

Flexim FLUXUS G731CA Ultrasonic Flowmeter



Stationary Ultrasonic Clamp-on System for Flow Measurement of Compressed Air and Other Industrial Gases

Features

- Accurate and reliable flow measurement
- Bidirectional measurement for flow direction detection in compressed-air networks
- Installation and start-up do not require any pipe work nor any process interruptions
- Measurement unaffected by gas density, viscosity, dust content and humidity
- Measurement at extremely low pressure:
 - min. 44 psia in metal pipes
 - 15 psia in plastic pipes
- Extremely high turndown ratio > 1000:1
- High measuring accuracy, even at low flow velocities down to 0.03 ft/s
 - Monitoring of small flows (e.g., during the night)
 - Leakage detection





Applications

- Industrial manufacturing facilities:
 - Air compressors and compressed-air distribution networks
 - Pressure generators and distribution networks for inert or purge gases
 - Pressure generators and distribution networks for oxygen, e.g. for steel production
- Measurement of atmospheric gases consumption: compressed air, nitrogen, oxygen, argon, helium


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Transmitter

Technical data

	FLUXUS G731CA nonEx	FLUXUS G731CA ATEX/IECEX	FLUXUS G731CA FM Class I Div. 2
design	DE7-G731CA-NNN**-*AL... (aluminum housing) DE7-G731CA-NNN**-*ST... (stainless steel housing)	DE7-G731CA-A2N**-*AL... (aluminum housing) DE7-G731CA-A2N**-*ST... (stainless steel housing)	DE7-G731CA-F2N**-*AL... (aluminum housing) DE7-G731CA-F2N**-*ST... (stainless steel housing)
			
certification type		aluminum housing: 731-ADN (100 to 240 V) 731-ANN (11 to 32 V DC) stainless steel housing: 731-SNN	F731**-F2N...
application	flow measurement of compressed air and industrial gases		
measurement			
measurement principle		transit time difference correlation principle	
flow direction		bidirectional	
synchronized channel averaging		x (2 measuring channels necessary)	
flow velocity	ft/s	0.03 to 115, depending on pipe diameter	
repeatability		0.15 % MV ±0.02 ft/s	
fluid		compressed air, oxygen, nitrogen, argon, helium	
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		±1 to 2 % MV ±0.02 ft/s, contact FLEXIM for an application specific uncertainty evaluation	
transmitter			
power supply		• 100 to 240 V ±10 %/50 to 60 Hz or • 11 to 32 V DC	• 731-ADN, 731-SNN: 100 to 240 V ±10 %/50 to 60 Hz or • 731-ANN, 731-SNN: 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	
degree of protection		IP66	
dimensions	inch	see dimensional drawing	
weight	lb	aluminum housing: 9.9 stainless steel housing: 12.8	
fixation		wall mounting, optional: 2" pipe mounting	
ambient temperature	°F	-40* to +140 aluminum housing and 240 V: -40* to +149 * < -4 without operation of the display	731-ADN: -40* to +149 731-ANN, 731-SNN: -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	
certificates			
use in unclassified (ordinary) locations	optional:  FM25US0185 FM25CA0073 ambient temperature: -40* to +140 °F	-	-
explosion protection			
• ATEX/IECEX			
marking	-	 0637  II3G Ex ec IIC T4 Gc II2D Ex tb IIC T135 °C Db T _a -40...+65 °C (731-ADN) T _a -40...+60 °C (731-ANN) T _a -40...+59/60 °C (731-SNN)	-
certification	-	IBExU24ATEX1014 X, IECEX IBE 23.0024X	-

¹ with aperture calibration of the transducers² outside the explosive atmosphere (housing cover open)

		FLUXUS G731CA nonEx		FLUXUS G731CA ATEX/IECEx		FLUXUS G731CA FM Class I Div. 2	
• FM							
marking		-		-		 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		operating volumetric flow rate, standard volumetric flow rate, mass flow rate, flow velocity					
totalizer		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 ² • LAN ²					
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		• FluxDiag Reader: 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, totaled 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		0 or 2					
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		0 or 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 transducers² outside the explosive atmosphere (housing cover open)

