

### Liquid Ultrasonic Flowmeter for Permanent Installation

Designed for wall mounting or installation in 19" rack systems

#### 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
- Automatic loading of calibration data and transducer detection for a fast and easy set-up (less than 5 min), providing precise and long-term stable results
- User-friendly design
- Transducers available for a wide range of inner pipe diameters (0.25...256 in) and fluid temperatures (-40...+752 °F), applications down to -276 °F possible
- FM Class 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

#### Applications

- Chemical industry
- Petrochemical industry
- Oil and gas industry
- Pharmaceutical industry
- Semiconductor industry
- Mechanical engineering
- Water and wastewater industry



FLUXUS ADM 7407



FLUXUS ADM 7907



Measurement with transducers mounted by PermaRail

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## 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.

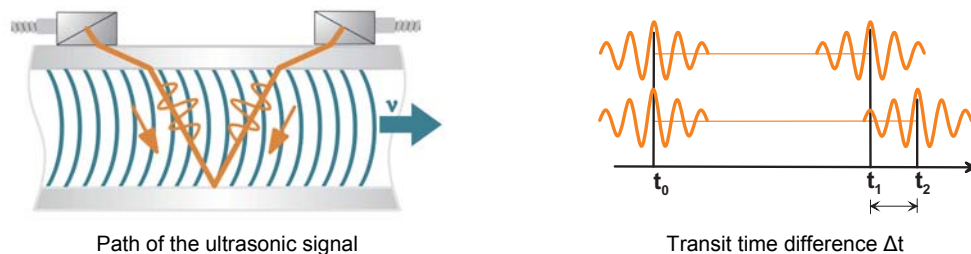
The transit time difference,  $\Delta t$ , is measured and allows the flowmeter to determine the average flow velocity along the propagation path of the ultrasonic signals. A flow profile correction is then performed in order to obtain the area averaged flow velocity, which is proportional to the volumetric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

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.



### 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
- $\Delta t$  = transit time difference
- $t_{fl}$  = transit time in the medium

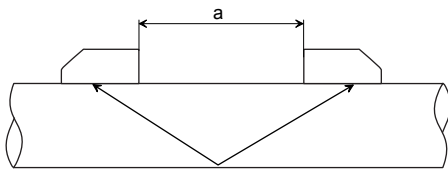
### Number of Sound Paths

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

- **reflect mode**  
The number of sound paths is even. Both of the transducers are mounted on the same side of the pipe. Correct positioning of the transducers is easier.
- **diagonal mode**  
The number of sound paths is odd. Both of the transducers are mounted on opposite sides of the pipe.
- **direct mode**  
Diagonal mode with 1 sound path. This should be used in the case of a high signal attenuation by the medium, pipe or coatings.

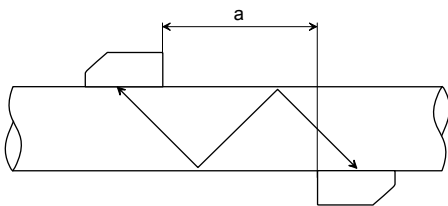
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

