



FLEXIM

Technical specification

FLUXUS G722ST-HT

Superheated steam flow measurement

Permanently installed non-invasive ultrasonic measuring system

Features

- Exact and highly reliable measurement of superheated steam up to 1166 °F
- Installation and start-up do not require any pipe work nor any process interruptions
- Volumetric and mass flow rate available without additional steam calculator
- Non-invasive and wear-free measurement without pressure loss
- Maintenance-free acoustic coupling using permanent coupling foil
- Bidirectional measurement over a wide turndown ratio - up to 10:1
- Advanced self-diagnosis and possibilities for event-based triggering of data recording
- Bidirectional communication and support of common bus technologies
- Transmitter and transducers are separately calibrated (traceable to national standards)
- The measurement is drift free

Applications

- Process control
- Consumption metering
- Check metering



FLUXUS G722ST-HT (aluminum housing)



FLUXUS G722ST-HT (stainless steel housing)



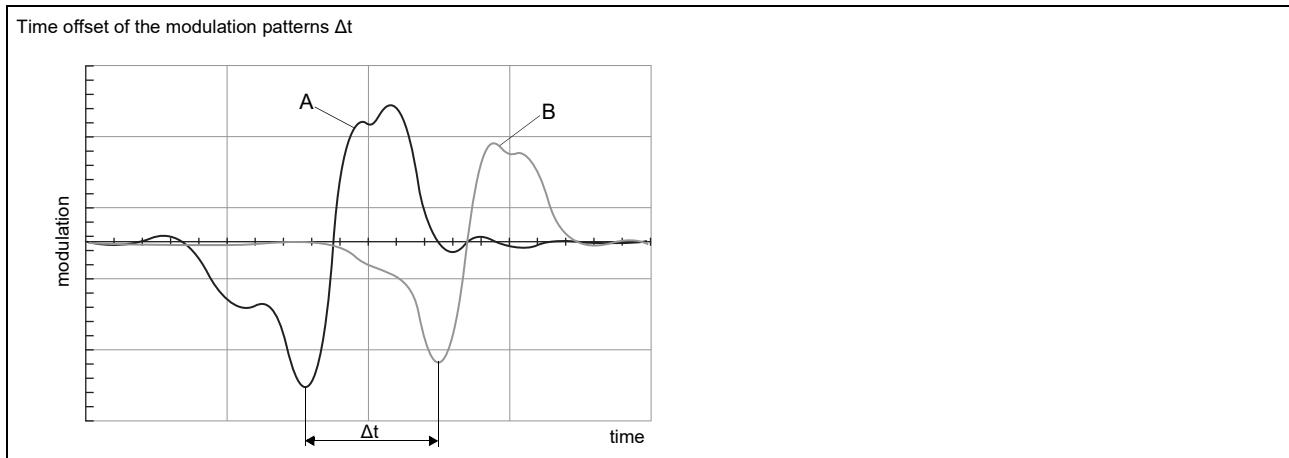
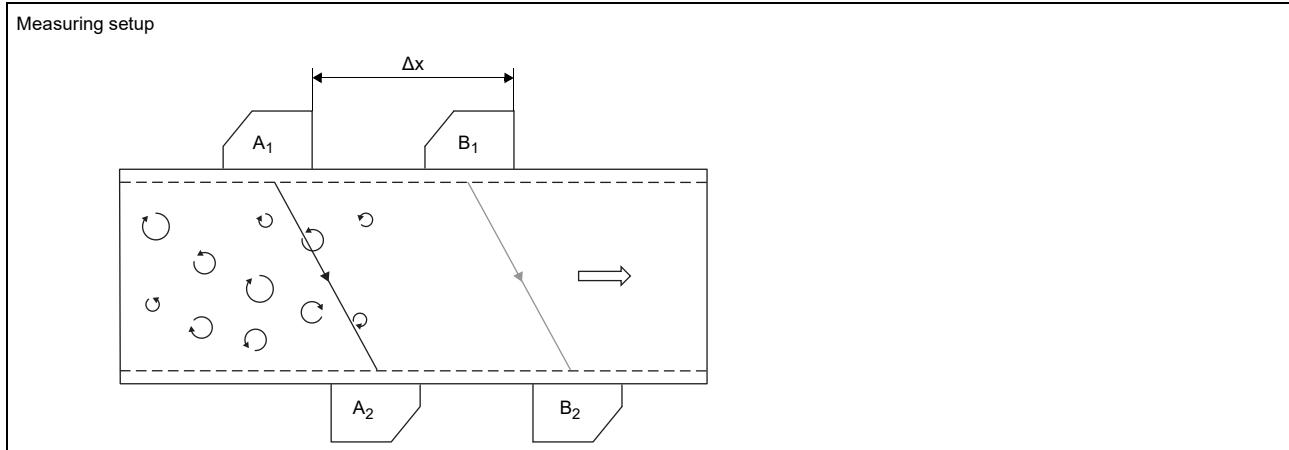
WavelInjector

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Function

Measurement principle

The flow velocity of the fluid is measured using the correlation principle. 2 pairs of ultrasonic transducers are mounted one after the other at a distance Δx on the pipe. The transducer pairs form the measuring barriers A and B. Ultrasonic signals are alternately emitted by the emitters A_1 and B_1 and received by the respective receivers A_2 and B_2 . The ultrasonic signals are modulated regarding amplitude and phase by the swirls of the turbulent flowing fluid. Since the swirls move with the flow, they pass the measuring barriers A and B with a time offset Δt , so that the modulation patterns of the ultrasonic signals of measuring barrier A and B are also offset by Δt . This time offset Δt is measured by means of cross correlation of the modulation signals.