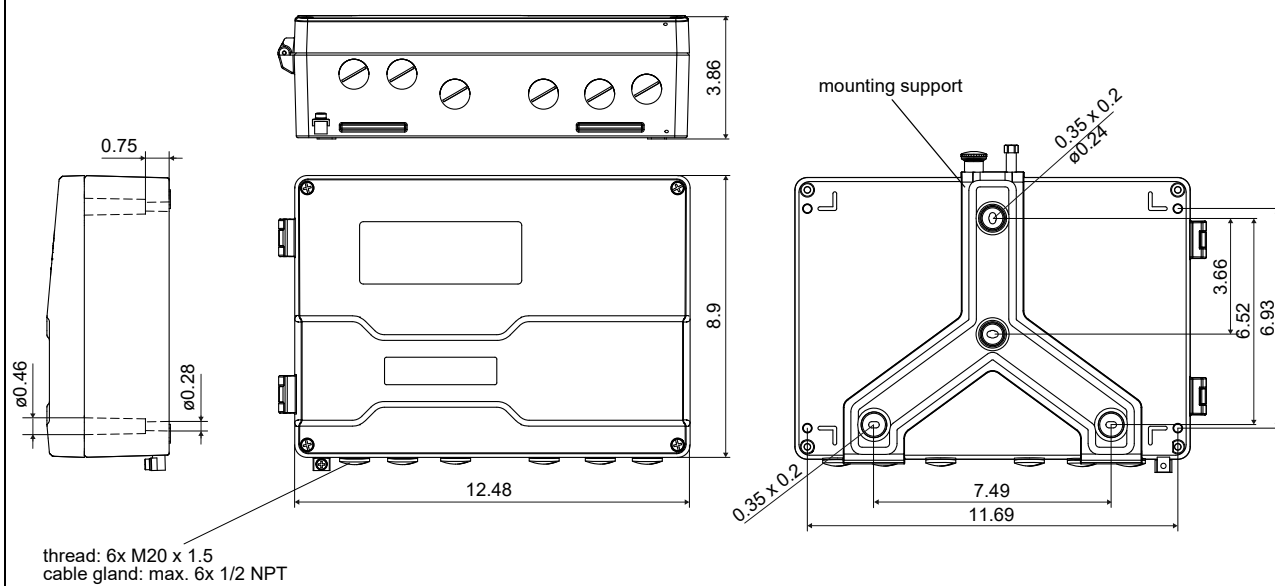
		FLUXUS G731CA nonEx	FLUXUS G731CA ATEX/IECEx	FLUXUS G731CA FM Class I Div. 2
inputs				
		The inputs are galvanically isolated from the transmitter.		
• temperature input				
number		1 or 2		
type		Pt100/Pt1000		
connection		4-wire		
range	°F	-238 to +1040		
resolution	K	0.01		
accuracy		±0.01 % MV ±0.03 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		
• switchable current input				
		All switchable current inputs are jointly switched to active or passive.		
number		1 or 2		
accuracy		±0.1 % MV ±0.01 mA at 64 to 82 °F ±0.1 % MV ±0.01 mA ±0.005 %/K at <64 °F/>82 °F		
resolution	μA	0.1		
active input		R _{int} = 75 Ω, I _{max} ≤ 30 mA U _{opencircuit} = 28 V (open circuit) U _{min} = 21.4 V at 20 mA		
• range	mA	0 to 20		
passive input		U _{ext} = 24 V, R _{int} = 35 Ω, I _{max} ≤ 24 mA		
• range	mA	0 to 20		

¹ with aperture calibration of the transducers

² outside the explosive atmosphere (housing cover open)