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

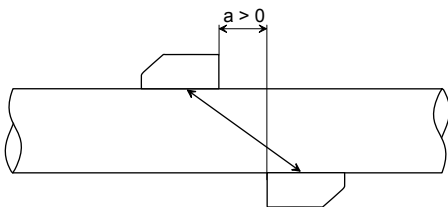


Reflect mode, number of sound paths: 2

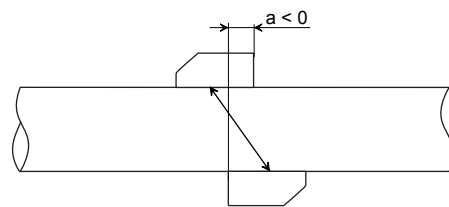
a = transducer distance



Diagonal mode, number of sound paths: 3

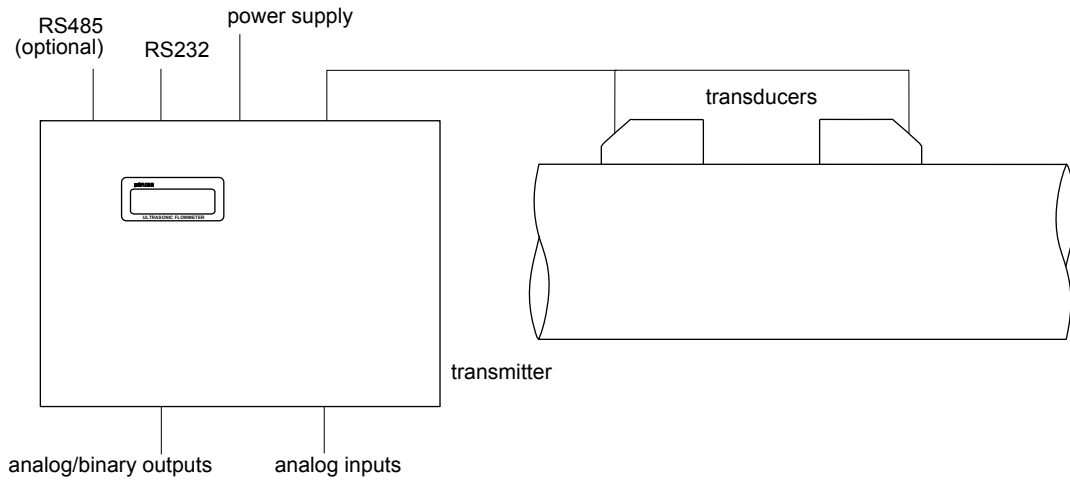


Direct mode, number of sound paths: 1

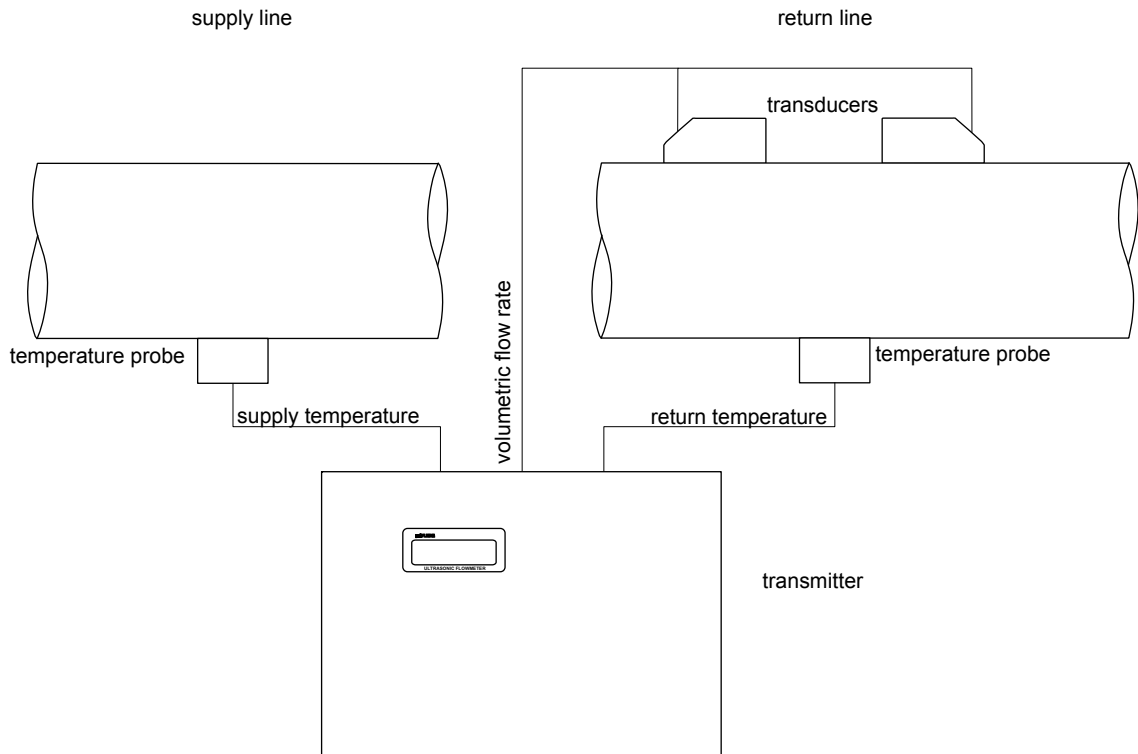


Direct mode, number of sound paths: 1,  
negative transducer distance

### Typical Measurement Setup






Example of a measurement setup in reflect mode



Example of a heat flow measurement

## Flow Transmitter

### Technical Data

FLUXUS	ADM 7407	ADM 7907
design	standard field device	19 " module
		
<b>measurement</b>	transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content	
measurement principle		
flow velocity	0.03 to 82 ft/s	
repeatability	0.15 % of reading ±0.03 ft/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-5M-1985	
<b>accuracy<sup>1</sup></b>		
with standard calibration	±1.6 % of reading ±0.03 ft/s	
with extended calibration (optional)	±1.2 % of reading ±0.03 ft/s	
with field calibration <sup>2</sup>	±0.5 % of reading ±0.03 ft/s	
<b>flow transmitter</b>		
power supply	100 to 240 V/50 to 60 Hz or 20 to 32 V DC	
power consumption	< 15 W	
number of flow measuring channels	1, optional: 2	
signal attenuation	0 to 100 s, adjustable	
measuring cycle (1 channel)	100 to 1000 Hz	
response time	1 s (1 channel), option: 70 ms	
housing material	aluminum, powder coated	aluminum
degree of protection	NEMA 4	NEMA 1
dimensions	see dimensional drawing	42HP x 3U (without back panel) see dimensional drawing
weight	6.2 lb	3.8 lb
fixation	wall mounting, optional: 2 " pipe mounting	19 " rack mounting
operating temperature	-4 to +140 °F	
display	2 x 16 characters, dot matrix, backlight	
menu language	English, German, French, Dutch, Spanish	
<b>explosion protection (optional)</b>		
<b>F</b> marking	 NI/Cl. I,II,III/Div. 2/ GP. A,B,C,D,E,F,G/ T5 Ta = 60 °C	-

<sup>1</sup> for transit time difference principle, reference conditions and v > 0.49 ft/s

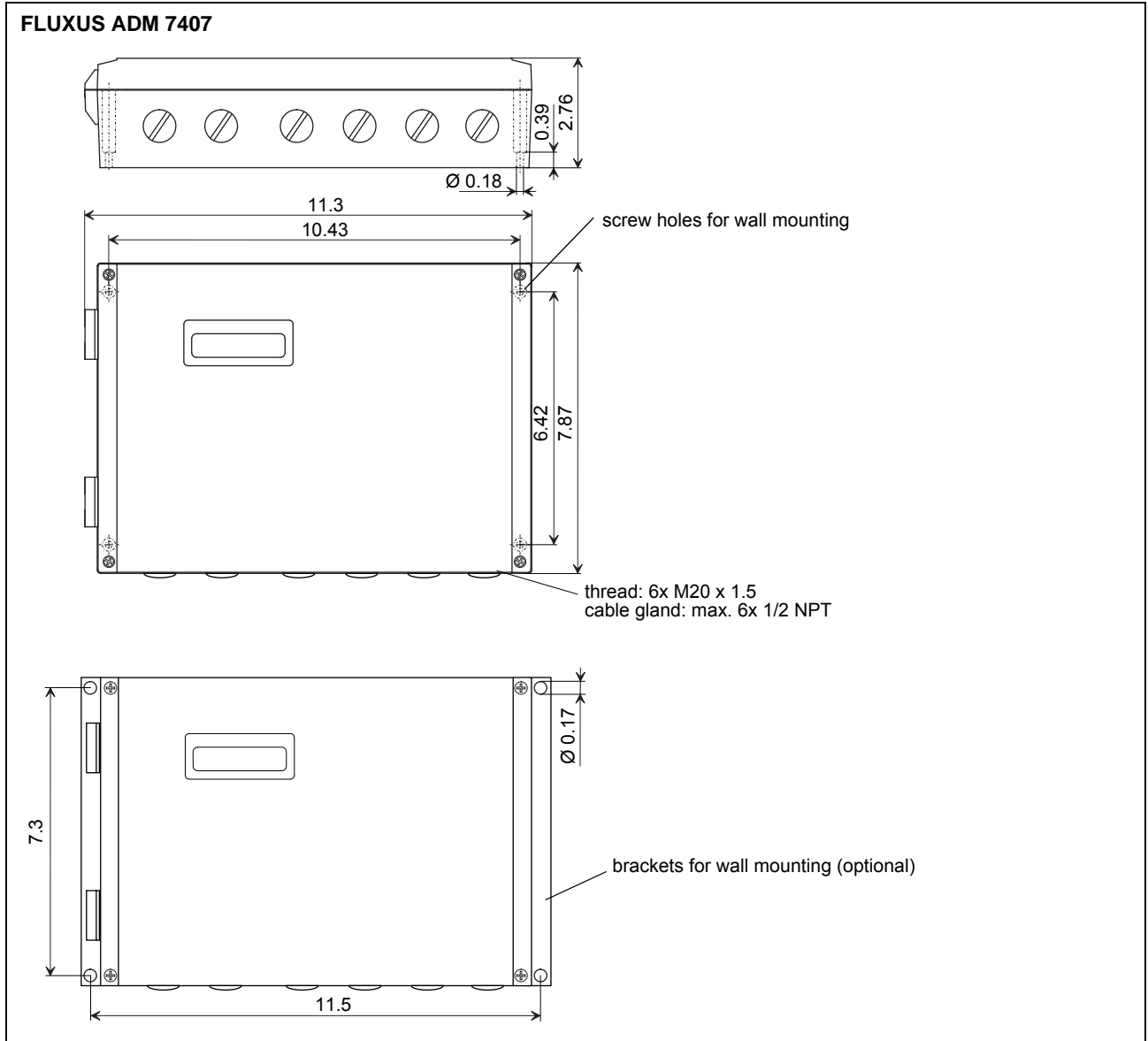
<sup>2</sup> reference uncertainty < 0.2 %