Calculation of volumetric flow rate

$$\dot{V} = A \cdot v = A \cdot k_{Re} \cdot \frac{\Delta x}{\Delta t}$$

where

- \dot{V} - operating volumetric flow rate
- A - cross-sectional pipe area
- v - flow velocity
- k_{Re} - fluid mechanics calibration factor
- Δx - distance between measuring barriers
- Δt - time offset of the modulation patterns

Transmitter

Technical data

	FLUXUS G722ST-NN0*A G722ST-NN0*S	FLUXUS G722ST-A20*A G722ST-A20*S	FLUXUS G722ST-F20*A G722ST-F20*S		
					
design	standard field device	standard field device zone 2	standard field device FM Class I Div. 2		
application	high-temperature steam measurement ¹				
measurement					
measurement principle	cross correlation principle				
flow velocity	ft/s	depending on the application			
repeatability		$\pm 1\% \text{ MV}$ ($\text{Re} > 60\,000$) $\pm 3\% \text{ MV}$ ($\text{Re} 10\,000$ to $60\,000$)			
Reynolds number		$\text{Re} > 10\,000$			
fluid		saturated steam, superheated steam			
fluid pressure	psia	15 to 1595			
fluid temperature	°F	212 to 1166			
measurement uncertainty (volumetric flow rate)					
measurement uncertainty at the measuring point		$\pm 3\% \text{ MV}$ ($\text{Re} > 60\,000$) $\pm 4\% \text{ MV}$ ($\text{Re} 10\,000$ to $60\,000$)			
transmitter					
power supply		<ul style="list-style-type: none"> 100 to 230 V/50 to 60 Hz or 20 to 32 V DC or 11 to 16 V DC 			
power consumption	W	< 15			
measuring setup		2 transducer pairs of the same type required (see measuring setup in section Measurement principle)			
damping	s	0 to 100 (adjustable)			
measuring cycle	Hz	0.5 to 1 (depending on the application)			
response time	s	20 to 50 (depending on the application)			
housing material		aluminum, powder coated or stainless steel 316L			
degree of protection	IP66	aluminum housing: IP66/NEMA 4X stainless steel housing: IP65			
dimensions	inch	see dimensional drawing			
weight	lb	aluminum housing: 11.9 stainless steel housing: 11.2			
fixation		wall mounting, optional: 2" pipe mounting			
ambient temperature	°F	-40 to +140 (< -4 without operation of the display)			
display		128 x 64 pixels, backlight			
menu language		English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian			
explosion protection					
• ATEX/IECEx					
marking	-	C E 0637 II3G II2D Ex nA nC ic IIC T4 Gc Ex tb IIIC T120 °C Db T _a -40...+60 °C	-		
certification	-	IEExU11ATEX1015, IECEx IBE 11.0008			
• FM					
marking	-	-	G722**-F20*S2, G722**-F20*S3:  NI/Cl. I,II,III/Div. 2/ GP. A,B,C, D,E,F,G/ T5		
			G722**-F20*S1:  NI/Cl. I,II,III/Div. 2/ GP. A,B,C, D,E,F,G/ T4A		
measuring functions					
physical quantities		operating volumetric flow rate, mass flow rate, flow velocity			
totalizer		volume, mass			
diagnostic functions		crest factor, peak width, symmetry of amplification			

¹ test measurement to validate the application required in advance

² outside the explosive atmosphere (housing cover open)

	FLUXUS G722ST-NN0*A G722ST-NN0*S	FLUXUS G722ST-A20*A G722ST-A20*S	FLUXUS G722ST-F20*A G722ST-F20*S
communication interfaces			
service interfaces	measured value transmission, parametrization of the transmitter: <ul style="list-style-type: none"> • USB² • LAN² 		
process interfaces	max. 1 option: <ul style="list-style-type: none"> • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP 		
accessories			
data transmission kit	USB cable		
software	<ul style="list-style-type: none"> • 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.		
number	on request		
• switchable current output			
	All switchable current outputs are jointly switched to active or passive.		
range	mA	4 to 20 (3.2 to 22)	
accuracy		0.04 % MV ±3 µA	
active output		$R_{ext} < 250 \Omega$	
passive output		$U_{ext} = 8$ to 30 V, depending on R_{ext} ($R_{ext} < 1 \text{ k}\Omega$ at 30 V)	
• HART			
range	mA	4 to 20	
accuracy		0.1 % MV ±15 µA	
active output		$U_{int} = 24$ V, $R_{ext} < 500 \Omega$	
passive output		$U_{ext} = 10$ to 24 V DC, depending on R_{ext} ($R_{ext} < 1 \text{ k}\Omega$ at 24 V)	
• voltage output			
range	V	0 to 1 or 0 to 10	
accuracy		0 to 1 V: 0.1 % MV ±1 mV 0 to 10 V: 0.1 % MV ±10 mV	
internal resistance		$R_{int} = 500 \Omega$	
• digital output			
functions		<ul style="list-style-type: none"> • frequency output • binary output • pulse output 	
number		3	
operating parameters		5 to 30 V/< 100 mA	
frequency output			
• range	kHz	0 to 5	
binary output			
• binary output as alarm output		limit, change of flow direction or error	
pulse output			
• functions		mainly for totalizing	
• pulse value	units	0.01 to 1000	
• pulse width	ms	0.05 to 1000	