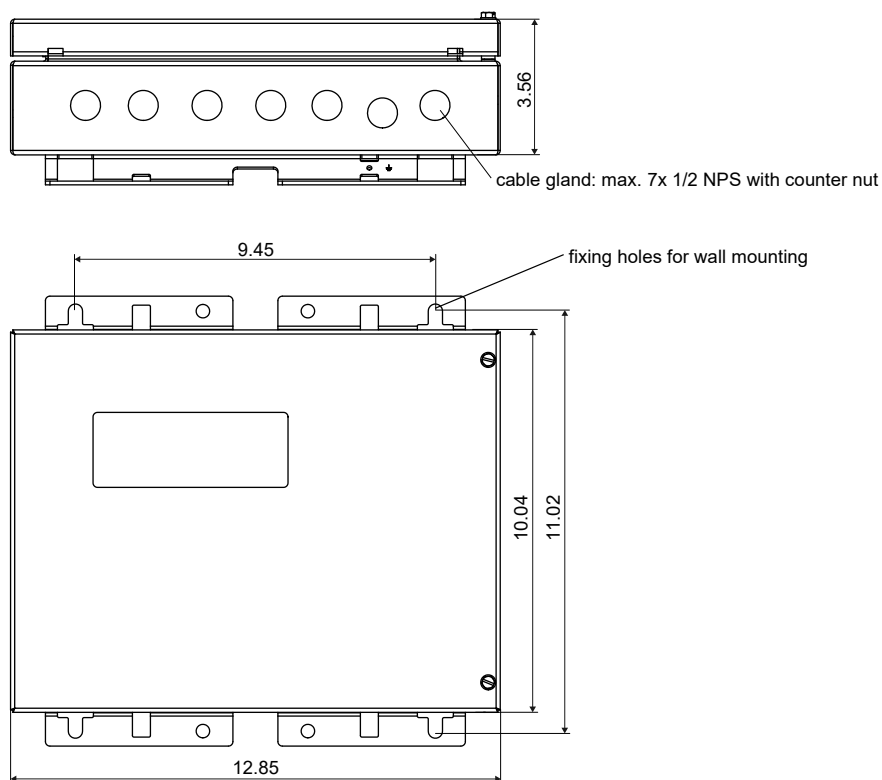
Dimensions

*731 (aluminum housing)



in inch

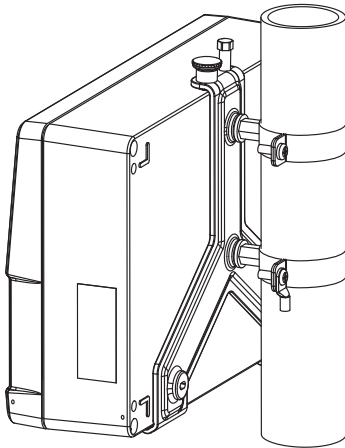
***731 (stainless steel housing)**



in inch

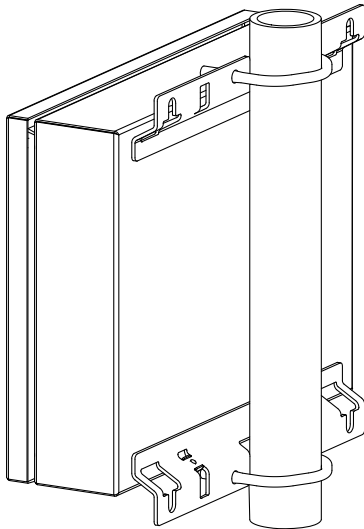
2" pipe mounting kit

*731 (aluminum housing)



item number: 731037-1

*731 (stainless steel housing)



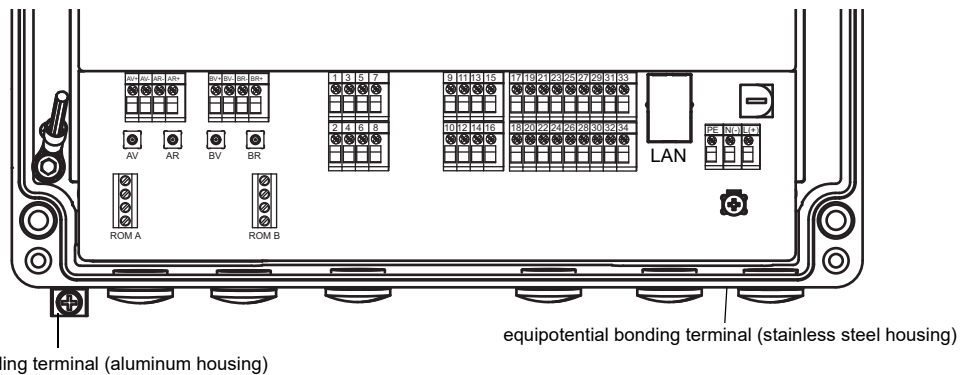
item number: 721110-4

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

*731



power supply ¹				
terminal		connection (AC)		connection (DC)
PE		protective conductor		protective conductor
N(-)		neutral conductor		-
L(+)		line 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, current input			
1, 2, 3, 4	temperature input			
5, 6, 7, 8				
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		
1, 5	red	white		
2, 6	white	red		
3, 7	red	black		
4, 8	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		

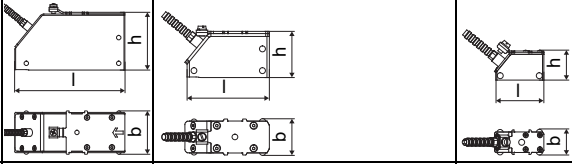

¹ cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

² The number, type and terminal assignment are customized.

