Flexim FLUXUS F731TE Ultrasonic Flowmeter

Ultrasonic Measurement of Thermal Energy and Volumetric Flow Rate

Features

- Integrated heat, cold and volumetric flow rate measuring system
  - Non-invasive ultrasonic clamp-on principle
  - No shutdown for installation, no wear and tear
  - Perfect for retrofitting
- Suitable for all heat and cooling liquids within industrial or building applications
- Full two channel meter capability – two measuring points with one transmitter
- The high precision paired temperature probes follow EN 1434 regulations
- Low flow ability down to 0.03 ft/s to detect even minimum energy flows

Applications

- Monitoring and balancing of industrial heating and cooling systems
- Data acquisition for energy management and ISO 50001
- Sub metering in buildings and building complexes
- Heat flow balancing and leakage control in district heating systems

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**EMERSON**

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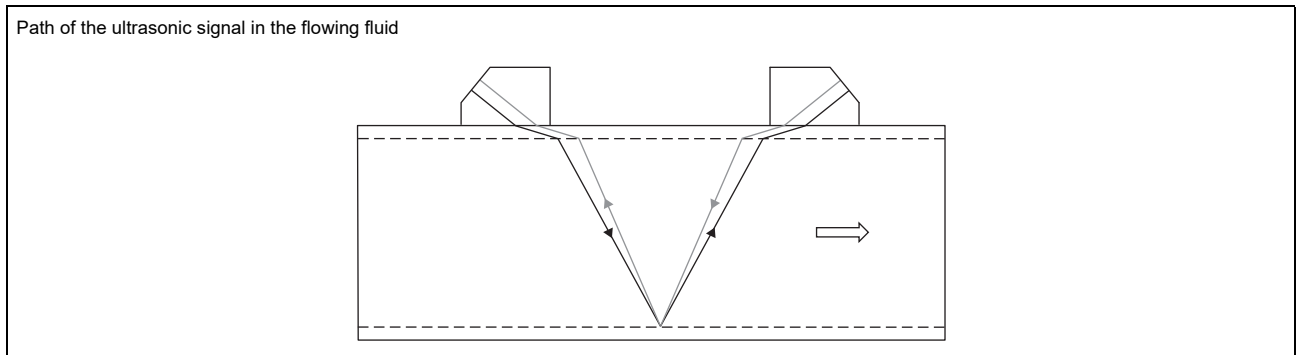
As the fluid where the ultrasound propagates is flowing, the transit time of the ultrasonic signal in flow direction is shorter than the one against the flow direction.

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

t_0 $\quad$ Δt
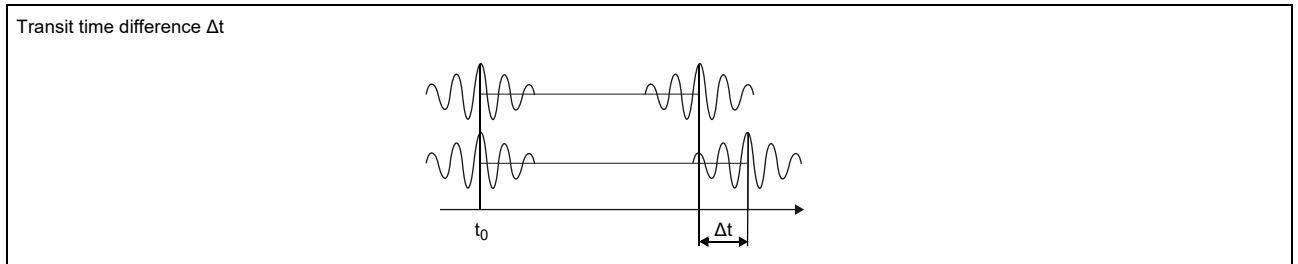
Calculation of volumetric flow rate

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

where

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

Calculation of thermal energy rate

The thermal energy rate is calculated with the following formula:

$\Phi = k_i \cdot \dot{V} \cdot (T_V - T_R)$ (heating application)

$\Phi = k_i \cdot \dot{V} \cdot (T_R - T_V)$ (cooling application)

where

Φ	–	thermal energy rate
k_i	–	thermal coefficient
$\dot{V}$	–	volumetric flow rate
T_V	–	supply temperature
T_R	–	return temperature

The thermal coefficient k_i results from several thermal energy rate coefficients for the specific enthalpy and density of the fluid. The thermal energy rate coefficients of some fluids are stored in the internal database of the transmitter. Further customized fluids are possible.

Max. permissible error

The max. permissible error MPE of a complete heat meter is according to EN 1434 the arithmetic sum of the max. permissible errors of the subassemblies: calculator, temperature sensor pair and flow sensor.

$MPE = E_c + E_t + E_f$

where

MPE	–	total max. permissible error
E_c	–	max. permissible relative error of the calculator
E_t	–	max. permissible relative error of the temperature sensor pair
E_f	–	max. permissible relative error of the flow sensor

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:

- **reflect 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 easy.
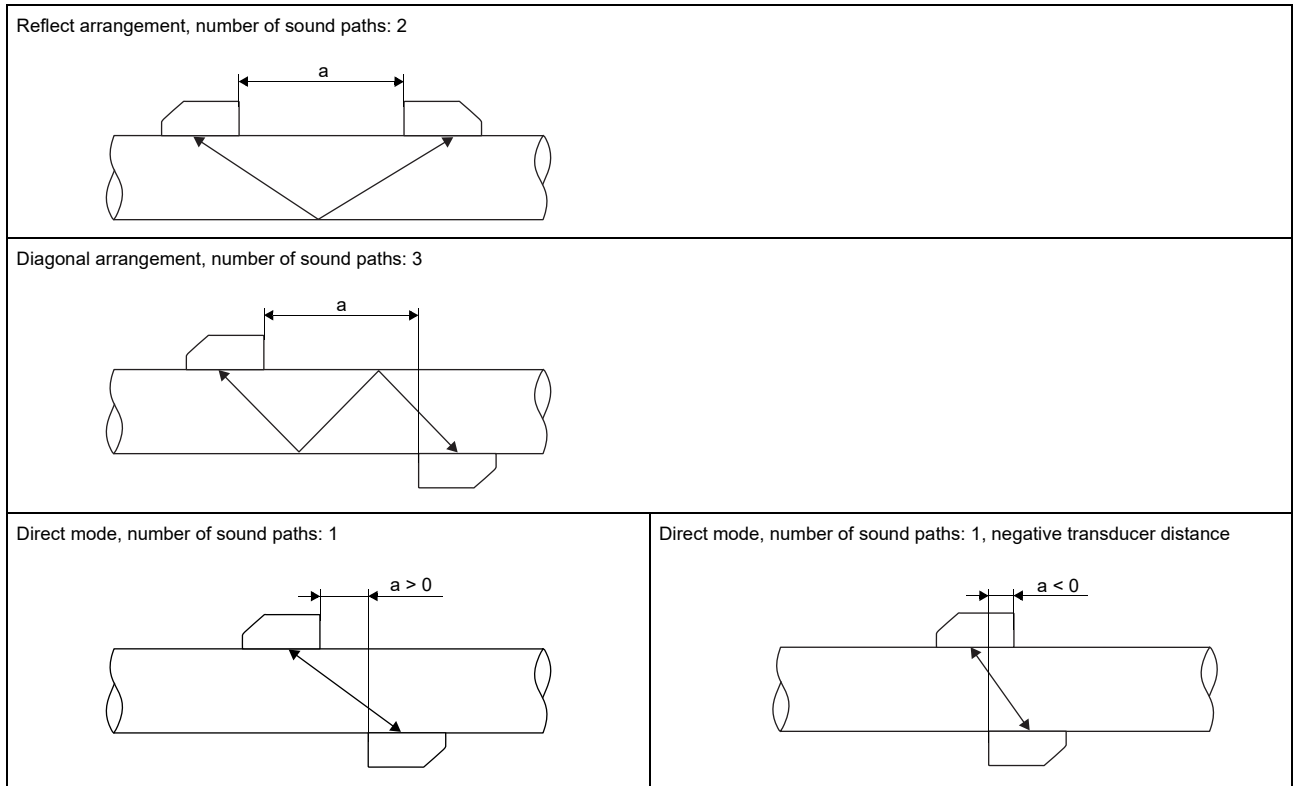
- **diagonal arrangement**
  The number of sound paths is odd. The transducers are mounted on opposite sides of the pipe.

- **direct mode**
  Diagonal arrangement with 1 sound path. This should be used in the case of a high signal attenuation by the fluid, pipe or coatings.
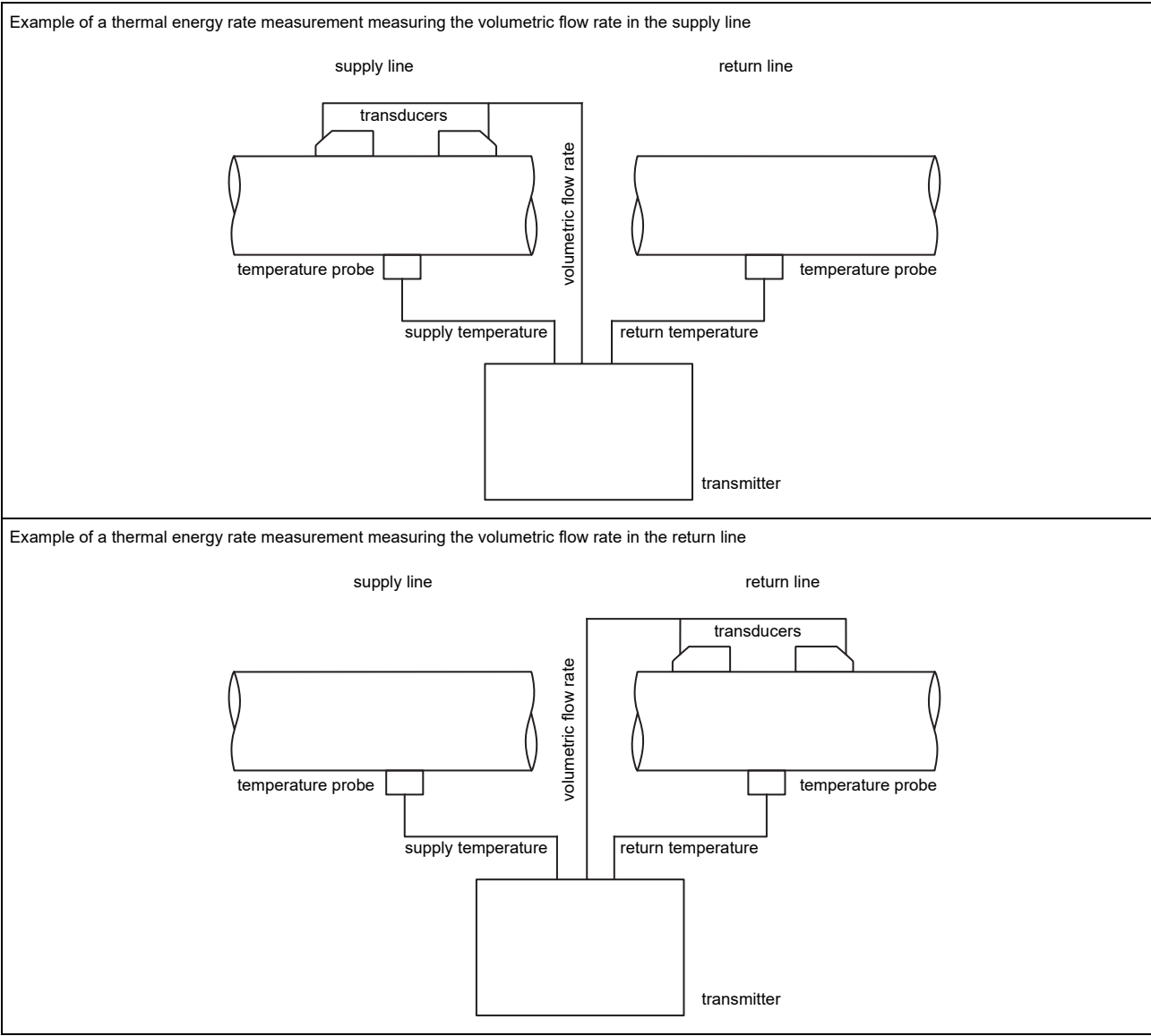
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the transmitter.