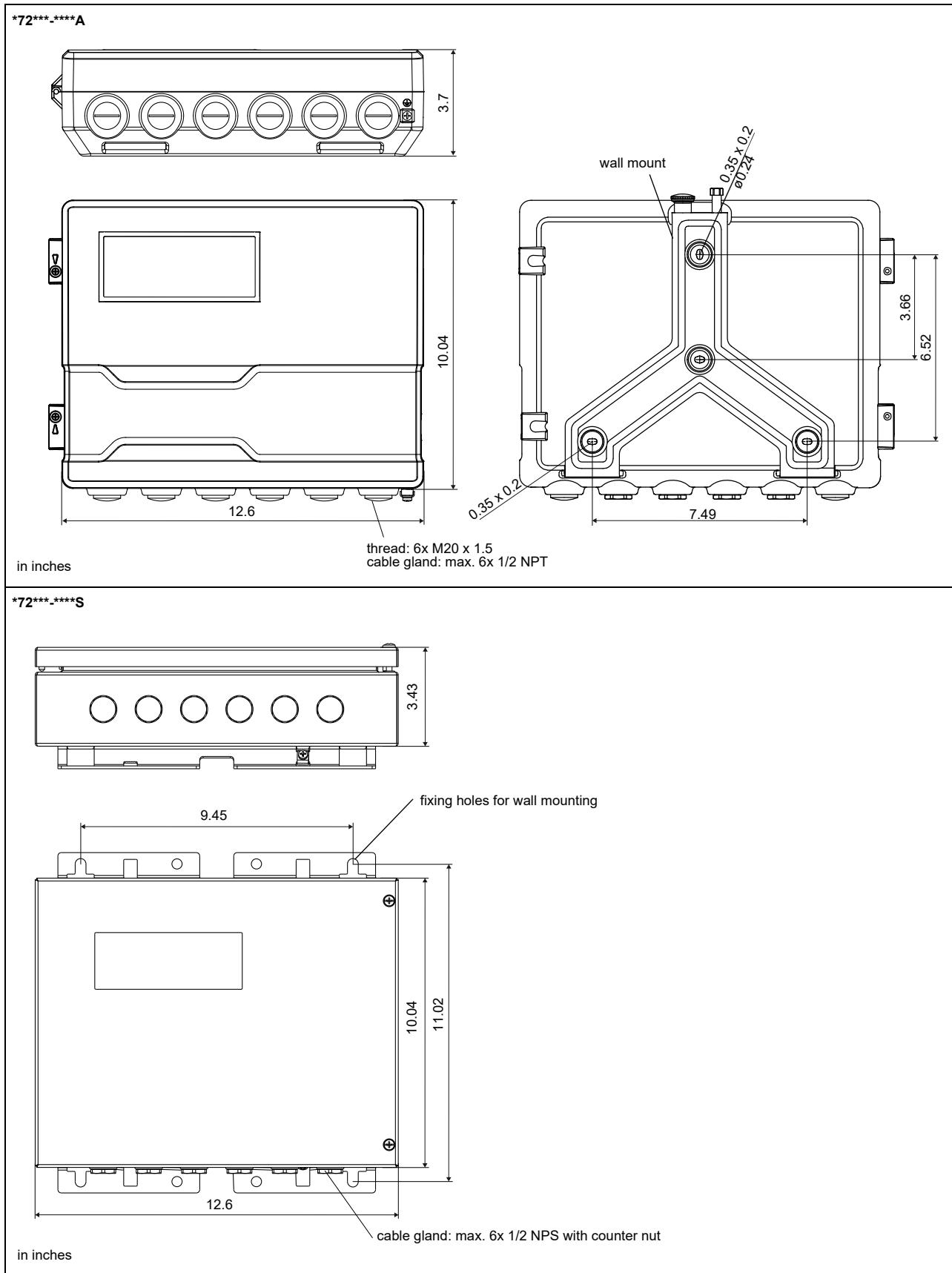
¹ test measurement to validate the application required in advance² outside the explosive atmosphere (housing cover open)

	FLUXUS G722ST-NN0*A G722ST-NN0*S	FLUXUS G722ST-A20*A G722ST-A20*S	FLUXUS G722ST-F20*A G722ST-F20*S		
inputs					
number	The inputs are galvanically isolated from the transmitter.				
• temperature input					
type	Pt100/Pt1000				
connection	4-wire				
range	°F	-238 to +1040			
resolution	K	0.01			
accuracy	±0.01 % MV ±0.03 K				
• current input					
accuracy	0.1 % MV ±10 µA				
active input	$U_{int} = 24 \text{ V}$, $R_{int} = 50 \Omega$, $P_{int} < 0.5 \text{ W}$, not short-circuit proof				
• range	mA	0 to 20			
passive input	$R_{int} = 50 \Omega$, $P_{int} < 0.3 \text{ W}$				
• range	mA	-20 to +20			
• voltage input					
range	V	0 to 1			
accuracy	0.1 % MV ±1 mV				
internal resistance	$R_{int} = 1 \text{ M}\Omega$				

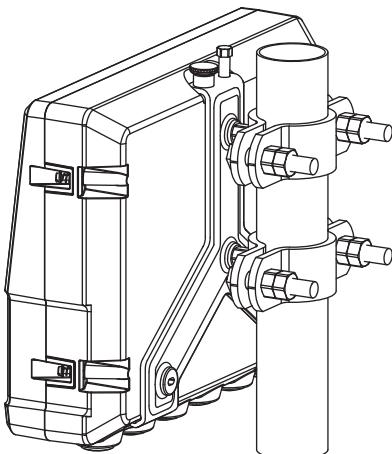
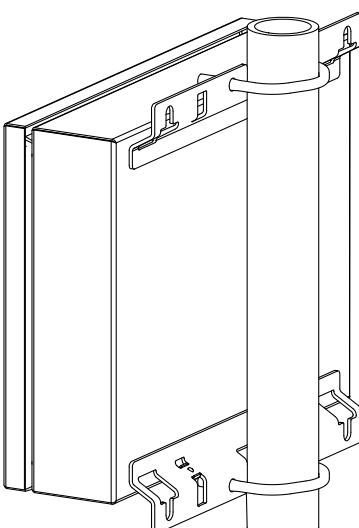
¹ test measurement to validate the application required in advance

² outside the explosive atmosphere (housing cover open)