Transducers

Technical data

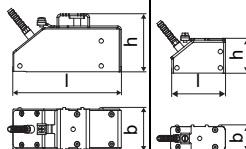
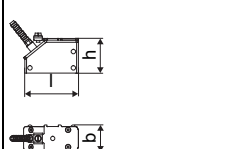

Lamb wave transducers (zone 2 - FM Class I Div. 2 - nonEx, TS)

order code		GLK-N***-**TS	GLM-N***-**TS	GLP-N***-**TS	GLQ-N***-**TS
technical type		G(RT)K1N52	G(RT)M1N52	G(RT)P1N52	G(RT)Q1N52
transducer frequency	MHz	0.5	1	2	4
fluid pressure ¹					
min. extended	psi	metal pipe: 145 (d > 4.7 inch) 44 (d < 4.7 inch)	metal pipe: 44 (d < 2.4 inch)	metal pipe: 44 (d < 1.4 inch)	metal pipe: 44 (d < 0.59 inch)
min.	psi	metal pipe: 218 (d > 4.7 inch) 145 (d < 4.7 inch) plastic pipe: 15	metal pipe: 145 (d > 2.4 inch) 73 (d < 2.4 inch) plastic pipe: 15	metal pipe: 145 (d > 1.4 inch) 73 (d < 1.4 inch) plastic pipe: 15	metal pipe: 145 (d > 0.59 inch) 73 (d < 0.59 inch) plastic pipe: 15
inner pipe diameter d ²					
min. extended	inch	2.4	1.2	0.59	0.28
min. recommended	inch	3.1	1.6	0.79	0.39
max. recommended	inch	11.8	5.9	2	0.87
max. extended	inch	14.2	7.1	2.4	1.2
pipe wall thickness					
min.	inch	0.2	0.1	0.05	0.02
max.	inch	0.39	0.2	0.12	0.05
material					
housing		PPSU with stainless steel cover 316L			
contact surface		PPSU			
degree of protection		IP66			
transducer cable					
type		1699			
length	ft	16	13		9
dimensions					
length l	inch	5.06	2.91		1.65
width b	inch	2.01	1.26		0.87
height h	inch	2.66	1.59		1
dimensional drawing					
weight (without cable)	lb	1	0.17		0.04
pipe surface temperature	°F	-40 to +266			
ambient temperature	°F	-40 to +266			
temperature compensation		x			
explosion protection					
• ATEX/IECEx					
order code		GLK-NA2N-**TS	GLM-NA2N-**TS	GLP-NA2N-**TS	GLQ-NA2N-**TS
pipe surface temperature (Ex)	°C	gas: -50 to +165 dust: -50 to +155			
marking		CE 0637 Ex II 3G Ex nA IIC T6...T3 Gc Ex tb IIIC T80 °C...T160 °C Db			
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X			
• FM					
order code		GLK-NF2N-**TS	GLM-NF2N-**TS	GLP-NF2N-**TS	GLQ-NF2N-**TS
pipe surface temperature (Ex)	°F	-40 to +329			
degree of protection		IP66			
marking		 NI/CI, I,II,III/Div. 2 / GP A,B,C,D,F,G/ Temp. Codes dwg 3860			

¹ depending on the application, typical absolute value for natural gas, nitrogen, compressed air

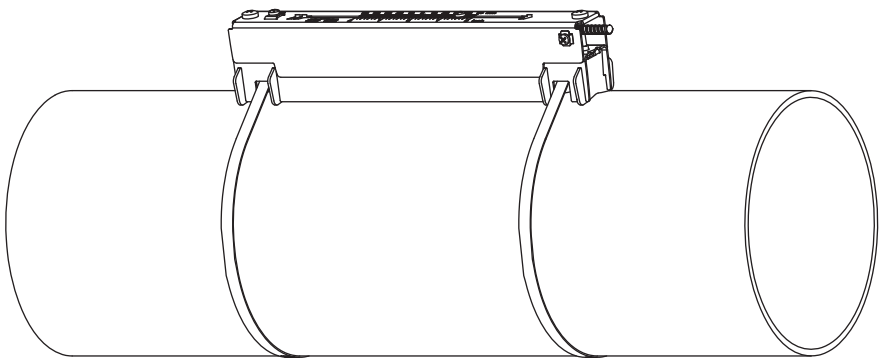
² Lamb wave transducer:
 typical values for natural gas, nitrogen, oxygen; pipe diameters for other fluids on request
 inner pipe diameter max. recommended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 49 ft/s (98 ft/s)
 inner pipe diameter max. extended: in reflect arrangement (diagonal arrangement) and for a flow velocity of 39 ft/s (82 ft/s)