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

Reflect arrangement, number of sound paths: 2

Diagonal arrangement, number of sound paths: 3

Direct mode, number of sound paths: 1

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

a - transducer distance

Typical measurement setup

Example of a thermal energy rate measurement measuring the volumetric flow rate in the supply line

supply line   return line

transducers

volumetric flow rate

temperature probe   temperature probe

supply temperature   return temperature

transmitter

Example of a thermal energy rate measurement measuring the volumetric flow rate in the return line

supply line   return line

transducers

volumetric flow rate

temperature probe   temperature probe

supply temperature   return temperature

transmitter

Transmitter

Technical data

		FLUXUS F731TE-NNN**-*AL F731TE-NNN**-*ST	FLUXUS F731TE-A2N**-*ST	FLUXUS F731TE-F2N**-*ST
design		standard field device	standard field device zone 2	standard field device FM Class I Div. 2
application		energy meter		
measurement				
• energy				
max. permissible relative error		complies to EN 1434 standard		
• temperature				
temperature difference		≤ 0.03 °F (2x Pt matched)		
max. permissible relative error		complies to EN 1434 standard		
• flow				
measurement principle		transit time difference correlation principle		
flow direction		bidirectional		
synchronized channel averaging		x (2 measuring channels necessary)		
flow	m³/h	Q_p = 17 to 20 000		
flow velocity	ft/s	0.03 to 82		
repeatability		0.15 % MV ±0.02 ft/s		
fluid		• water • glycol/H_2O: 20 %, 30 %, 40 %, 50 % • thermal fluids: BP Transcal LT, BP Transcal N, R22 Freon, R134 Freon, ammonia, Shell Termina B, Mobiltherm 594, Mobiltherm 603, R407C, R410A • others on request		
temperature compensation		corresponding to the recommendations in ANSI/ASME MFC-5.1-2011		
measurement uncertainty (volumetric flow rate)				
measurement uncertainty of the measuring system[1]		±0.3 % MV ±0.02 ft/s includes calibration certificate traceable to NIST		
measurement uncertainty at the measuring point[2]		±1 % MV ±0.02 ft/s		
transmitter				
power supply		• 100 to 240 V ±10 %/50 to 60 Hz or • 11 to 32 V DC		
power consumption	W	< 15		
number of measuring channels		1, optional: 2		
damping	s	0 to 100 (adjustable)		
measuring cycle	Hz	100 to 1000 (1 channel)		
response time	s	1 (1 channel), option: 0.02		
housing material		aluminum, powder coated or stainless steel 316L	stainless steel 316L	
degree of protection		IP66		
dimensions	inch	see dimensional drawing		
weight	lb	aluminum housing: 9.9 stainless steel housing: 12.8	12.8	
fixation		wall mounting, optional: 2" pipe mounting		
ambient temperature	°F	-40 to +140 (< -4 without operation of the display)		
display		240 x 128 pixels, backlight		
menu language		English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian, Chinese		
explosion protection				
• ATEX/IECEx				
certification type		-	731-SNN	-
marking		-	CE 0637 (Ex) II3G Ex ec IIC T4 Gc UKCA II2D Ex tb IIIC T135 °C Db T_a -40...+59/60 °C	-
certification		-	IBExU24ATEX1014 X, IECEx IBE 23.0024X	-

[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

[3] outside the explosive atmosphere (housing cover open)

		FLUXUS F731TE-A2N**-*ST	FLUXUS F731TE-F2N**-*ST
	FLUXUS **F731TE-NNN**-*AL** **F731TE-NNN**-*ST**		

• FM

marking	-	-	FM APPROVED Cl. I,II,III/Div. 2 / GP. A, B, C, D, F, G / T5 -40 °C ≤ Ta ≤ +60 °C
certification	-	-	FM23US0036, FM23CA0026

measuring functions

physical quantities	thermal energy rate, volumetric flow rate, mass flow rate, flow velocity
totalizer	thermal energy, volume, mass
calculation functions	average, difference, sum (2 measuring channels necessary)
diagnostic functions	sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times

communication interfaces

service interfaces	measured value transmission, parametrization of the transmitter: • USB[3] • LAN[3]		
process interfaces	max. 1 option: • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1	max. 1 option: • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP

accessories

data transmission kit	USB cable
software	• FluxDiagReader: reading of measured values and parameters, graphical representation • FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrization of the transmitter

data logger

loggable values	all physical quantities, totalized physical quantities and diagnostic values
capacity	max. 800 000 measured values

outputs

	The outputs are galvanically isolated from the transmitter.

