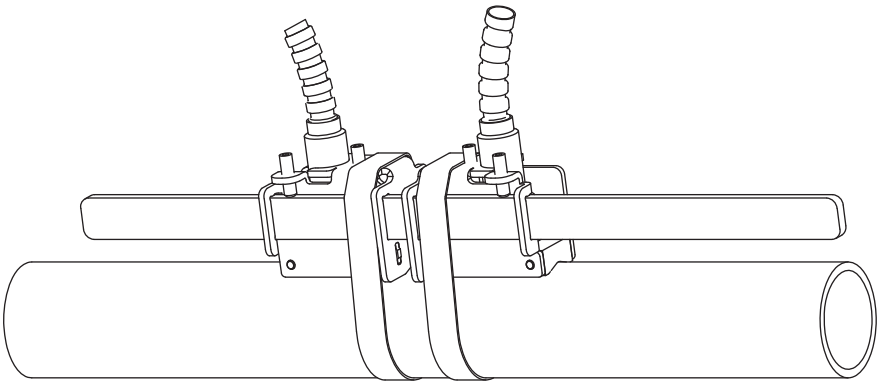
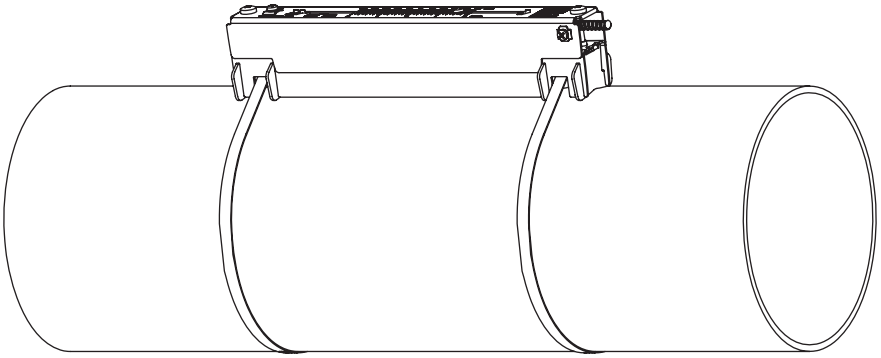
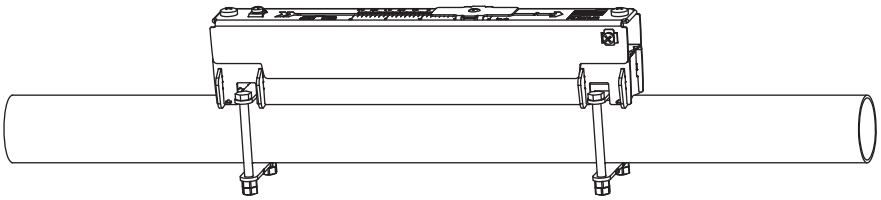
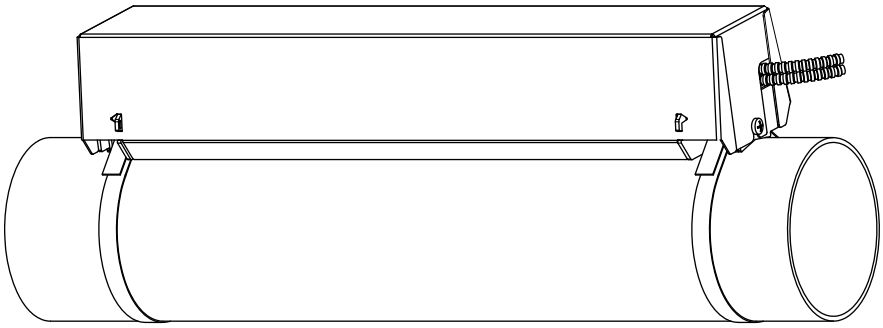
Shear wave transducers (FM Class I Div. 1, TS)