Dimensions



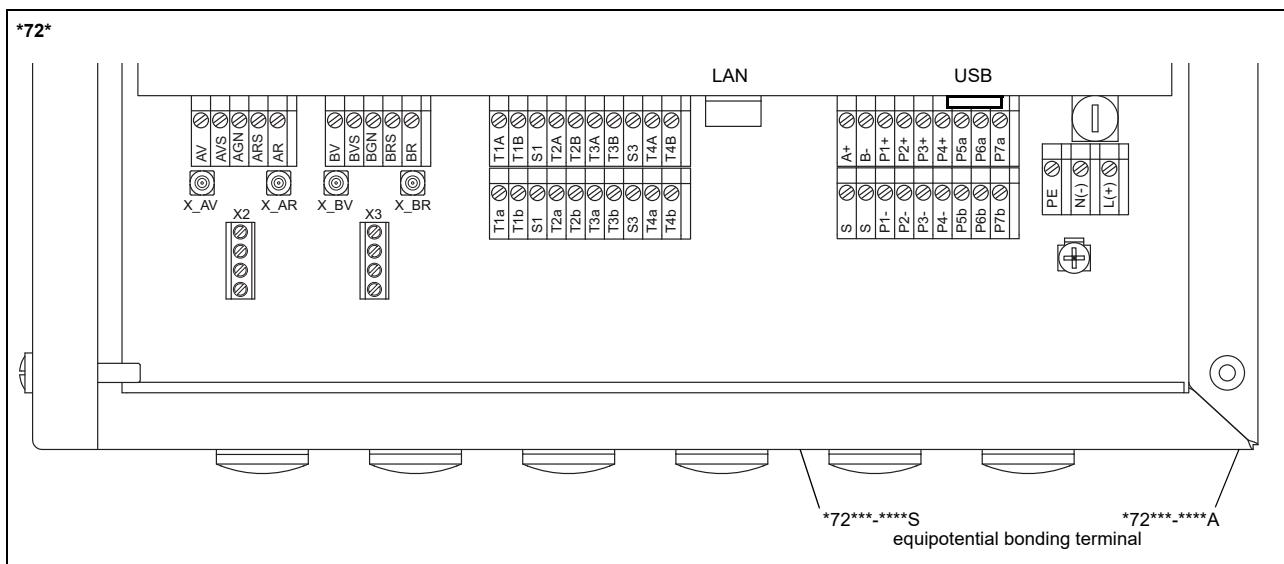
2" pipe mounting kit

*72***-***A		order code: ACC-PE-*721-/PMK4
*72***-***S		order code: ACC-PE-*721-/PMK6

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



power supply¹

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

transducers

extension cable				transducer	transducer cable	
measuring channel A	measuring channel B	measuring chan-	measuring chan-		connection	
AV	signal	BV	signal	↑	X_AV	X_BV
AVS	shield	BVS	shield			
ARS	shield	BRS	shield	↗	X_AR	X_BR
AR	signal	BR	signal			

outputs^{1, 2}

terminal	connection	terminal	connection	communication interface
P1+ to P4+	current output, voltage output, HART (P1)	A+	signal +	• RS485 ¹
P1- to P4-		B-	signal -	• Modbus RTU ¹
P5a to P7a	digital output	S	shield	• BACnet MS/TP ¹
P5b to P7b		USB	type B Hi-Speed USB 2.0 Device	• Profibus PA ¹
		LAN	RJ45 10/100 Mbps Ethernet	• FF H1 ¹
				• service (FluxDiag/ FluxDiagReader)
				• service (FluxDiag/ FluxDiagReader)
				• BACnet IP
				• Modbus TCP

analog inputs^{1, 2}

terminal	temperature probe	connection with extension cable	passive sensor	active sensor
terminal	direct connection	connection	connection	connection
T1a to T4a	red	white	not connected	not connected
T1A to T4A	red	black	-	+
T1b to T4b	white	red	+	not connected
T1B to T4B	white	green	not connected	-
S1, S3	shield	shield	not connected	not connected

¹ cable (by customer):

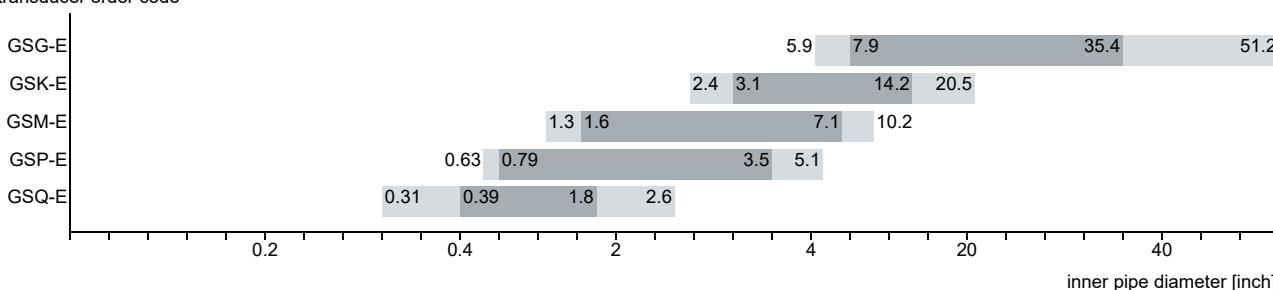
- e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24
- outer diameter of the cable (*72***-****S with ferrite nut): max. 0.3 inch

² The number, type and terminal assignment are customized.