• switchable current output

		configurable according to NAMUR NE 43 All switchable current outputs are jointly switched to active or passive.
number		max. 4
range	mA	4 to 20 (alarm current: 3.2 to 3.99, 20.01 to 24, hardware fault current: 3.2)
uncertainty		0.04 % of output value ±3 µA
active output		R_{ext} = 250 to 530 Ω, $U_{opencircuit}$ = 28 V DC
passive output		U_{ext} = 9 to 30 V DC, depending on R_{ext} (R_{ext} < 458 Ω at 20 V)
current output in HART mode		option
• range	mA	4 to 20 (alarm current: 3.5 to 3.99, 20.01 to 22, hardware fault current: 3.2)
• active output		R_{ext} = 250 to 530 Ω, $U_{opencircuit}$ = 28 V DC
• passive output		U_{ext} = 9 to 30 V DC, depending on R_{ext} (R_{ext} = 250 to 458 Ω at 20 V)

• digital output

number		max. 4	
functions		• frequency output • binary output • pulse output	
type		open collector (passive)	
operating parameters		**OC30V/100mA** 5 to 30 V, I_{max} = 100 mA, R_{int} = 20 Ω Low: U < 2 V at I_{loop} = 2 mA (R_{ext} = 12 kΩ at U_{ext} = 24 V) High: U > 15 V (R_{ext} = 12 kΩ at U_{ext} = 24 V)	**OC30V** (IEC 60947-5-6) 5 to 30 V, I_{max} = 20 mA, R_{int} = 1020 Ω Low: U < 2 V at I_{loop} = 2 mA (R_{ext} = 11 kΩ at U_{ext} = 24 V) High: U > 15 V (R_{ext} = 11 kΩ at U_{ext} = 24 V)

frequency output

• range	kHz	0.002 to 10
• damping	s	0 to 999.9 (adjustable)
• pulse-to-pause ratio		1:1

binary output

• binary output as alarm output		limit, change of flow direction or error

pulse output

• pulse value	units	0.01 to 1000
• pulse width	ms	0.05 to 1000
• pulse rate		max. 10 000 pulses

[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions
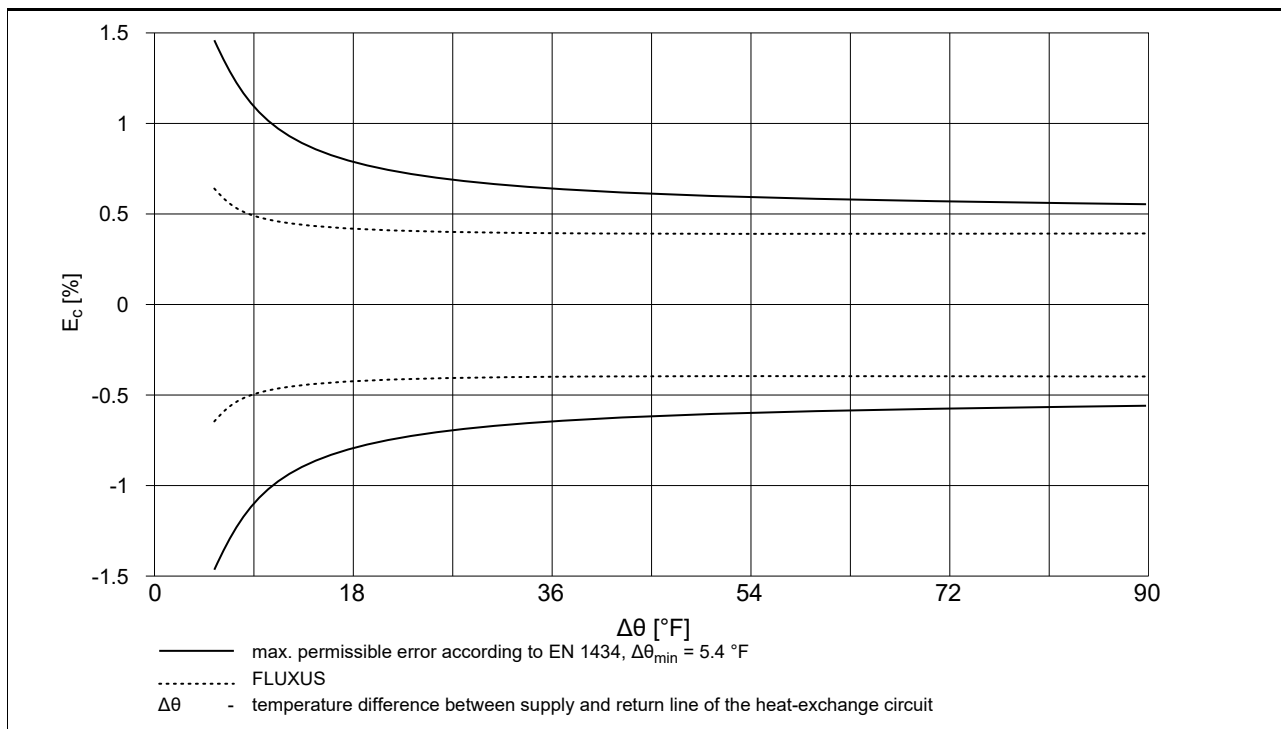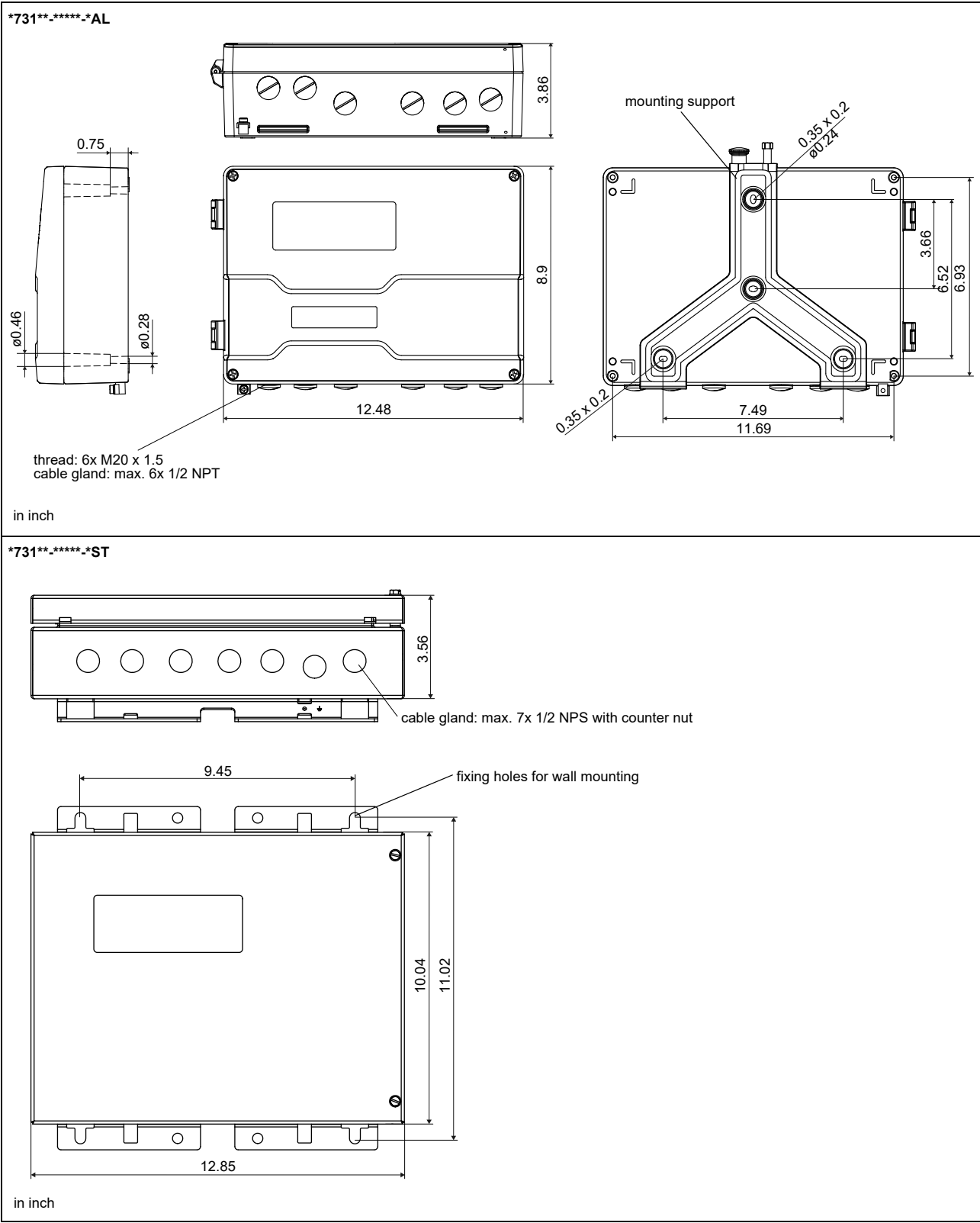
[3] outside the explosive atmosphere (housing cover open)