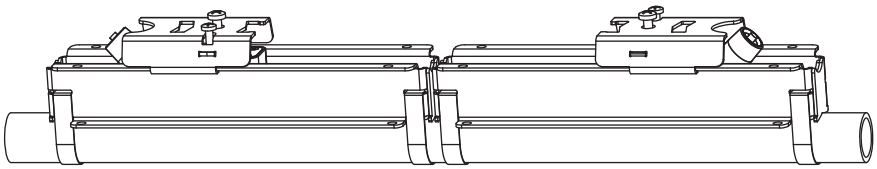
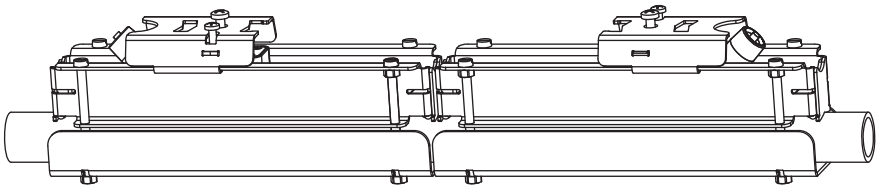
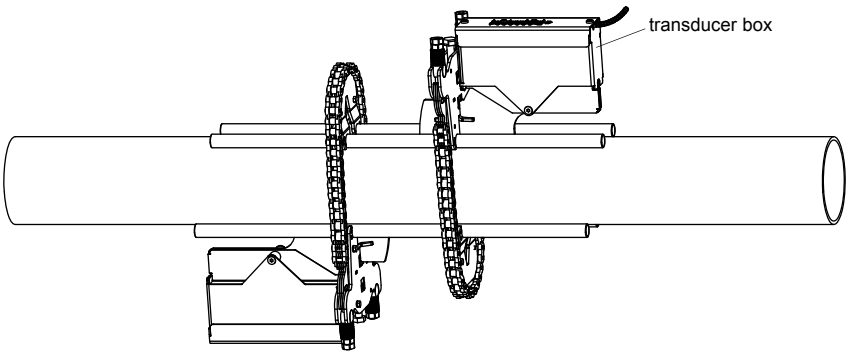
order code		FSG-NF1TS/**	FSK-NF1TS/**	FSM-NF1TS/**	FSP-NF1TS/**	FSQ-NF1TS/**
technical type		C(DL)G1N62	C(DL)K1N62	C(DL)M1N62	C(DL)P1N62	C(DL)Q1N62
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	mm	400	100	50	25	10
min. recommended	mm	500	200	100	50	25
max. recommended	mm	4000	2000	1000	400	150
max. extended	mm	6500	2400	1200	480	240
pipe wall thickness						
min.	mm	11	5	2.5	1.2	0.6
material						
housing		stainless steel 304 (1.4301), ***-*****/OS: 316L (1.4404)				
contact surface		PEEK				
degree of protection		IP66				
transducer cable						
type		2549				
length	m	10				
length (***-*****/LC)	m	46				
dimensions						
length l	mm	132		60		
width b	mm	60		30		
height h	mm	72		43		
mounting length l_m	mm	185		110		
dimensional drawing						
ambient temperature						
min.	°C	-40				
max.	°C	+110				
temperature compensation		x				
explosion protection						
• FM						
order code		FSG-NF1TS/**	FSK-NF1TS/**	FSM-NF1TS/**	FSP-NF1TS/**	FSQ-NF1TS/**
explosion protection temperature						
• min.	°C	-40				
• max.	°C	+125				
marking		S/Cl. I, II, III / Div. 1 / GP A, B, C, D, E, F, G / Temperature Codes dwg 3831				
remark		on request				

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**	**/**	**option**	**description**
VL										Variofix L
VC										Variofix C
PF										PermaFiX
WI										transducer box for WaveInjector
	K									transducers with transducer frequency G, K
	M									transducers with transducer frequency M, P, Q
	Q									transducers with transducer frequency Q
	S									transducers with transducer frequency S
			D							reflection arrangement or diagonal arrangement
			R							reflection arrangement
				S						small
				M						medium
				L						large
						B				bolts
						S				tension straps
						W				welding
						N				without fixation
							002			10...20 mm
							004			20...40 mm
							T36			40...360 mm
							013			10...130 mm
							036			130...360 mm
							092			360...920 mm
							200			920...2000 mm
							450			2000...4500 mm
							940			4500...9400 mm
							NDR			any
									IP68	for transducers with degree of protection IP68
									OS	housing with stainless steel 316
									Z	special design