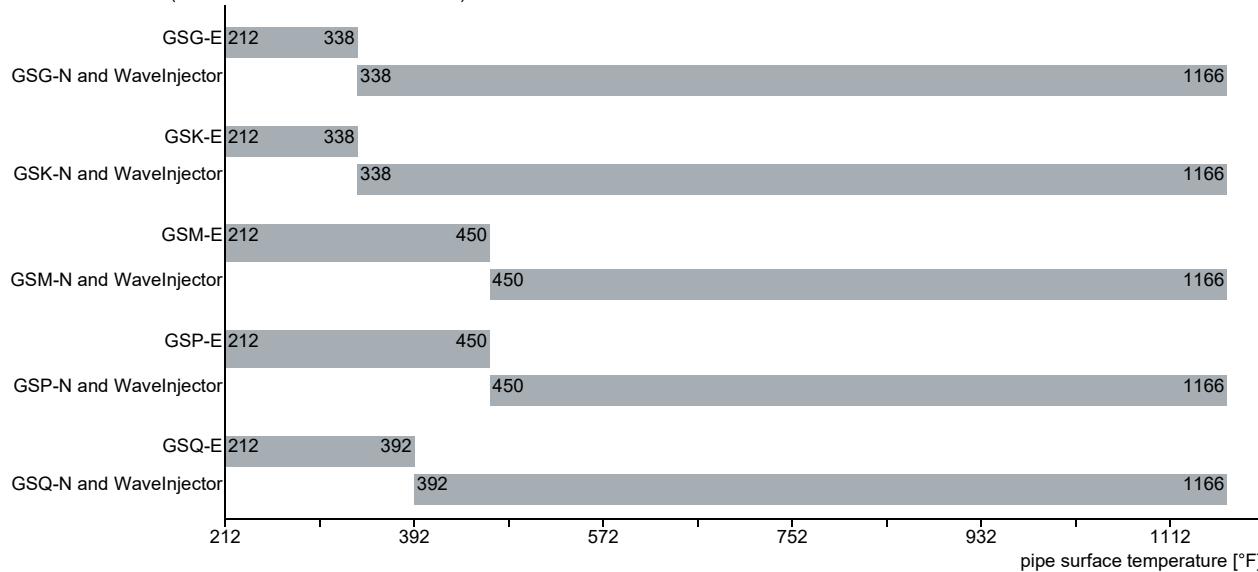
Transducers

Transducer selection

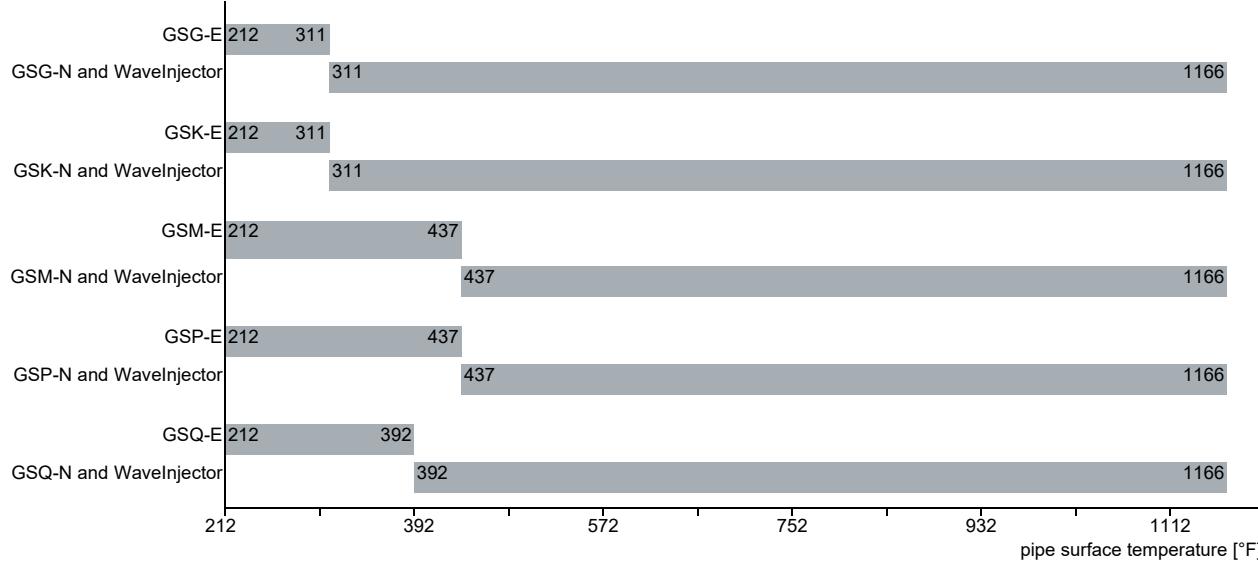
transducer order code



transducer order code (zone 2 - FM Class I Div. 2 - nonEx)



transducer order code (zone 1)



recommended

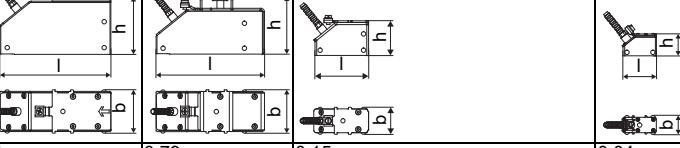
possible

Transducer order code

1, 2 transducer	3 transducer frequency	4 ambient temperature	5, 6 explosion protection	7, 8 connection system	9 to 11 extension cable	/ option	no. of character description
GS	-			-	/		set of ultrasonic flow transducers, shear wave
	G						0.2 MHz
	K						0.5 MHz
	M						1 MHz
	P						2 MHz
	Q						4 MHz
	N						normal temperature range
	E						extended temperature range
	NN						not explosion-proof
	A2						ATEX zone 2/IECEx zone 2
	F2						FM Class I Div. 2
	TS						with SMB connector
	XXX						0 m: without extension cable > 0 m: with extension cable
	LC						long transducer cable
	OS						housing with stainless steel 316