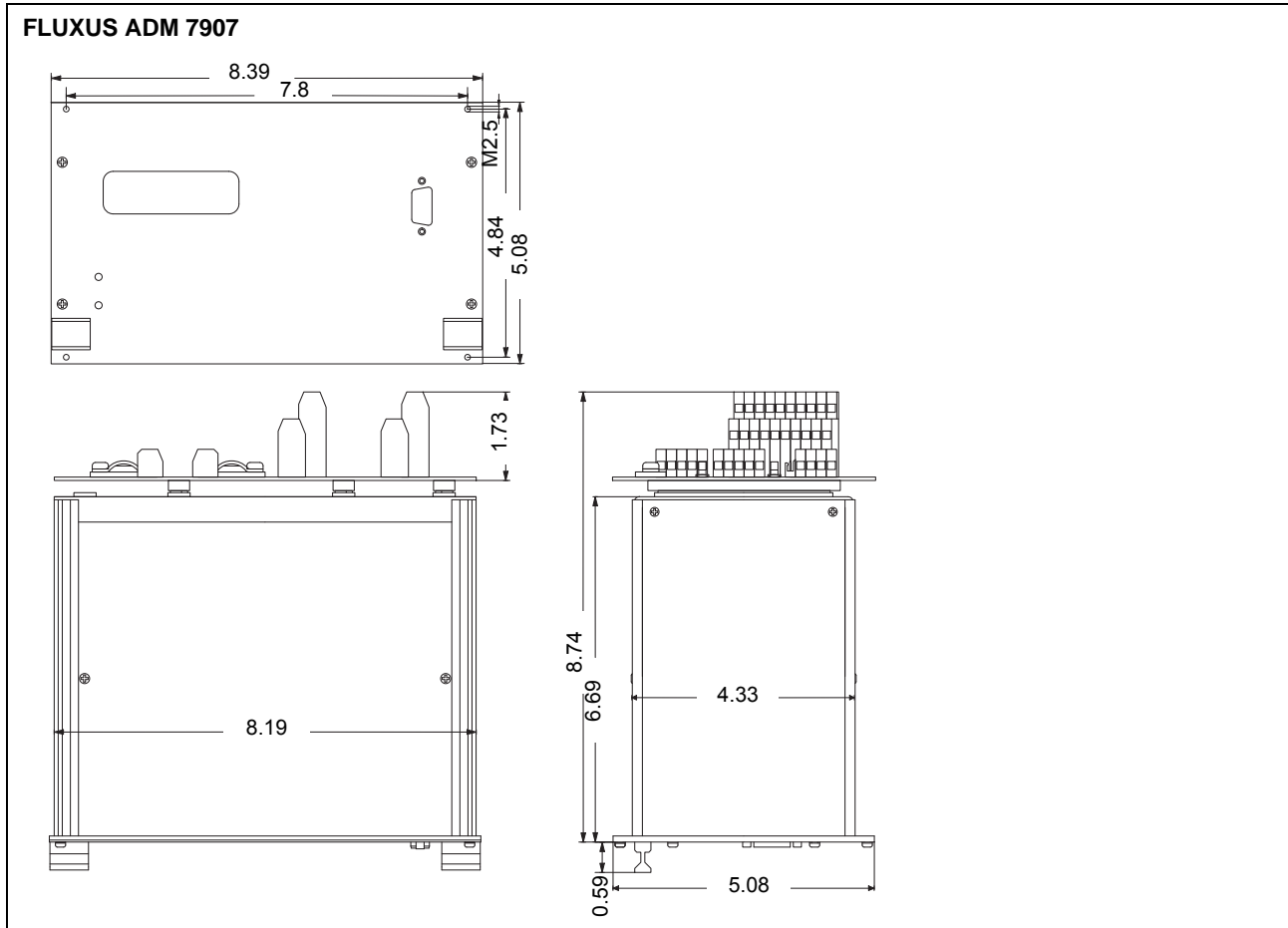
FLUXUS	ADM 7407	ADM 7907
<b>measuring functions</b>		
physical quantities	volumetric flow rate, mass flow rate, flow velocity, heat flow (if temperature inputs are installed)	
totalizer	volume, mass, optional: heat quantity	
calculation functions	average, difference, sum (2 measuring channels necessary)	
diagnostic functions	sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times	
<b>data logger</b>		
loggable values	all physical quantities, totaled values and diagnostic values	
capacity	> 100 000 measured values	
<b>communication</b>		
interface	- process integration: optional: RS485 (Modbus, emitter) or HART - diagnosis: RS232	
<b>serial data kit (optional)</b>		
software (all Windows™ versions)	-FluxData: download of measurement data, graphical presentation, conversion to other formats (e.g. for Excel™) -FluxKoef: creating medium data sets	
cable	RS232	
adapter	RS232 - USB	
<b>outputs (optional)</b>		
	The outputs are galvanically isolated from the transmitter.	
number	on request	
<b>current output</b>		
current output	0/4 to 20 mA	
- range	0.1 % of reading ±15 µA	
- accuracy	$R_{ext} < 500 \Omega$	
- active output	$U_{ext} = 4 \text{ to } 24 \text{ V}$ , depending on $R_{ext}$ , $R_{ext} < 1 \text{ k}\Omega$	
- passive output		
current output I1 in HART mode	4 to 20 mA	
- range	$U_{ext} = 10 \text{ to } 24 \text{ V}$	
- passive output		
<b>voltage output</b>		
range	0 to 1 V or 0 to 10 V	
accuracy	0 to 1 V: 0.1 % of reading ±1 mV 0 to 10 V: 0.1 % of reading ±10 mV	
internal resistance	$R_i = 500 \Omega$	
<b>frequency output</b>		
range	0 to 5 kHz	
open collector	24 V/4 mA	
<b>binary output</b>		
Reed relay	-	48 V/0.25 A
open collector	-	24 V/4 mA
optorelay	26 V/100 mA	-
binary output as alarm output	limit, change of flow direction or error	limit, change of flow direction or error
- functions		
binary output as pulse output	0.01 to 1000 units	0.01 to 1000 units
- pulse value	1 to 1000 ms	80 to 1000 ms
- pulse width		

FLUXUS	ADM 7407	ADM 7907
<b>inputs (optional)</b>		
	The inputs are galvanically isolated from the transmitter.	
number	max. 4, on request	
<b>temperature input</b>		
type	Pt100/Pt1000	
connection	4-wire	
range	-238 to +1040 °F	
resolution	0.01 K	
accuracy	±0.01 % of reading ±0.03 K	
<b>current input</b>		
accuracy	0.1 % of reading ±10 µA	
active input	U <sub>i</sub> = 24 V, R <sub>i</sub> = 50 Ω, P <sub>i</sub> < 0.5 W, not short-circuit proof 0 to 20 mA	U <sub>i</sub> = 15 V, R <sub>i</sub> = 50 Ω, P <sub>i</sub> < 0.5 W, not short-circuit proof 0 to 20 mA
- range		
passive input	R <sub>i</sub> = 50 Ω, P <sub>i</sub> < 0.3 W	R <sub>i</sub> = 50 Ω, P <sub>i</sub> < 0.3 W
- range	-20 to +20 mA	-20 to +20 mA
<b>voltage input</b>		
range	0 to 1 V	
accuracy	0.1 % of reading ±1 mV	
internal resistance	R <sub>i</sub> = 1 MΩ	



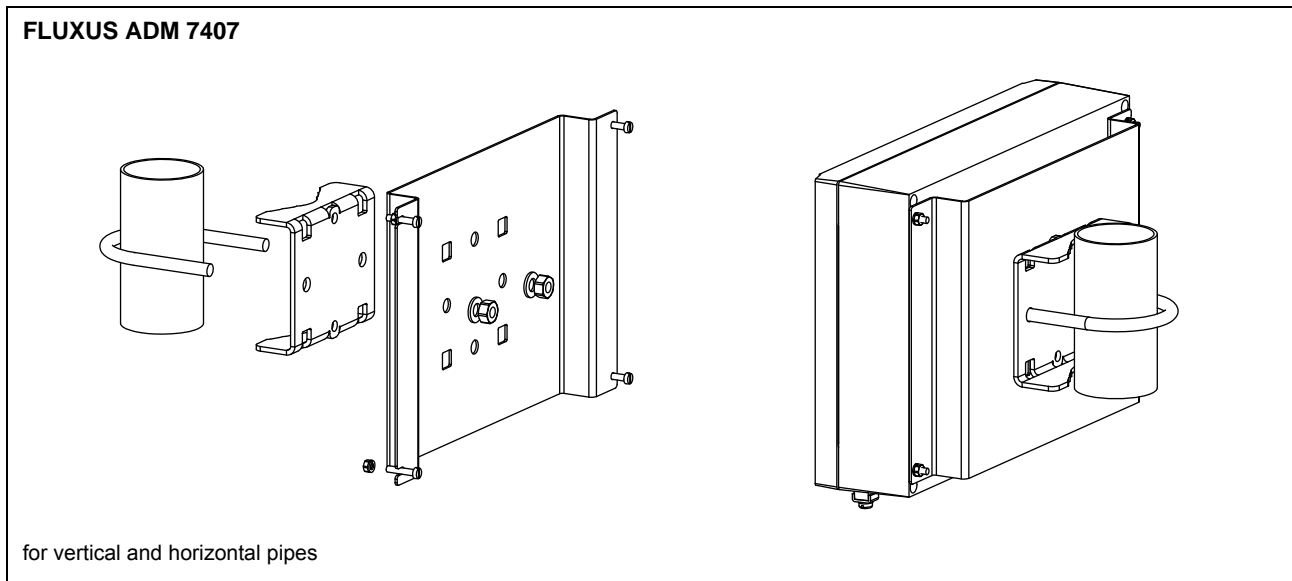
### Dimensions





in inch

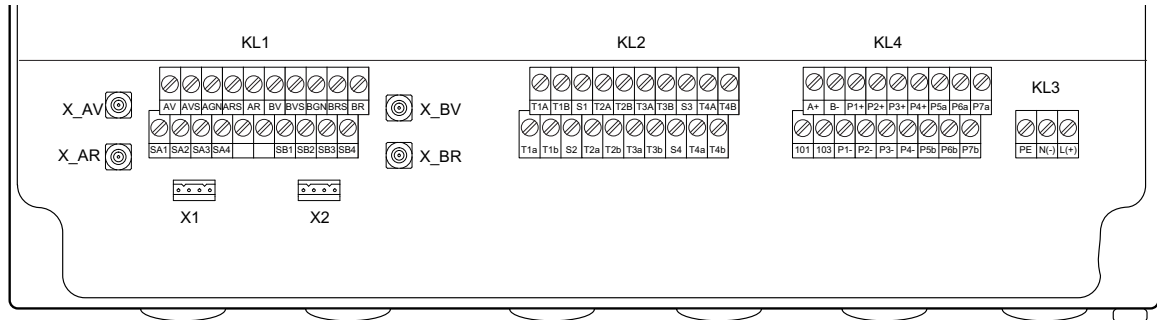
**2 " Pipe Mounting Kit (optional)**



for vertical and horizontal pipes

## Terminal Assignment

### FLUXUS ADM 7407



#### power supply

terminal strip KL3

terminal	connection AC	connection DC
PE	earth	earth
N(-)	neutral	- DC
L(+)	phase	+ DC