Variofix L (VLS) 	transducer frequency: S material: stainless steel 304 (1.4301), 303 (1.4305)
Variofix L (VLK, VLM, VLQ) 	material: stainless steel 304 (1.4301), 301 (1.4310), 410 (1.4006) option OS: 316Ti (1.4571), 316L (1.4404), 17-7PH (1.4568) inner length: **VLK**: 348 mm, option IP68: 368 mm **VLM**: 234 mm **VLQ**: 176 mm dimensions: **VLK**: 423 x 90 x 93 mm option IP68: 443 x 94 x 105 mm **VLM**: 309 x 57 x 63 mm **VLQ**: 247 x 43 x 47 mm
Variofix L with bolt mounting plates (VL*--B)** 	material: stainless steel 304 (1.4301), 301 (1.4310), 410 (1.4006) option OS: 316Ti (1.4571), 316L (1.4404), 17-7PH (1.4568) inner length: **VLM**: 234 mm **VLQ**: 176 mm dimensions: **VLM**: 309 x 57 x 63 mm **VLQ**: 247 x 43 x 47 mm outer pipe diameter: max. 48 mm
Variofix C (VC) 	material: stainless steel 304 (1.4301), 301 (1.4310) option OS: 316Ti (1.4571) inner length: **VCK-*L**: 500 mm **VCK-*S**: 350 mm **VCM**: 400 mm **VCQ**: 250 mm dimensions: **VCK-*L**: 560 x 122 x 102 mm, option IP68: 560 x 126 x 120 mm **VCK-*S**: 410 x 122 x 102 mm, option IP68: 410 x 126 x 120 mm **VCM**: 460 x 96 x 80 mm **VCQ**: 310 x 85 x 62 mm

PermaFiX • with tension straps (PF*-DS-S) 	material: stainless steel 304 (1.4301), 301 (1.4310) option OS: 316Ti (1.4571) inner length: **PFK**: 373 mm **PFM**: 276 mm dimensions: **PFK**: 410 x 90 x 73 mm **PFM**: 310 x 68 x 44 mm
• with bolts (PF*-DS-B) 	
transducer box WI for WaveInjector 	see Technical specification TSWaveInjectorVx-x

Coupling materials for transducers

	normal temperature range (4th character of transducer order code = N)		**extended temperature range (4th character of transducer order code = E)**		**WaveInjector WI-400**	
	< 100 °C	< 170 °C	< 150 °C	< 200 °C	< 280 °C	280...400 °C
< 24 h	coupling compound type N or coupling foil type VT	coupling compound type E or coupling foil type VT	coupling compound type E or coupling foil type VT	coupling compound type E or H or coupling foil type VT	coupling foil type A and coupling foil type VT	coupling foil type B and coupling foil type VT
long time measure-ment	coupling foil type VT[1]	coupling foil type VT[2]	coupling foil type VT[1]	coupling foil type VT[2]	coupling foil type A and coupling foil type VT	coupling foil type B and coupling foil type VT

[1] < 5 years

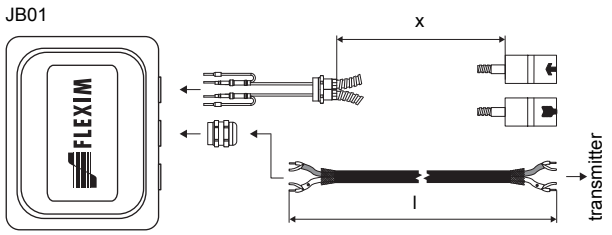
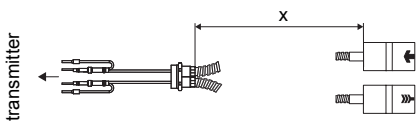
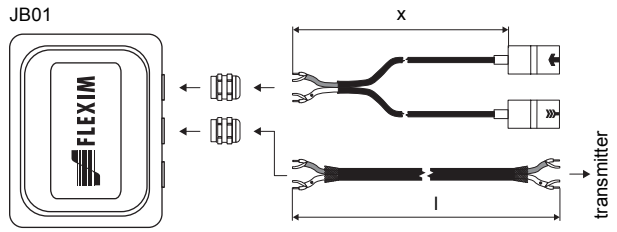
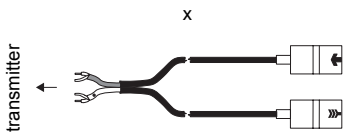
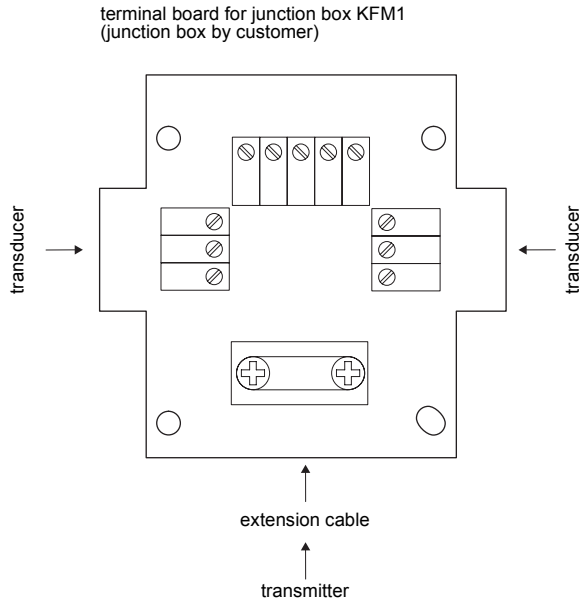
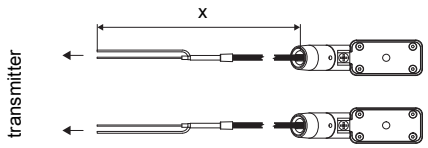
[2] < 6 months