Technical data

Shear wave transducers (zone 2 - FM Class I Div. 2 - nonEx, TS)

order code	GSG-N**TS/**	GSK-N**TS/**	GSM-N**TS/**	GSP-N**TS/**	GSQ-N**TS/**
technical type	G(DL)G1N52	G(DL)K1N52	G(DL)M2N52	G(DL)P2N52	G(DL)Q2N52
transducer frequency [MHz]	0.2	0.5	1	2	4
inner pipe diameter d					
min. extended	[inch]	7.1	2.8	1.5	0.35
min. recommended	[inch]	9.4	3.9	1.9	0.47
max. recommended	[inch]	36.2	14.6	7.1	1.8
max. extended	[inch]	51.2	20.5	10.2	2.6
pipe wall thickness					
min.	[inch]	0.44	0.17	0.09	0.04
material					
housing		PEEK with stainless steel cover 304, ***-****/OS: 316L			
contact surface		PEEK			
degree of protection		NEMA 6			
transducer cable					
type		1699			
length	[ft]	16	13		9
length (***/****/LC)	[ft]	29			
dimensions					
length l	[inch]	5.1	4.98	2.52	1.57
width b	[inch]	2.01	2.01	1.26	0.87
height h	[inch]	2.64	2.66	1.59	1
dimensional drawing					
weight (without cable)	[lb]	1	0.79	0.15	0.04
pipe surface temperature	[°F]	-40 to +266			
ambient temperature	[°F]	-40 to +266			
temperature compensation		x			
explosion protection					
• ATEX/IECEx					
order code		GSG-NA2TS/**	GSK-NA2TS/**	GSM-NA2TS/**	GSP-NA2TS/**
pipe surface temperature (Ex)	[°C]	gas: -55 to +190 dust: -55 to +180			
marking		 II3G  II2D Ex nA IIC T6...T3 Gc Ex tb IIIC T80 °C...T185 °C Db			
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X			
• FM					
order code		GSG-NF2TS/**	GSK-NF2TS/**	GSM-NF2TS/**	GSP-NF2TS/**
pipe surface temperature (Ex)	[°F]	-40 to +257			
		-40 to +374			
degree of protection		IP66			
marking		 APPROVED NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860			

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

order code	GSG-ENNTS/**	GSK-ENNTS/**	GSM-E**TS/**	GSP-E**TS/**	GSQ-E**TS/**
technical type	G(DL)G1E52	G(DL)K1E52	G(DL)M2E52	G(DL)P2E52	G(DL)Q2E52
transducer frequency MHz	0.2	0.5	1	2	4
inner pipe diameter d					
min. extended	inch 5.9	2.4	1.3	0.63	0.31
min. recommended	inch 7.9	3.1	1.6	0.79	0.39
max. recommended	inch 35.4	14.2	7.1	3.5	1.8
max. extended	inch 51.2	20.5	10.2	5.1	2.6
pipe wall thickness					
min.	inch 0.44	0.17	0.09	0.04	0.02
material					
housing	PPSU with stainless steel cover 304, ***-****/OS: 316L	PI with stainless steel cover 304, ***-****/OS: 316L			
contact surface	PPSU	PI			
degree of protection	IP65	NEMA 4			
transducer cable					
type	1699	6111			
length	ft 16	13		9	
length (**-****/LC)	ft 29	29			
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					
min.	°F 212	212	212		
max.	°F 356	450 ¹	392		
ambient temperature					
min.	°F -40	-22	-22		
max.	°F +356	+104 +140 ² +392 ³	+392		
temperature compensation	x	x			
explosion protection					
• ATEX/IECEx					
order code	-	-	GSM-EA2TS/**	GSP-EA2TS/**	GSQ-EA2TS/**
pipe surface temperature (Ex)					
• min.	°C -	-	-45		
• max.	°C -	-	gas: +235 ¹ , dust: +225 ¹		
marking	-	-	CE 0637 Ex II3G II2D		
			Ex nA IIC T6...T2 Gc		
			Ex tb IIIA T80 °C...230 °C Db		
certification ATEX	-	-	IBExU10ATEX1163 X		
certification IECEx	-	-	IECEx IBE 12.00005X		
• FM					
order code	-	-	GSM-EF2TS/**	GSP-EF2TS/**	GSQ-EF2TS/**
pipe surface temperature (Ex)					
• min.	°F -	-	-40		
• max.	°F -	-	+455 ¹		
degree of protection	-	-	IP66		
marking	-	-	NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860		

¹ > +200 °C/+392 °F:

quick release clasps and tension straps (nonEx)

observe the insulation instruction

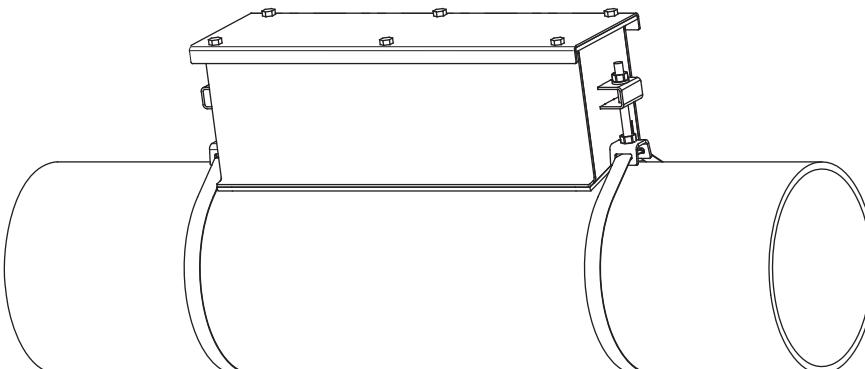
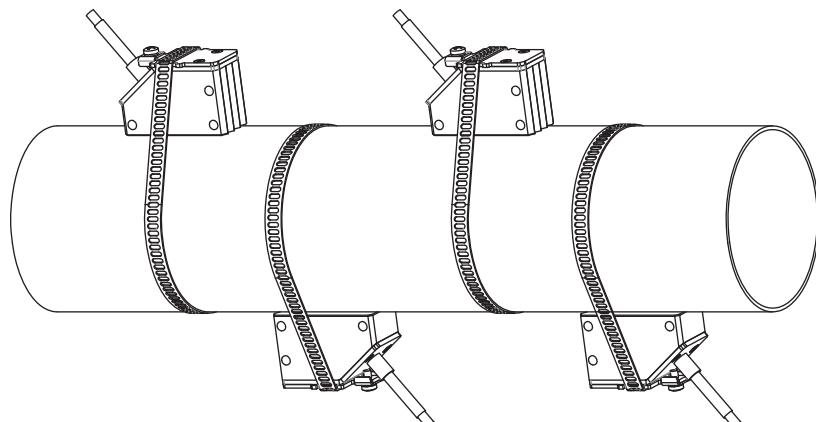
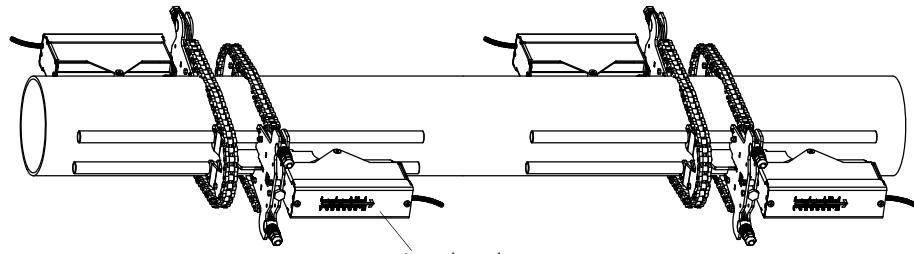
Ex: ambient temperature max. +40 °C/+104 °F