		FLUXUS F731TE-NNN**-*AL F731TE-NNN**-*ST	FLUXUS F731TE-A2N**-*ST	FLUXUS F731TE-F2N**-*ST
inputs				
		The inputs are galvanically isolated from the transmitter.		
• temperature input				
number		max. 4		
type		Pt100/Pt1000		
connection		4-wire		
range	°F	-238 to +1040		
resolution	K	0.01		
accuracy		±0.01 % MV ±0.03 K at 64 to 82 °F ±0.01 % MV ±0.03 K ±0.0005 %/K at <64 °F/>82 °F		
cable resistance	Ω	max. 1000		

[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

[3] outside the explosive atmosphere (housing cover open)
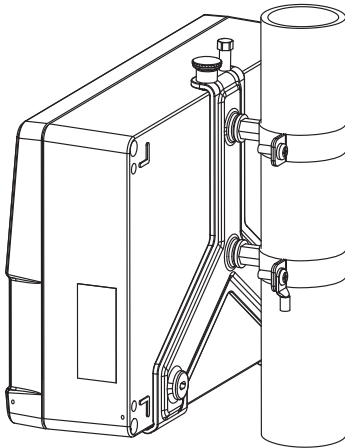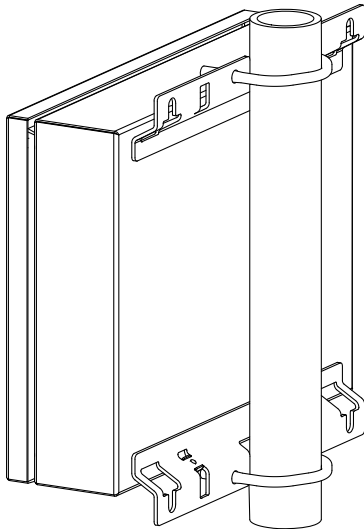

Max. permissible error of the calculator

——— max. permissible error according to EN 1434, Δθ$_{min}$ = 5.4 °F

········ FLUXUS

Δθ   -   temperature difference between supply and return line of the heat-exchange circuit

Dimensions

*731**-*****-*AL

3.86

0.75

ø0.46   ø0.28

8.9

12.48

thread: 6x M20 x 1.5
cable gland: max. 6x 1/2 NPT

mounting support

0.35 x 0.2
ø0.24

0.35 x 0.2

3.66

6.52

6.93

7.49

11.69

in inch

*731**-*****-*ST

3.56

cable gland: max. 7x 1/2 NPS with counter nut

9.45

fixing holes for wall mounting

10.04

11.02

12.85

in inch

2" pipe mounting kit

*731**-*****-*AL 	item number: 731037-1
*731**-*****-*ST 	item number: 721110-4

Storage

- do not store outdoors
- store within the original package
- store in a dry and dust-free place
- protect against sunlight
- keep all openings closed
- storing temperature: -40…+140 °F

Terminal assignment

equipotential bonding terminal (stainless steel housing)

equipotential bonding terminal (aluminum housing)

power supply[1]