Technical data

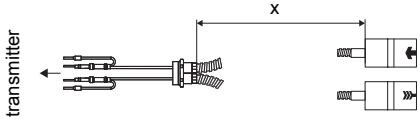
type	**ambient temperature** °C	**material**
coupling compound type N	-30...+130	mineral grease paste
coupling compound type E	-30...+200	silicone paste
coupling compound type H	-30...+250	fluoropolymer paste
coupling foil type A	max. 280	lead
coupling foil type B	> 280...400	silver
coupling foil type VT	-10...+200	fluoroelastomer

Connection systems

connection system TS

connection with extension cable	direct connection	transducers technical type
		*****8*
		****LI*
		*****62

connection system T1

	direct connection	transducers technical type
		*****53

Cable

transducer cable					
type		**1699**	**2550**	**6111**	**2549**
weight	kg/m	0.094	0.035	0.092	0.065
ambient temperature	°C	-55...+200	-40...+100	-100...+225	-100...+200
properties			longitudinal watertight		
cable jacket					
material		PTFE	PUR	PFA	PTFE
outer diameter	mm	2.9	5.2 ±0.2	2.7	5.3
thickness	mm	0.3	0.9	0.5	0.5
colour		brown	grey	white	black
shield		x	x	x	x
sheath					
material		stainless steel 304 (1.4301) option OS: 316Ti (1.4571)	-	stainless steel 304 (1.4301) option OS: 316Ti (1.4571)	-
outer diameter	mm	8	-	8	-

extension cable			
type		**2615**	**5245**
weight	kg/m	0.18	0.38
ambient temperature	°C	-30...+70	-30...+70
properties		halogen free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2	halogen free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2
cable jacket			
material		PUR	PUR
outer diameter	mm	12	12
thickness	mm	2	2
colour		black	black
shield		x	x
sheath			
material		-	steel wire braid with copolymer sheath
outer diameter	mm	-	15.6

Cable length

transducer frequency		F, G, H, K		M, P		Q		S	
connection system TS, T1									
transducers technical type		x	l	x	l	x	l	x	l
*(DR)***8*	m	5	≤ 300	4	≤ 300	3	≤ 90	-	-
option LC: *(LT)***8*	m	9	≤ 300	9	≤ 300	9	≤ 90	-	-
*(DR)***5*	m	5	≤ 300	4	≤ 300	3	≤ 90	2	≤ 40
option LC: *(LT)***5*	m	9	≤ 300	9	≤ 300	9	≤ 90	-	-
*(DR)***62	m	10	≤ 300	10	≤ 300	10	≤ 90	-	-
option LC: *(LT)***62	m	46	≤ 300	46	≤ 300	46	≤ 90	-	-
option IP68: ****LI*	m	12	≤ 300	12	≤ 300	-	-	-	-

x - transducer cable length

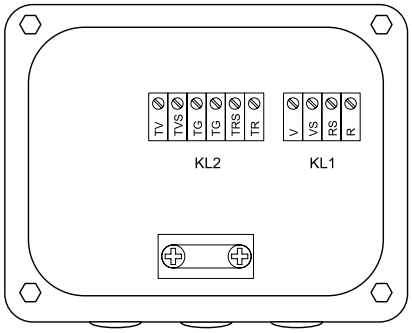
l - max. length of extension cable (depending on application)