² pipe surface temperature +200 to +232 °C/+392 to +450 °F: quick release clasps and tension straps³ pipe surface temperature max. +200 °C/+392 °F

Transducer mounting fixture

Order code

1, 2	3	4	5	6	7 to 9	no. of character
transducer mounting fixture	transducer	-	measurement arrangement	size	-	outer pipe diameter
PL					/	option
WI						
K						description
M						
Q						
D						
S						
L						
S						
SK1						0.5 to 2.5 inch
SK2						3 to 6 inch
SK3						8 to 10 inch
SK4						12 to 18 inch
SK5						20 to 36 inch
SK6						42 to 100 inch
Z						special design

PermaLok PL 	material: stainless steel 316 dimensions: PLK-RL: 19.25 x 3.9 x 3.95 inch PLK-DS: 13.25 x 3.85 x 3.95 inch PLM: 25.25 x 3.08 x 3.15 inch PLQ: 13.37 x 2.68 x 2.4 inch weight: PLK-RL: 6 lb PLK-DS: 4.2 lb PLM: 6.6 lb PLQ: 2.8 lb temperature: max. 392 °F
quick release clasps and tension straps 	material: stainless steel 410, 200 nonEx
transducer box WI for WavelInjector 	see Technical specification TSWaveInjectorVx-x

Coupling materials for transducers

type	ambient temperature °F	remark
coupling pad type VT	14 to +392	fluid temperature 392 °F: min. 2 years
coupling pad type TF	392 to 464	
coupling compound type E	-22 to +392	in combination with type VT only
coupling compound type H	-22 to +482	in combination with type TF only
coupling pad type A	max. 536	WaveInjector
coupling pad type B	536 to 1166	WaveInjector

Connection systems

connection system TS		
connection with extension cable	direct connection	transducers technical type
<p>JB02, JB03, JB04</p>		*****52

Cable

transducer cable		
type	1699	6111
weight	lb/ft	0.06
ambient temperature	°F	-67 to +392
cable jacket		
material	PTFE	PFA
outer diameter	inch	0.11
thickness	inch	0.01
color		brown
shield	x	x
sheath		
material		stainless steel 304 option OS: 316Ti
outer diameter	inch	0.31
extension cable		
type	2615	5245
weight	lb/ft	0.12
ambient temperature	°F	-22 to +158
properties		halogen-free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2
cable jacket		
material	PUR	PUR
outer diameter	inch	max. 0.47
thickness	inch	0.08
color		black
shield	x	x
sheath		
material	-	steel wire braid with copolymer sheath
outer diameter	inch	max. 0.61

Cable length

transducer frequency	G, K	M, P	Q
connection system TS			
transducers technical type	x		x
*D***5*	ft	16	≤ 984 13 ≤ 984 9 ≤ 295
option LC: *L***5*	ft	29	≤ 984 29 ≤ 984 29 ≤ 295

x = transducer cable length

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

Junction box

Technical data

JB02, JB03, JB04		
weight	lb	2.6 lb
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L
gasket		silicone
degree of protection		IP67
ambient temperature		
min.	°F	-40
max.	°F	+176
explosion protection		
• ATEX		
junction box		JB02
marking		 II3G Ex nA IIC (T6)...T4 Gc II3D Ex tc IIIC T 100 °C Dc Ta -40...+(70)80 °C
• FM		
junction box		JB04
marking		NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ T6 Ta = -40...+60 °C