AC		DC	
terminal	**connection**	**terminal**	**connection**
L	line conductor	(+)	+
N	neutral conductor	(-)	-
PE	protective conductor	PE	protective conductor

transducers

transducer cable, extension cable

measuring channel A		measuring channel B		
terminal	**connection**	**terminal**	**connection**	**transducer**
AV or AV+	signal	BV or BV+	signal	
AVS or AV-	shield	BVS or BV-	shield	
ARS or AR-	shield	BRS or BR-	shield	
AR or AR+	signal	BR or BR+	signal	

outputs, inputs[1, 2]

terminal	connection
depending on configuration	current output, digital output
1, 2, 3, 4 5, 6, 7, 8 9, 10, 11, 12 13, 14, 15, 16	temperature input
29+, 30-	passive current output/HART
29-, 30+	active current output/HART
29, 30	Modbus RTU, BACnet MS/TP, Profibus PA, FF H1

temperature probe

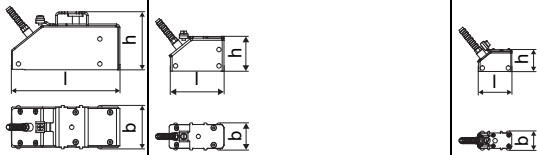| terminal	direct connection	connection with extension cable, inline temperature probe
1, 5, 9, 13	red	white
2, 6, 10, 14	white	red
3, 7, 11, 15	red	black
4, 8, 12, 16	white	green
USB	type C Hi-Speed USB 2.0 Device	service (FluxDiag/FluxDiagReader)
LAN	RJ45 10/100 Mbps Ethernet	• service (FluxDiag/FluxDiagReader) • Modbus TCP • BACnet IP

[1] cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

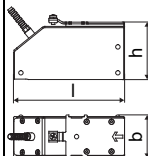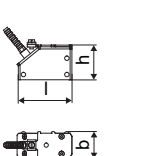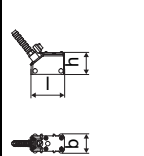[2] The number, type and terminal assignment are customized.

Transducers

Technical data

Shear wave transducers (max. 266 °F)

order code		FSK-NNNN-**T1	FSM-NNNN-**T1	FSP-NNNN-**T1	FSQ-NNNN-**T1
technical type		C(DL)K1N53	C(DL)M2N53	C(DL)P2N53	C(DL)Q2N53
transducer frequency	MHz	0.5	1	2	4
inner pipe diameter d					
min. extended	inch	3.9	2	0.98	0.39
min. recommended	inch	7.9	3.9	2	0.98
max. recommended	inch	78.7	39.4	15.7	5.9
max. extended	inch	94.5	47.2	18.9	9.4
pipe wall thickness					
min.	inch	0.2	0.1	0.05	0.02
material					
housing		PEEK with stainless steel cover 316L			
contact surface		PEEK			
degree of protection		IP66	IP66/IP67		
transducer cable					
type		1699			
length	ft	16	13		9
dimensions					
length l	inch	4.98	2.52		1.57
width b	inch	2.01	1.26		0.87
height h	inch	2.66	1.59		1
dimensional drawing					
weight (without cable)	lb	0.79	0.15		0.04
pipe surface temperature	°F	-40 to +266			
ambient temperature	°F	-40 to +266			
temperature compensation		x			

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

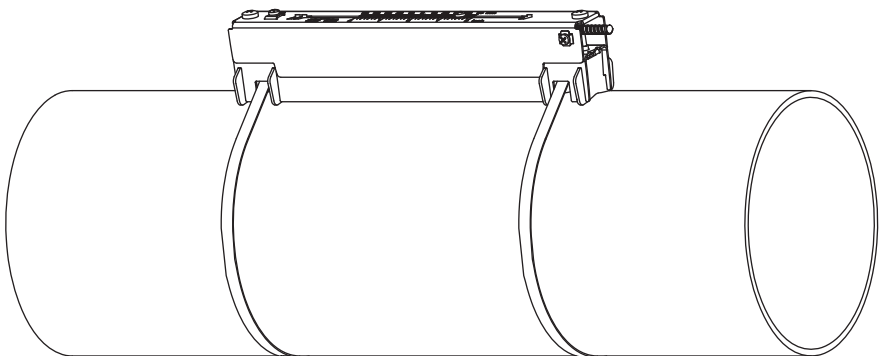| order code		FSK-E***-**T1	FSM-E***-**T1	FSP-E***-**T1	FSQ-E***-**T1
technical type		C(DL)K1E53	C(DL)M2E53	C(DL)P2E53	C(DL)Q2E53
transducer frequency	MHz	0.5	1	2	4
inner pipe diameter d					
min. extended	inch	3.9	2	0.98	0.39
min. recommended	inch	7.9	3.9	2	0.98
max. recommended	inch	78.7	39.4	15.7	5.9
max. extended	inch	94.5	47.2	18.9	9.4
pipe wall thickness					
min.	inch	0.2	0.1	0.05	0.02
material					
housing		PPSU with stainless steel cover 316L	PI with stainless steel cover 316L		
contact surface		PPSU	PI		
degree of protection		IP66	IP66/IP67		
transducer cable					
type		1699	6111		
length	ft	16	13		9
dimensions					
length l	inch	5.1	2.52		1.57
width b	inch	2.01	1.26		0.87
height h	inch	2.64	1.59		1
dimensional drawing					
weight (without cable)	lb	1.8	0.15		0.04
pipe surface temperature	°F	-40 to +356	-22 to +450[1]		-22 to +392
ambient temperature	°F	-40 to +356	-22 to +104 -22 to +140[2] -22 to +392[3]		-22 to +392
temperature compensation		x			
explosion protection					
• ATEX/IECEx					
order code		-	FSM-EA2*-**T1	FSP-EA2*-**T1	FSQ-EA2*-**T1
pipe surface temperature (Ex)	°C	-	gas: -45 to +235 dust: -45 to +225		
marking		-	$C \epsilon$ 0637 (Ex) II3G II2D Ex nA IIC T6...T2 Gc Ex tb IIIA T80 °C...T230 °C Db		
certification		-	IBExU10ATEX1163 X, IECEx IBE 12.0005X		
• FM					
order code		FSK-EF2*-**T1	FSM-EF2*-**T1	FSP-EF2*-**T1	FSQ-EF2*-**T1
pipe surface temperature (Ex)	°F	-40...+329	-45 to +235		
degree of protection		IP66			
marking		FM APPROVED	NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