Junction box

Technical data

JB01S4E3M		
weight	kg	1.2 kg
transmitter		F808**-A1
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L (1.4404)
gasket		silicone
degree of protection		IP67
ambient temperature		
min.	°C	-40
max.	°C	+80
explosion protection		
• **ATEX/IECEx**		
marking		CE 0637 Ex II2G II2D Ex e mb IIC (T6)...T4 Gb Ex tb IIIC T 100 °C Db Ta -40...+(70)80 °C
certification ATEX		IBExU06ATEX1161
certification IECEx		IECEx IBE 08.0006
type of protection		gas: increased safety decoupled network: encapsulation dust: protection by enclosure

connection



transducers

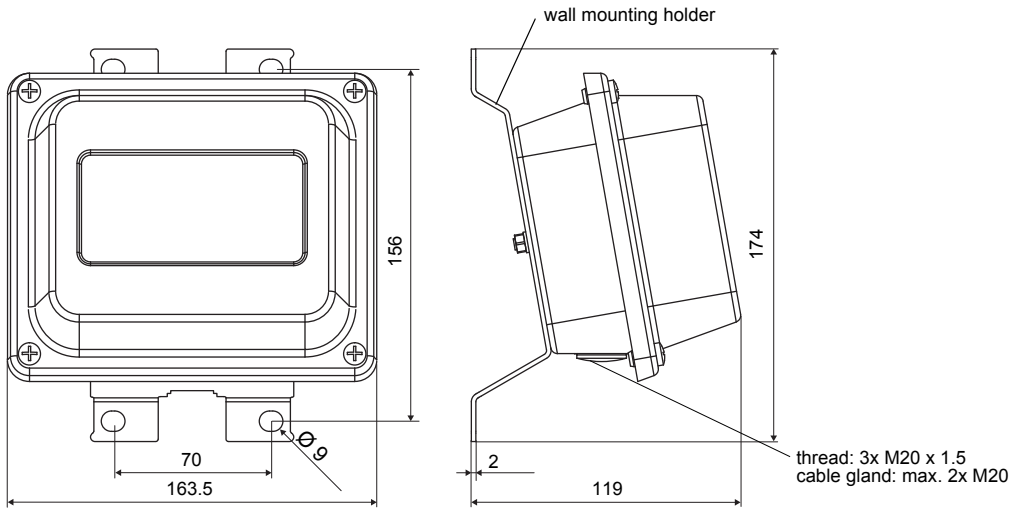
terminal strip	terminal	connection	transducer
KL1	V	signal	
	VS	internal shield	
	RS	internal shield	
	R	signal	

extension cable

terminal strip	terminal	connection
KL2	TV	signal
	TVS	internal shield
	TRS	internal shield
	TR	signal

Dimensions

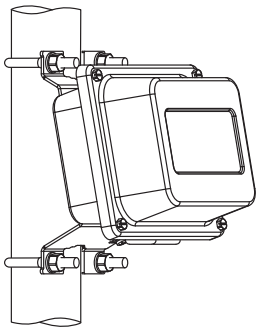
JB0*, JBP*



in mm

2" pipe mounting kit

JB**

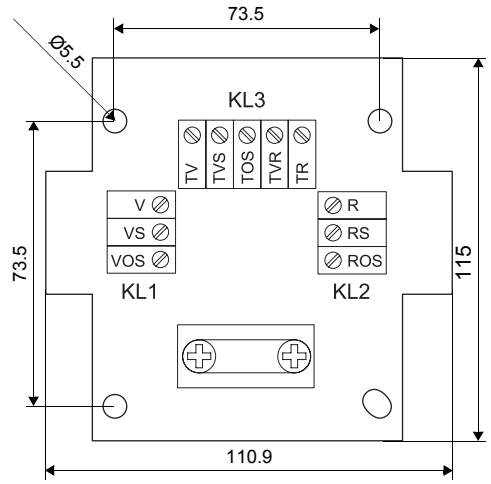


Extension cable (F808**-F1)

The extension cable and the transducers are connected via terminal board KFM1. The terminal board has to be installed into a junction box (by customer) approved for hazardous areas.

Terminal assignment KFM1

KFM1



in mm

transducers

terminal strip	terminal	connection	transducer
KL1	V	signal	
	VS	internal shield	
	VOS	external shield	
KL2	R	signal	
	RS	internal shield	
	ROS	external shield	

extension cable

terminal strip	terminal	connection	transducer
KL3	TV	signal	
	TVS	internal shield	
	TOS	external shield	
	TRS	internal shield	
	TR	signal	

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