#### transducers

terminal strip KL1

extension cable (transducers ****L)*, *****52) transducer cable (transducers ****L*)			
measuring channel A		measuring channel B	
terminal	connection	terminal	connection
AV	signal	BV	signal
AVS	shield	BVS	shield
ARS	shield	BRS	shield
AR	signal	BR	signal

transducer cable (transducers ****L*)		
measuring channel A	measuring channel B	
terminal		connection
X_AV	X_BV	SMB connector
X_AR	X_BR	SMB connector

#### outputs<sup>2</sup>

terminal strip KL4

terminal	connection
P1+ to P4+, P1- to P4-	current output, voltage output, frequency output or binary output (optorelay)
P5a to P7a, P5b to P7b	binary output (optorelay)

#### RS485 (optional)

terminal strip KL4

terminal	connection
A+	signal +
B-	signal -
101	shield

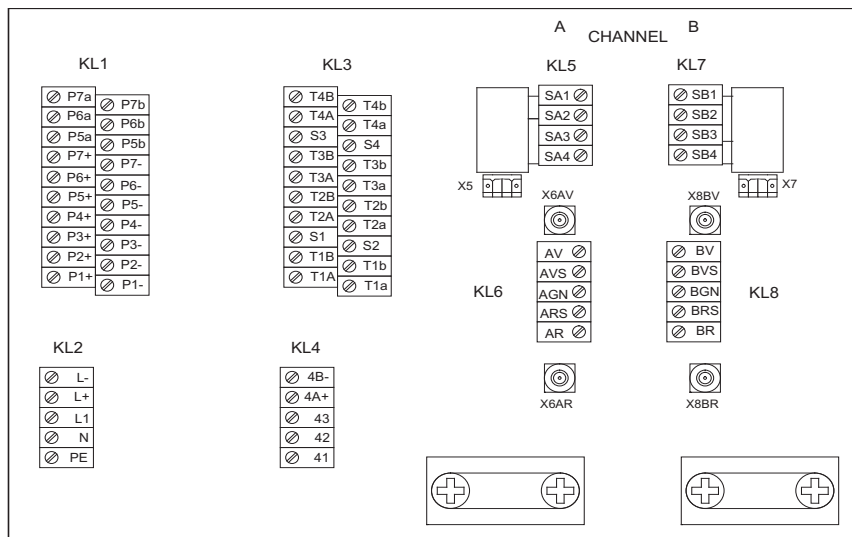
#### inputs<sup>2</sup>

terminal strip KL2

terminal	temperature probe				passive current source connection of an active input	active current source connection of a passive input
	connection		connection with extension cable			
	with connector	without connector	with connector	without connector		
T1a to T4a	red	white	red	white	not connected	not connected
T1A to T4A	red/blue	black	gray	black	-	+
T1b to T4b	white/blue	red	blue	red	+	not connected
T1B to T4B	white	green	white	green	not connected	-
S1 to S4	shield	-	shield	-	not connected	not connected

<sup>2</sup> The number, type and terminal assignment of the outputs and inputs will be customized.

**FLUXUS ADM 7907**



**power supply**

terminal strip KL2

terminal	connection AC	terminal	connection DC
PE	earth	PE	earth
N	neutral	L-	DC-
L1	phase	L+	DC+

**transducers**

terminal strip KL6, KL8

extension cable (transducers ****L1*, ****52) transducer cable (transducers ****L1*)			
measuring channel A		measuring channel B	
terminal	connection	terminal	connection
AV	signal	BV	signal
AVS	shield	BVS	shield
ARS	shield	BRS	shield
AR	signal	BR	signal

**outputs<sup>2</sup>**

terminal strip KL1

terminal	connection
P1+ to P7+, P1- to P7-	current output, voltage output, frequency output or binary output (open collector, Reed relay)
P5a to P7a, P5b to P7b	binary output (Reed relay)

**RS485 (optional)**

terminal strip KL4

terminal	connection
4A+	signal +
4B-	signal -
43	shield

**inputs<sup>2</sup>**

terminal strip KL3

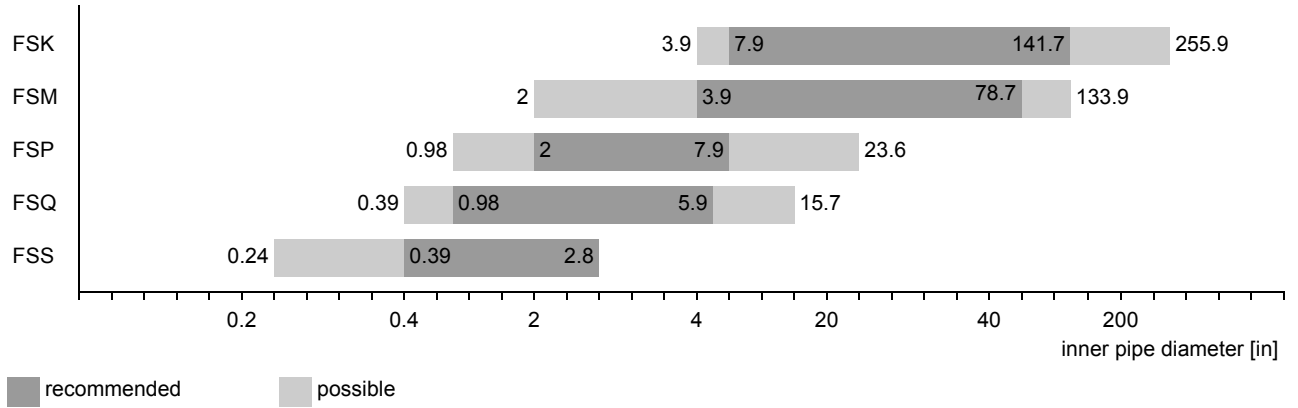
terminal	temperature probe				passive current source connection of an active input	active current source connection of a passive input
	connection		connection with extension cable			
	with connector	without connector	with connector	without connector		
T1a to T4a	red	white	red	white	not connected	not connected
T1A to T4A	red/blue	black	gray	black	-	+
T1b to T4b	white/blue	red	blue	red	+	not connected
T1B to T4B	white	green	white	green	not connected	-
S1 to S4	shield	-	shield	-	not connected	not connected

<sup>2</sup> The number, type and terminal assignment of the outputs and inputs will be customized.

## Transducers

### Transducer Selection

transducer order code

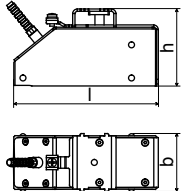
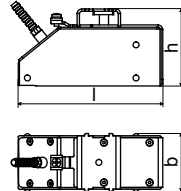
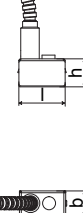





### Transducer Order Code

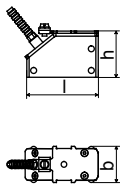
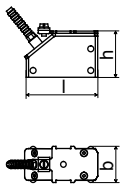
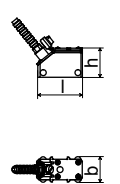



1, 2	3	4	5, 6	7, 8	9 to 11	12, 13	no. of character			
transducer	transducer frequency	-	operating temperature	explosion protection	connection system	-	extension cable	/	option	description
FS										set of ultrasonic flow transducers for liquids measurement, shear wave
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
	S									8 MHz
		N								normal temperature range
		E								extended temperature range (shear wave transducers with transducer frequency M, P, Q)
			F2							FM Class I Div. 2
			NN							not explosion proof
				TS						direct connection or connection via junction box
						XXX				cable length in m, for max. length of extension cable see page 23 0 m: without junction box > 0 m: with junction box JB03 or JBP3 (transducers NEMA 6P)
								LC		long transducer cable (only FSK)
								IP68		degree of protection NEMA6P
								OS		housing with stainless steel 316
example										
FS	M	-	N	F2	TS	-	030			shear wave transducer 1 MHz, normal temperature range, FM Class I Div. 2, connection system TS with junction box JB03 and extension cable 30 m (98 ft)
		-				-		/		