[1] > +200 °C/+392 °F:
nonEx: quick release clasps and tension straps or Variofix L
Ex: Variofix L, ambient temperature max. +40 °C/+104 °F
observe the insulation instruction

[2] nonEx: pipe surface temperature +200...+232 °C/+392...+450 °F: quick release clasps and tension straps

[3] pipe surface temperature max. +200 °C/+392 °F[3]nonEx: pipe surface temperature max. +200 °C/+392 °F

Transducer mounting fixture

Variofix L (VL)

material: stainless steel 316Ti, 316L, 17-7PH
inner length:
VLK: 13.7 inch
VL(MP): 9.2 inch
VLQ: 6.9 inch
dimensions:
VLK: 16.65 x 3.54 x 3.66 inch
VL(MP): 12.17 x 2.24 x 2.48 inch
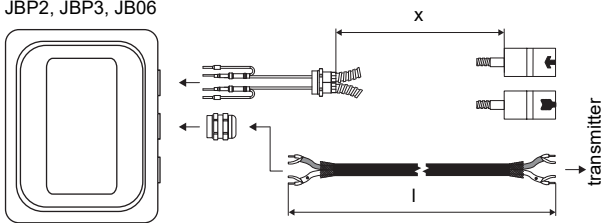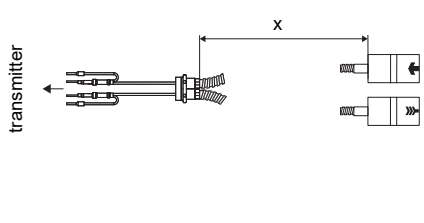**VLQ**: 9.72 x 1.69 x 1.85 inch

Coupling materials for transducers

	normal temperature range (4th character of transducer order code = N)		extended temperature range higher temperatures (4th character of transducer order code = E)		
	< 212 °F	< 266 °F	< 356 °F	< 392 °F	392 to 464 °F
< 24 h	coupling compound type N or coupling pad type VT	coupling compound type type N or E or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type H or coupling pad type TF
long time measure-ment	coupling pad type VT	coupling pad type VT	coupling pad type VT	coupling pad type VT	coupling pad type TF

type VT: fluid temperature 392 °F: min. 2 years

Technical data

type	ambient temperature °F
coupling compound type N	-22 to +266
coupling compound type E	-22 to +392
coupling compound type H	-22 to +482
coupling pad type VT	14 to +392
coupling pad type TF	392 to 464

Connection systems

connection system T1		
connection with extension cable	direct connection	transducers technical type
JBP2, JBP3, JB06		*****53

Cable

transducer cable			
type		**1699**	**6111**
weight	lb/ft	0.06	0.06
ambient temperature	°F	-67 to +392	-148 to +437
cable jacket			
material		PTFE	PFA
outer diameter	inch	0.11	0.11
thickness	inch	0.01	0.02
color		brown	white
shield		x	x
sheath			
material		stainless steel 316Ti	stainless steel 316Ti
outer diameter	inch	0.31	0.31

extension cable			
type		**2615**	**5245**
weight	lb/ft	0.12	0.26
ambient temperature	°F	-22 to +158	-22 to +158
properties		halogen-free	halogen-free
		fire propagation test according to IEC 60332-1	fire propagation test according to IEC 60332-1
		combustion test according to IEC 60754-2	combustion test according to IEC 60754-2
cable jacket			
material		PUR	PUR
outer diameter	inch	max. 0.47	max. 0.47
thickness	inch	0.08	0.08
color		black	black
shield		x	x
sheath			
material		-	steel wire braid with copolymer sheath
outer diameter	inch	-	max. 0.61

Cable length

transducer frequency		K		M, P		Q	
transducers technical type		x	l	x	l	x	l
*D***5*	ft	16	≤ 984	13	≤ 984	9	≤ 295
*L***5*	ft	29	≤ 984	29	≤ 984	29	≤ 295

x = transducer cable length

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

Junction box

Technical data

JBP2, JBP3, JB06		
weight	lb	2.6 lb
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L
gasket		silicone
degree of protection		JBP2, JBP3: IP66/IP67 JB06: Type 4X, IP66
ambient temperature	°F	-40 to +176
explosion protection		
• ATEX/UKCA		
junction box		JBP2
marking		CE UKCA (Ex) II3G Ex nA IIC T6...T4 Gc II3D Ex tc IIIC T 100 °C Dc -40 ≤ Ta ≤ +70 °C/+80 °C
• FM		
junction box		JB06
certification type		JBC23
marking		FM APPROVED NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ T6 Ta = -40...+60 °C

Connection

Transducers

terminal strip	terminal	connection	transducer
KL1	V	signal	▲
	VS	internal shield	
	RS	internal shield	⚒
	R	signal	
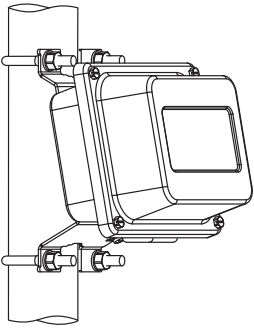
Extension cable