Connection

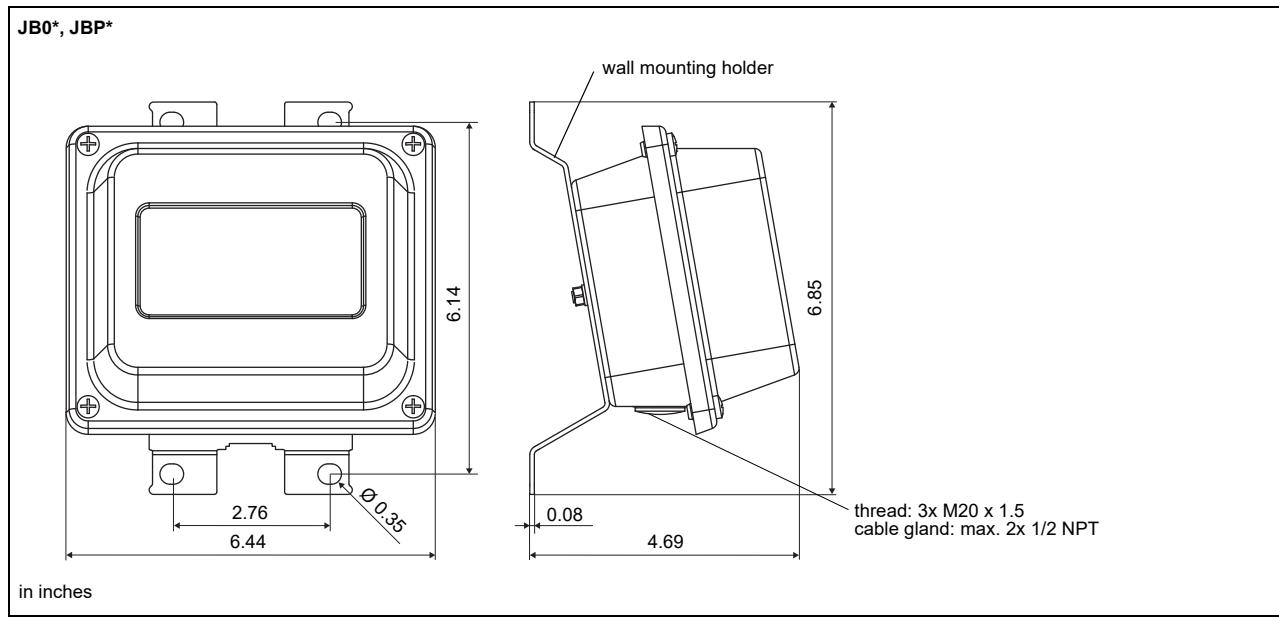
Transducers

	terminal	connection	transducer
	XV	SMB connector	
	XR	SMB connector	

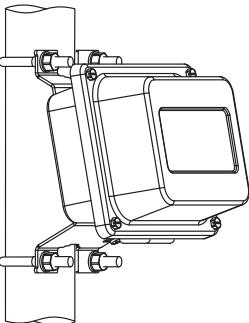
Extension cable

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

Dimensions

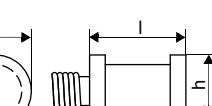
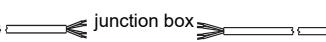


2" pipe mounting kit

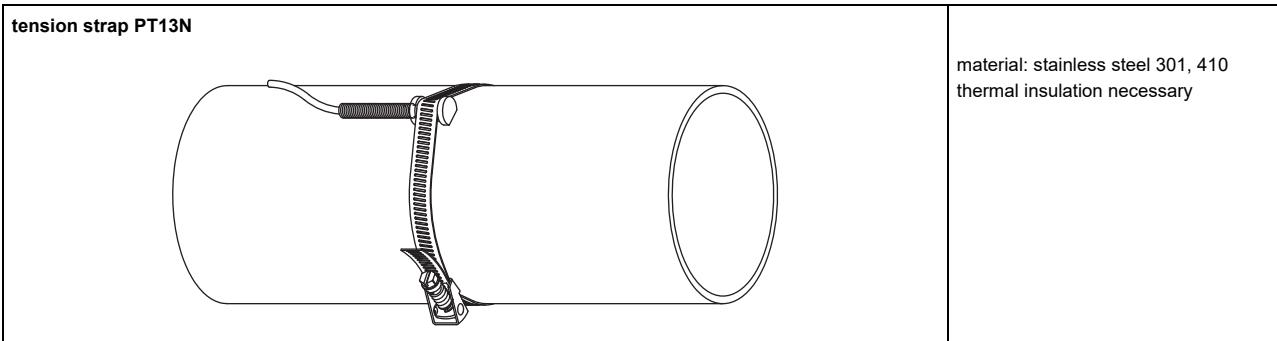
JB** 	order code: ACC-PE-GNNN-/JBPMK4
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Clamp-on temperature probe (optional)

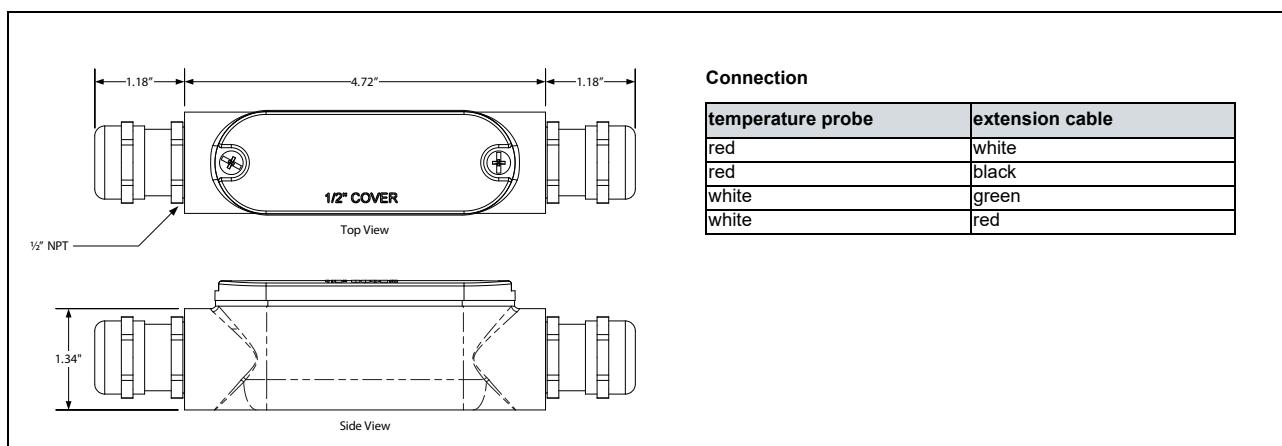
Technical data

PT13N		
design	clamp-on	
type	Pt1000	
connection	4-wire	
measuring range °F	-40 to +392	
accuracy T	$\pm(0.27 \text{ }^{\circ}\text{F} + 2 \cdot 10^{-3} \cdot (T \text{ }^{\circ}\text{F}) - 32 \text{ }^{\circ}\text{F})$	class A
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		
		
Connection		
temperature probe		
red		
red		
white		
white		
Cable		
temperature probe		extension cable
type		4 x 24 AWG
standard length		ft 20
max. length		ft -
cable jacket		PTFE
		LS PVC

Fixation



Junction box



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Subject to change without prior notice.

Errors excepted.

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