## Technical Data

### Shear Wave Transducers (FM or not explosion proof)

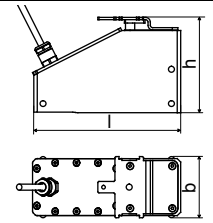
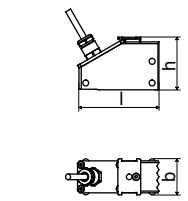
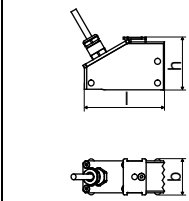
technical type		CDK1N52	CLK1N52	CDS1N52
order code		<b>FSK-NF2TS</b> <b>FSK-NF2TS/OS</b> <b>FSK-NNNTS</b> <b>FSK-NNNTS/OS</b>	<b>FSK-NF2TS/LC</b> <b>FSK-NF2TS/LC/OS</b> <b>FSK-NNNTS/LC</b> <b>FSK-NNNTS/LC/OS</b>	<b>FSS-NF2TS</b> <b>FSS-NNNTS</b>
transducer frequency	MHz	0.5	0.5	8
<b>inner pipe diameter d</b>				
min. extended	in	3.9	3.9	0.24
min. recommended	in	7.9	7.9	0.39
max. recommended	in	141.7	141.7	2.8
max. extended	in	255.9	255.9	2.8
<b>pipe wall thickness</b>				
min.	in	-	-	-
max.	in	-	-	-
<b>material</b>				
housing		PEEK with stainless steel cap 304, option OS: 316L	PEEK with stainless steel cap 304, option OS: 316L	stainless steel 304
contact surface		PEEK	PEEK	PEI
degree of protection		NEMA 6	NEMA 6	NEMA 4
<b>transducer cable</b>				
type		1699	1699	1699
length	ft	16	29	6
<b>dimensions</b>				
length l	in	4.98	4.98	0.98
width b	in	2.01	2.01	0.51
height h	in	2.66	2.66	0.67
dimensional drawing				
<b>operating temperature</b>				
min.	°F	-40	-40	-22
max.	°F	+266	+266	+266
temperature compensation		x	x	x
<b>explosion protection</b>				
<b>F M</b>	transducer	FSK-NF2TS FSK-NF2TS/OS	FSK-NF2TS/LC FSK-NF2TS/LC/OS	FSS-NF2TS
	<b>explosion protection temperature</b>			
	min.	°F	-40	-40
	max.	°F	+257	+257
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
type of protection		non incandive	non incandive	non incandive

**Shear Wave Transducers FM or not explosion proof)**

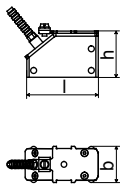
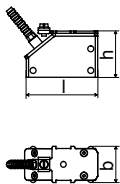
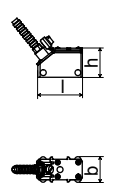



technical type		CDM2N52	CDP2N52	CDQ2N52	
order code		<b>FSM-NF2TS</b> <b>FSM-NF2TS/OS</b> <b>FSM-NNNTS</b> <b>FSM-NNNTS/OS</b>	<b>FSP-NF2TS</b> <b>FSP-NF2TS/OS</b> <b>FSP-NNNTS</b> <b>FSP-NNNTS/OS</b>	<b>FSQ-NF2TS</b> <b>FSQ-NF2TS/OS</b> <b>FSQ-NNNTS</b> <b>FSQ-NNNTS/OS</b>	
transducer frequency	MHz	1	2	4	
<b>inner pipe diameter d</b>					
min. extended	in	2	0.98	0.39	
min. recommended	in	3.9	2	0.98	
max. recommended	in	78.7	7.9	5.9	
max. extended	in	133.9	23.6	15.7	
<b>pipe wall thickness</b>					
min.	in	-	-	-	
max.	in	-	-	-	
<b>material</b>					
housing		PEEK with stainless steel cap 304, option OS: 316L	PEEK with stainless steel cap 304, option OS: 316L	PEEK with stainless steel cap 304, option OS: 316L	
contact surface		PEEK	PEEK	PEEK	
degree of protection		NEMA 6	NEMA 6	NEMA 6	
<b>transducer cable</b>					
type		1699	1699	1699	
length	ft	13	13	9	
<b>dimensions</b>					
length l	in	2.46	2.46	1.54	
width b	in	1.26	1.26	0.87	
height h	in	1.59	1.59	1	
dimensional drawing					
<b>operating temperature</b>					
min.	°F	-40	-40	-40	
max.	°F	+266	+266	+266	
temperature compensation		x	x	x	
<b>explosion protection</b>					
<b>F M</b>	transducer	FSM-NF2TS FSM-NF2TS/OS	FSP-NF2TS FSP-NF2TS/OS	FSQ-NF2TS FSQ-NF2TS/OS	
	<b>explosion protection temperature</b>				
	min.	°F	-67	-67	-67
	max.	°F	+374	+374	+374
	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
type of protection		non incandive	non incandive	non incandive	



**Shear Wave Transducers (not explosion proof, NEMA 6P)**

technical type		CDK1LI8	CDM2LI8	CDP2LI8
order code		<b>FSK-NNNTS/IP68</b>	<b>FSM-NNNTS/IP68</b>	<b>FSP-NNNTS/IP68</b>
transducer frequency	MHz	0.5	1	2
<b>inner pipe diameter d</b>				
min. extended	in	3.9	2	0.98
min. recommended	in	7.9	3.9	2
max. recommended	in	141.7	78.7	7.9
max. extended	in	255.9	133.9	23.6
<b>pipe wall thickness</b>				
min.	in	-	-	-
max.	in	-	-	-
<b>material</b>				
housing		PEEK with stainless steel cap 316Ti	PEEK with stainless steel cap 316Ti	PEEK with stainless steel cap 316Ti
contact surface		PEEK	PEEK	PEEK
degree of protection		NEMA 6P	NEMA 6P	NEMA 6P
<b>transducer cable</b>				
type		2550	2550	2550
length	ft	39	39	39
<b>dimensions</b>				
length l	in	5.06	2.76	2.76
width b	in	2.13	1.26	1.26
height h	in	3.29	1.81	1.81
dimensional drawing				
<b>operating temperature</b>				
min.	°F	-40	-40	-40
max.	°F	+212	+212	+212
temperature compensation		x	x	x

**Shear Wave Transducers (extended temperature range, FM or not explosion proof)**

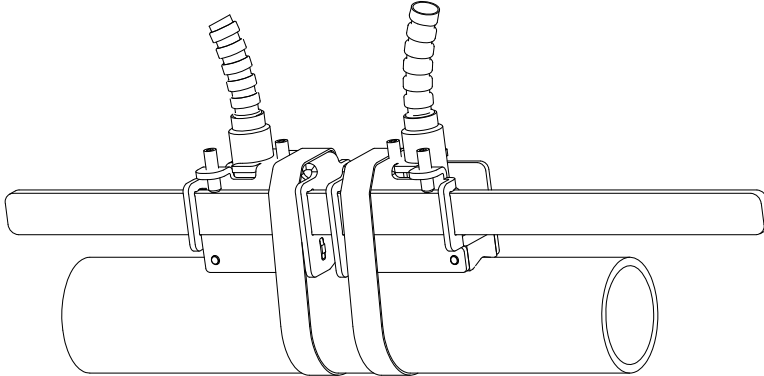
technical type		CDM2E52	CDP2E52	CDQ2E52	
order code		<b>FSM-EF2TS</b> <b>FSM-EF2TS/OS</b> <b>FSM-ENNTS</b> <b>FSM-ENNTS/OS</b>	<b>FSP-EF2TS</b> <b>FSP-EF2TS/OS</b> <b>FSP-ENNTS</b> <b>FSP-ENNTS/OS</b>	<b>FSQ-EF2TS</b> <b>FSQ-EF2TS/OS</b> <b>FSQ-ENNTS</b> <b>FSQ-ENNTS/OS</b>	
transducer frequency	MHz	1	2	4	
<b>inner pipe diameter d</b>					
min. extended	in	2	0.98	0.39	
min. recommended	in	3.9	2	0.98	
max. recommended	in	78.7	7.9	5.9	
max. extended	in	133.9	23.6	15.7	
<b>pipe wall thickness</b>					
min.	in	-	-	-	
max.	in	-	-	-	
<b>material</b>					
housing		PI with stainless steel cap 304, option OS: 316L	PI with stainless steel cap 304, option OS: 316L	PI with stainless steel cap 304, option OS: 316L	
contact surface		PI	PI	PI	
degree of protection		NEMA 4	NEMA 4	NEMA 4	
<b>transducer cable</b>					
type		6111	6111	6111	
length	ft	13	13	9	
<b>dimensions</b>					
length l	in	2.46	2.46	1.54	
width b	in	1.26	1.26	0.87	
height h	in	1.59	1.59	1	
dimensional drawing					
<b>operating temperature</b>					
min.	°F	-22	-22	-22	
max.	°F	+392	+392	+392	
temperature compensation		x	x	x	
<b>F M</b>	transducer	FSM-EF2TS FSM-EF2TS/OS	FSP-EF2TS FSP-EF2TS/OS	FSQ-EF2TS FSQ-EF2TS/OS	
	<b>explosion protection temperature</b>				
	min.	°F	-49	-49	-49
	max.	°F	+455	+455	+455
	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
type of protection		non incendive	non incendive	non incendive	