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

Dimensions

JB0*, JBP*

wall mounting holder

6.14
6.85
2.76
6.44
Ø 0.35
0.08
4.69

thread: 3x M20 x 1.5
cable gland: max. 2x 1/2 NPT
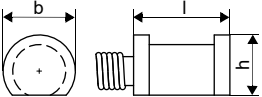
in inch
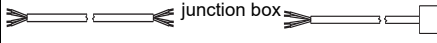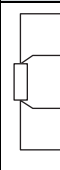
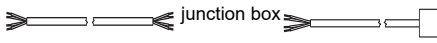## 2" pipe mounting kit

JB**	
	item number: 751035-2
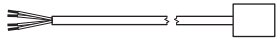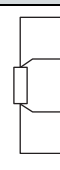
Clamp-on temperature probe (optional)

Technical data
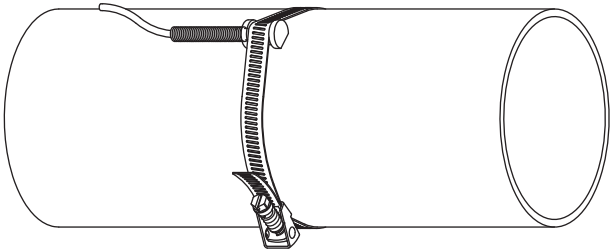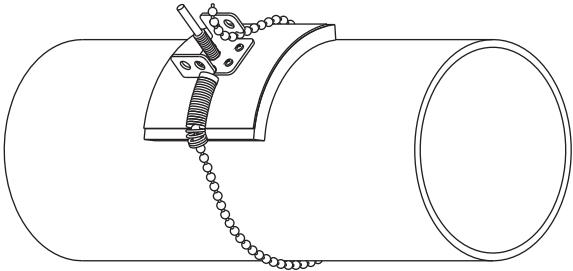
PT13N

design		clamp-on
type		Pt1000
connection		4-wire
measuring range	°F	-40 to +392
accuracy T		$\pm(0.27\ °F + 2 \cdot 10^{-3} \cdot (|T\ [°F]| - 32\ °F))$ class A
accuracy ΔT (2x Pt matched according to EN 1434-1)		≤ 0.03 °F (at 50 °F)
housing material		360 brass alloy
degree of protection		NEMA 4
dimensions		
length l	inch	0.79
width b	inch	0.59
height h	inch	0.49
dimensional drawing		
weight	lb	0.437
accessories		
thermal conductivity foil 482 °F		x

Connection system

connection with extension cable	direct connection
extension cable junction box	

Connection

	temperature probe
	red
	red
	white
	white

Cable

		temperature probe	extension cable
type		4 x 24 AWG	4 x 18 AWG
standard length	ft	20	-
max. length	ft	-	656
cable jacket		PTFE	LS PVC
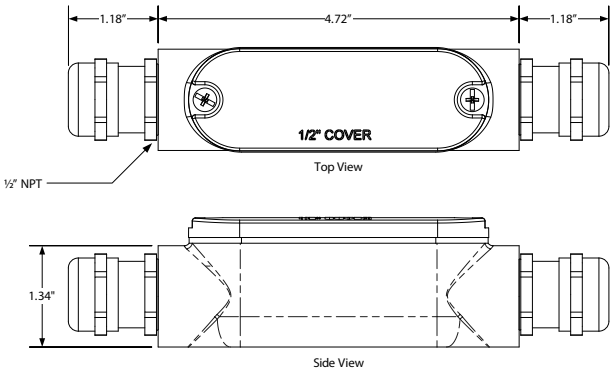
PT13F

design		clamp-on short response time
type		Pt1000
connection		4-wire
measuring range	°F	-58 to +482
accuracy T		$\pm(0.27\ °F + 2 \cdot 10^{-3} \cdot (|T\ [°F]| - 32\ °F))$ class A
response time	s	8 (t50, T1 = 25 °C, T2 = 60 °C)
housing material		PEEK, stainless steel 304, copper
degree of protection		IP54
dimensions		
length l	inch	0.55
width b	inch	1.18
height h	inch	1.06
dimensional drawing		
weight	lb	0.7
accessories		
thermal conductivity paste 392 °F		x
thermal conductivity foil 482 °F		x
plastic protection plate, insulation foam		x

Connection system

connection with extension cable	direct connection
extension cable junction box	

Connection

	temperature probe
	red
	red/blue
	white/blue
	white

Cable

		temperature probe	extension cable
type		4 x 0.22 mm²	4 x 18 AWG
standard length	ft	9	-
max. length	ft	-	656
ambient temperature	°F	-58 to +482	
min. bend radius	inch	1.06	
cable jacket			
material		PFA	LS PVC
outer diameter	inch	0.15 ±0.01	
color		black	

Fixation
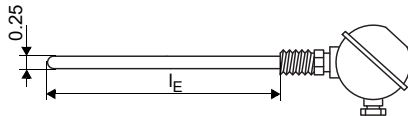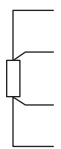
tension strap PT13N 	material: stainless steel 301, 410 thermal insulation necessary
ball chain PT13F 	material: stainless steel 316L length: 3 ft

Junction box

Connection

temperature probe	extension cable
red	white
red	black
white	green
white	red

Inline temperature probe (optional)

A2179				
order code		US-TEMP.yy US-TEMP.Pyy (matched)		
design		inline		
type		Pt1000	**connection**	
connection		4-wire		
measuring range	°F	-58 to +500 °F		
accuracy ΔT (2x Pt matched according to EN 1434)		≤ 0.03 °F (at 32 °F)		
housing		stainless steel 316 connecting head: aluminum		
thread		1/2 NPT		
mounting length l_E	inch	yy = 02.5, 04, 06, 09		

connection

	temperature probe
	red
	red
	white
	white

cable

		temperature probe
type		4 x 18 AWG
standard length	ft	-
max. length	ft	656
cable jacket		LS PVC

0.25

l_E

in inch

For more information: **Emerson.com**

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