## Transducer Mounting Fixture

### Order Code

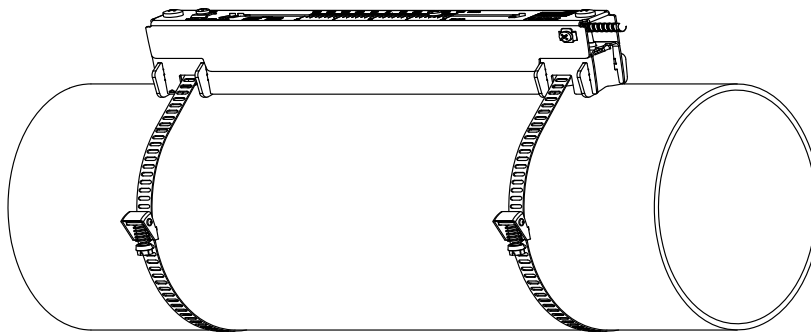
1, 2	3	4	5	6	7 to 9	10, 11	no. of character			
transducer mounting fixture	transducer	-	measuring mode	size	-	fixation	outer pipe diameter	/	option	description
PL										PermaLok
VL										PermaRail
WI										transducer clamping fixture for Wavelnjector
	K									transducers with transducer frequency K
	M									transducers with transducer frequency M, P
	Q									transducers with transducer frequency Q
	S									transducers with transducer frequency S
			D							reflect mode or diagonal mode/direct mode
			R							reflect mode
				S						small
				M						medium
				L						large
						S				tension straps
						W				welding
						N				without fixation
							940			4500 to 9400 mm
							SK1			0.5 to 2.5 in
							SK2			3 to 6 in
							SK3			8 to 10 in
							SK4			12 to 18 in
							SK5			20 to 36 in
							SK6			42 to 100 in
							SK7			100 to 170 in
							SK8			170 to 370 in
							NDR			any
									IP68	degree of protection NEMA6P
									OS	housing with stainless steel 316
									Z	special design
example										
VL	M	-	D	S	-	S	200			PermaRail and tension straps for transducers with transducer frequency M, P
		-			-			/		

### PermaRail (VLS)



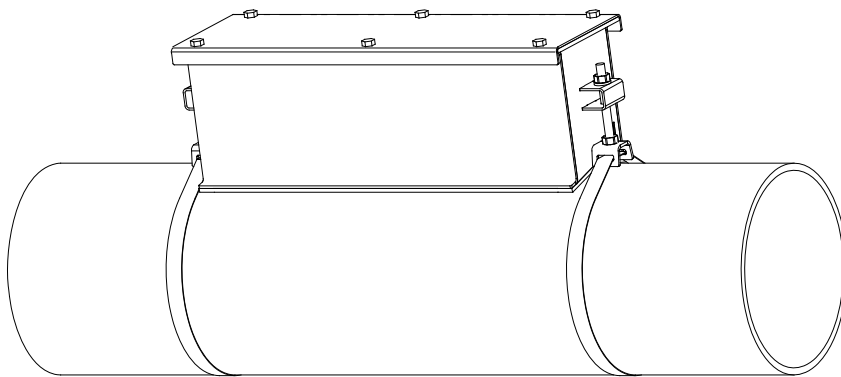
transducers: CDS1N52  
material: stainless steel 304, 303

### PermaRail (VLK, VLM, VLQ)

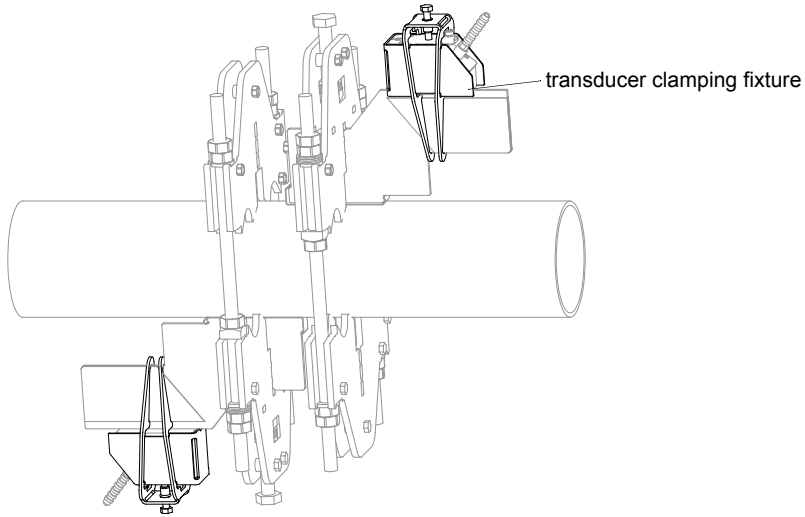


material: stainless steel 304, 301  
option OS: 316, 316L, 17-7PH  
inner length:  
**VLK:** 13.7 in,  
option IP68: 14.5 in  
**VLM:** 9.2 in  
**VLQ:** 6.9 in  
dimensions:  
**VLK:** 16.65 x 3.54 x 3.66 in,  
option IP68: 17.44 x 3.7 x 4.13 in  
**VLM:** 12.17 x 2.24 x 2.48 in  
**VLQ:** 9.72 x 1.69 x 1.85 in

### PermaLok PL



**transducer clamping fixture for WaveInjector WI**



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	
	< 212 °F	212 to 338 °F	< 302 °F	302 to 392 °F	< 536 °F	536 to 752 °F
< 2 h	coupling compound type N	coupling compound type E	coupling compound type E	coupling compound type E or H	coupling foil type A	coupling foil type B
< 24 h	coupling compound type N	coupling compound type E	coupling compound type E	coupling foil type VT	coupling foil type A	coupling foil type B
long time measurement	indoor	coupling compound type N	coupling compound type E	coupling foil type VT <sup>1</sup>	coupling foil type VT <sup>2</sup>	coupling foil type B
	outdoor	coupling foil type VT	coupling foil type VT	coupling foil type VT <sup>1</sup>	coupling foil type VT <sup>2</sup>	coupling foil type B

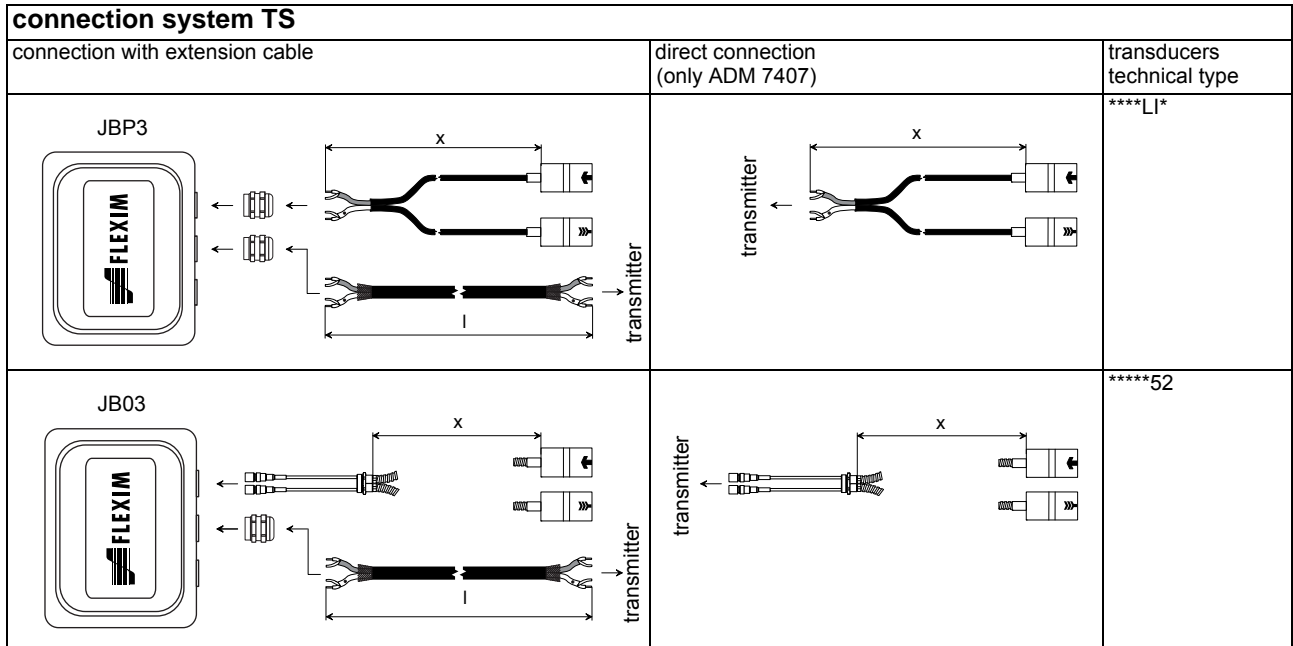
<sup>1</sup> < 5 years

<sup>2</sup> < 6 months

### Technical Data

type	order code	operating temperature °F	material	remark
coupling compound type N	990739-1	-22 to +266	mineral grease paste	
coupling compound type E	990739-2	-22 to +392	silicone paste	
coupling compound type H	990739-3	-22 to +482	fluoropolymer paste	
coupling foil type A	990739-7	max. 536	plomb	
coupling foil type B	990739-8	> 536 to 752	silver	
coupling foil type VT	990739-0	14 to 302, short-time peak max. 392	fluoroelastomer	for transducers with transducer frequency G, H, K
	990739-6			for shear wave transducers with transducer frequency M, P
	990739-14			for shear wave transducers IP68 and Lambwave transducers with transducer frequency M, P
	990739-15			for shear wave transducers with transducer frequency Q
	990739-5			for Lambwave transducers with transducer frequency Q

### Connection Systems



transducer frequency (3d character of transducer order code)		G, H, K		M, P		Q		S		
T	cable length	ft	x 16	≤ 984	x 13	≤ 984	x 9	≤ 295	x 6	≤ 131
S	cable length (option LC)	ft	29	≤ 984	-	-	-	-	-	-
	cable length (option IP68)	ft	39	≤ 984	39	≤ 984	-	-	-	-

x = transducer cable length  
 l = max. length of extension cable

### Transducer Cable

#### Technical Data

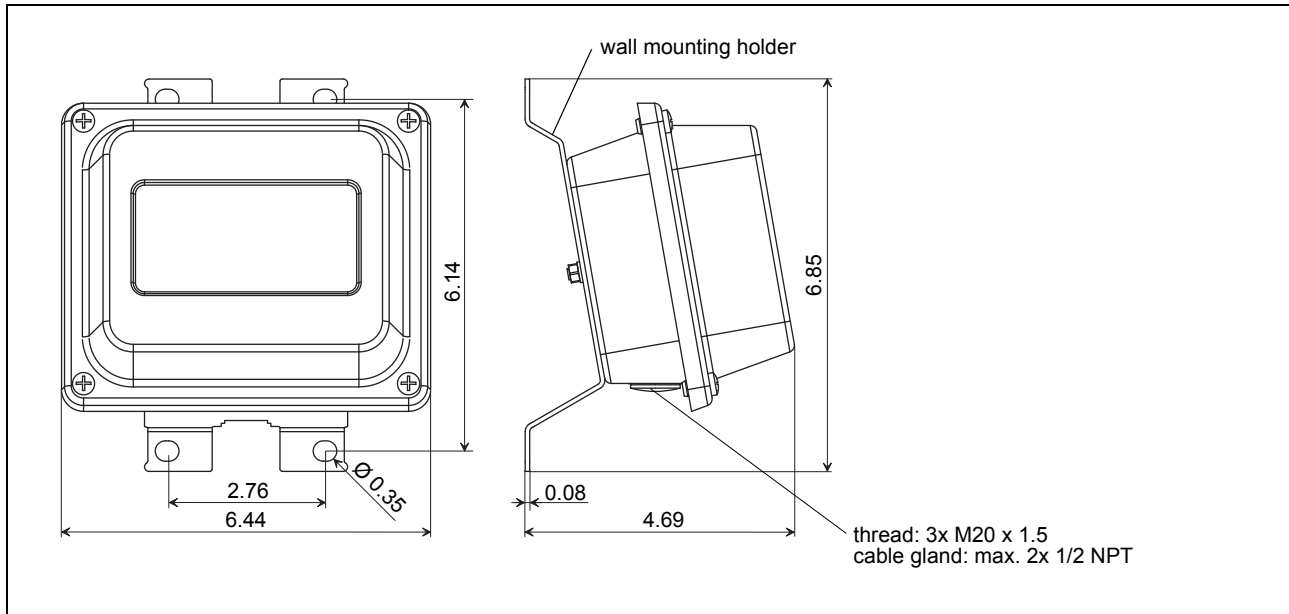
		transducer cable			extension cable
type		1699	2550	6111	2615
connection system					TS
standard length	ft	see table above			-
max. length	ft	-			see table above
operating temperature	°F	-67 to +392	-40 to +212	-148 to +437	-40 to +158
properties			longitudinal water tight		halogen free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2
<b>sheath</b>					
material		stainless steel 304 option OS: 316L	-	stainless steel 304 option OS: 316L	-
outer diameter	in	0.31	-	0.31	-
<b>cable jacket</b>					
material		PTFE	PUR	PFA	PUR
outer diameter	in	0.11	0.2 ±0.01	0.11	0.47
thickness	in	0.01		0.02	0.08
color		brown	gray	white	black
shield	x		x	x	x

## Junction Box

### Technical Data

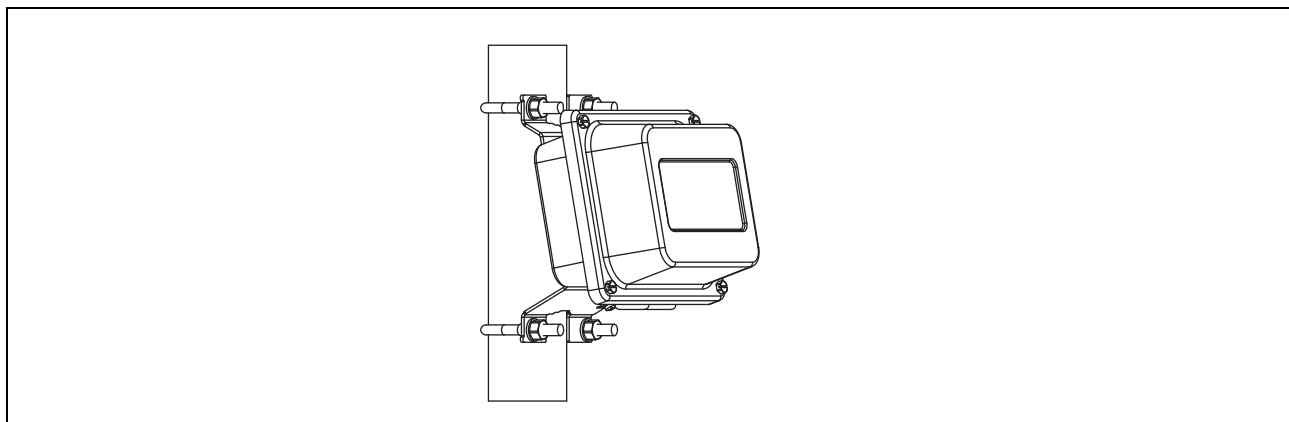
technical type		JB03	JBP3
dimensions		see dimensional drawing	see dimensional drawing
fixation		wall mounting, optional: 2 " pipe mounting	wall mounting, optional: 2 " pipe mounting
<b>material</b>			
housing		stainless steel 304 option OS: 316L	stainless steel 316L
gasket		silicone	silicone
degree of protection		NEMA 6	NEMA 6
<b>operating temperature</b>			
min.	°F	-40	-40
max.	°F	+176	+176

### Dimensions



in inch

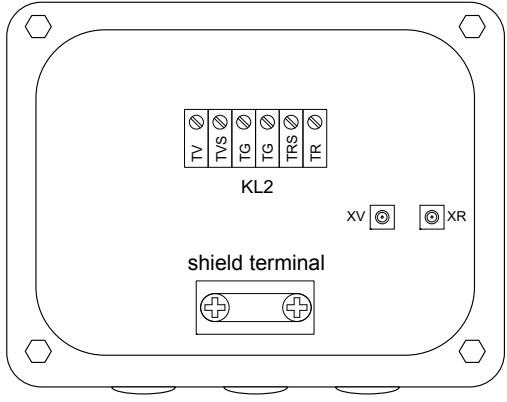
### 2 " Pipe Mounting Kit (optional)





## Terminal Assignment

### JB03



**transducers**

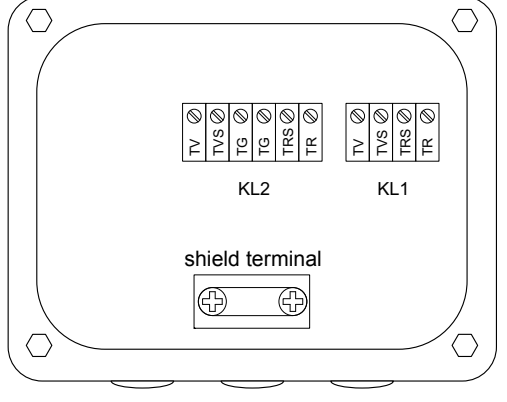
terminal	connection
XV	transducer  SMB connector
XR	transducer  SMB connector
cable gland	external shield

**extension cable**

terminal strip KL2

terminal	connection
TV	signal
TVS	internal shield
TRS	internal shield
TR	signal
shield terminal	external shield

### JBP3



**transducers**

terminal strip KL1

terminal	connection
TV	transducer , signal
TVS	transducer , internal shield
TRS	transducer , internal shield
TR	transducer , signal
cable gland	external shield

**extension cable**

terminal strip KL2

terminal	connection
TV	signal
TVS	internal shield
TRS	internal shield
TR	signal
shield terminal	external shield

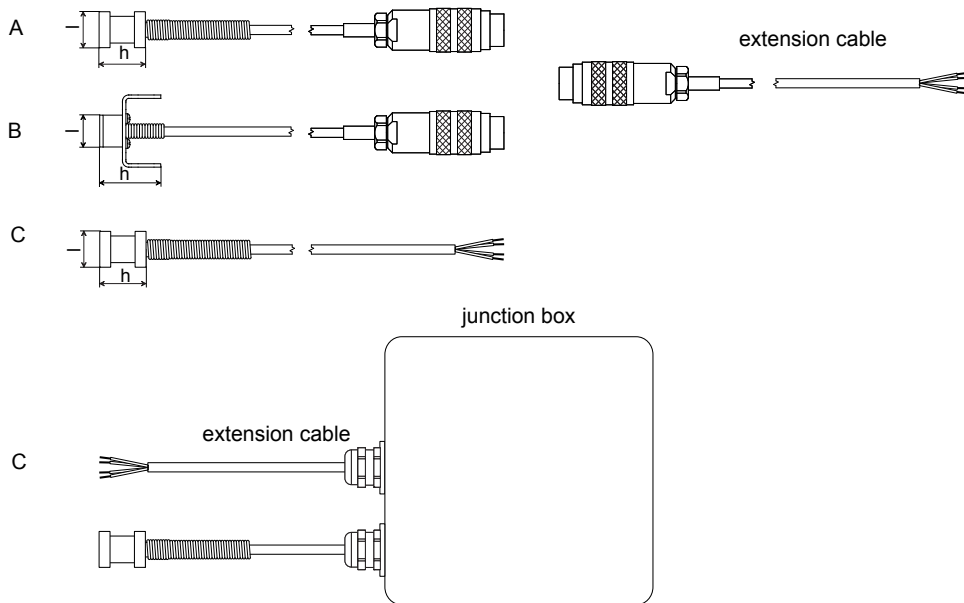
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### Clamp-on Temperature Probe (optional)

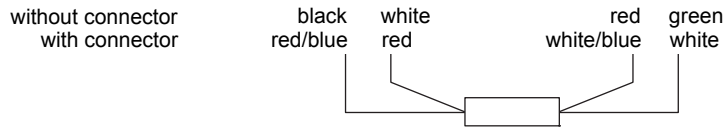
#### Technical Data

technical type		PT13N	PT13N	PT13N	PT13N	PT13F	PT13F
order code		670413-1	670412-1	770413-1	770412-1	670413-2	670412-2
design		with connector		without connector		short response time	
type		Pt1000	Pt1000 matched according to EN 1434-1	Pt1000	Pt1000 matched according to EN 1434-1	Pt1000	Pt1000 matched according to EN 1434-1
connection		4-wire		4-wire		4-wire	
measuring range	°F	-22 to +482		-58 to +428		-58 to +482	
accuracy T		$\pm(0.27 \text{ }^\circ\text{F} + 2 \cdot 10^{-3} \cdot (T \text{ [}^\circ\text{F]} - 32 \text{ }^\circ\text{F}))$ class A		$\pm(0.27 \text{ }^\circ\text{F} + 2 \cdot 10^{-3} \cdot (T \text{ [}^\circ\text{F]} - 32 \text{ }^\circ\text{F}))$ class A		$\pm(0.27 \text{ }^\circ\text{F} + 2 \cdot 10^{-3} \cdot (T \text{ [}^\circ\text{F]} - 32 \text{ }^\circ\text{F}))$ class A	
accuracy $\Delta T$		-	$\leq 0.1 \text{ K}$ ( $3\text{K} < \Delta T < 6 \text{ K}$ ), more corresponding to EN 1434-1	-	$\leq 0.03 \text{ }^\circ\text{F}$ (at $50 \text{ }^\circ\text{F}$ ) 3 point $\Delta T$ check, more corresponding to EN 1434-1	-	$\leq 0.1 \text{ K}$ ( $3\text{K} < \Delta T < 6 \text{ K}$ ), more corresponding to EN 1434-1
response time	s	50				8	
housing		aluminum		360 brass alloy		PEEK, stainless steel 304, copper	
degree of protection		NEMA 4		NEMA 4		NEMA 4	
weight (without connector)	lb	0.6	1.1	0.437	0.875	0.7	1.4
fixation		clamp-on		clamp-on		clamp-on	
accessories		-		-		plastic protection plate, insulation foam	
<b>dimensions</b>							
length l	in	0.59		0.59		0.55	
width b	in	0.59		0.49		1.18	
height h	in	0.79		0.79		1.06	
dimensional drawing		A		C		B	



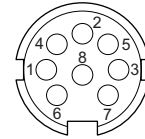
## Connection

### Temperature Probe



### Connector

pin	cable of temperature probe	extension cable
1	white/blue	blue
2	red/blue	gray
3, 4, 5	not connected	
6	red	red
7	white	white
8	not connected	



### Cable

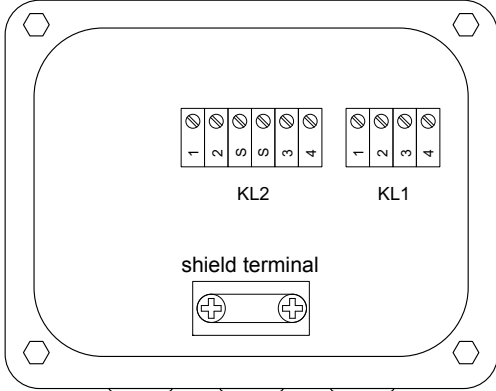
		cable of temperature probe	extension cable
type		4 x 0.25 mm <sup>2</sup> black or white	LIYCY 8 x 0.14 mm <sup>2</sup> gray
standard length	ft	9	16/32/82
max. length	ft	-	656
cable jacket		PTFE	PVC

### Junction Box

technical type		JBT3
dimensions		see dimensional drawing
fixation		wall mounting optional: 2 " pipe mounting
<b>material</b>		
housing		stainless steel 304
gasket		silicone
degree of protection		NEMA 6
cable gland		max. 2x 1/2 NPT
<b>operating temperature</b>		
min.	°F	-40
max.	°F	+176

**Terminal Assignment**

**JBT3**



**temperature probe (with connector)**  
terminal strip KL1

terminal	connection
1	red
2	red/blue
3	white
4	white/blue

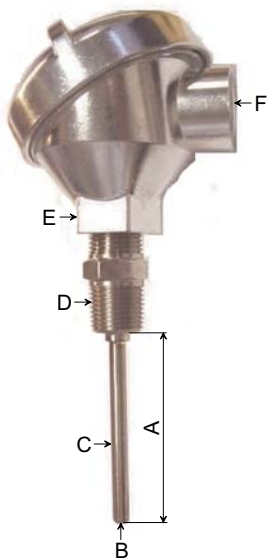
**extension cable (with connector)**  
terminal strip KL2

terminal	connection
1	red
2	gray
3	white
4	blue

**temperature probe, extension cable (without connector)**  
terminal strip KL1, KL2

terminal	connection
1	white
2	black
3	green
4	red

**Wetted Temperature Probe (optional)**



	type	Pt1000
A	insertion length	6 " or specified length
B	resistance	1 000 Ω, 00385
C	insertion length sheath material	6 " or specified length stainless steel 316
D	thread	1/2 " NPT HEX CPLG. spring loaded
E	head	aluminum screw cover head 4 terminal block
F	thread	3/4 " NPT



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

internet: [www.flexim.com](http://www.flexim.com)  
e-mail: [usinfo@flexim.com](mailto:usinfo@flexim.com)  
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