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

order code		GSK-N***-T1	GSM-N***-T1	GSP-N***-T1	GSQ-N***-T1
technical type		G(DL)K1N53	G(DL)M2N53	G(DL)P2N53	G(DL)Q2N53
transducer frequency	MHz	0.5	1	2	4
fluid pressure ¹					
min. extended	psi	metal pipe: 290			
min.	psi	metal pipe: 435, plastic pipe: 15			
inner pipe diameter d ²					
min. extended	inch	2.4	1.2	0.59	0.28
min. recommended	inch	3.1	1.6	0.79	0.39
max. recommended	inch	11.8	5.9	2	0.87
max. extended	inch	14.2	7.1	2.4	1.2
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			
explosion protection					
• ATEX/IECEx					
order code		GSK-NA2N-T1	GSM-NA2N-T1	GSP-NA2N-T1	GSQ-NA2N-T1
pipe surface temperature (Ex)	°C	gas: -55 to +190 dust: -55 to +180			
marking		CE0637 Ex 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		GSK-NF2N-T1	GSM-NF2N-T1	GSP-NF2N-TS	GSQ-NF2N-T1
pipe surface temperature (Ex)	°F	-40 to +257	-40 to +374		
degree of protection		IP66			
marking		 NI/CI. I,II,III/Div. 2 / GP A,B,C,D,F,G/ Temp. Codes dwg 3860			

¹ depending on the application, typical absolute value for natural gas, nitrogen, compressed air² shear wave transducer:
typical values for natural gas, nitrogen, oxygen; pipe diameters for other fluids on request
inner pipe diameter max. recommended/max. extended: in reflect arrangement and for a flow velocity of 49 ft/s

Transducer mounting fixture

<p>Variofix L (VL)</p> 	<p>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</p>
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Coupling materials for transducers

type	ambient temperature °F	remark
coupling compound type N	-22 to +266	< 24 h
coupling pad type VT	14 to +392	

Damping mats

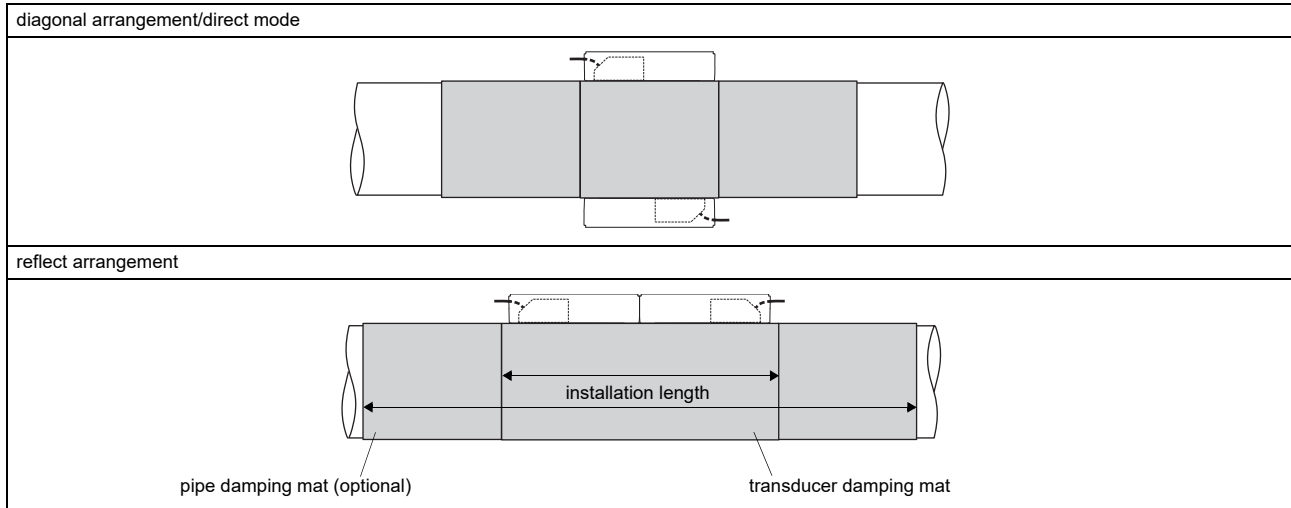
Damping mats will be used for the gas measurement to reduce acoustic noise influences on the measurement.

transducer damping mat

Transducer damping mats will be installed below the transducers.

pipe damping mat

Pipe damping mats will be installed if the sound propagation is disturbed at reflection points (e.g., flange, weld). Depending on the noise, the pipe damping mats will be installed at one or both sides of the transducer damping mat. If the local conditions are unknown, pipe damping mats should be installed.



Technical data

type		E30R4	E30R3
item number		992080-11	992080-10
width	inch	8.9	2
thickness	inch	0.03	
length (per roll)	ft	32	
weight	lb/ft ²	2.2	
ambient temperature	°F	-22 to +176	
properties		self-adhesive	

Dimensioning

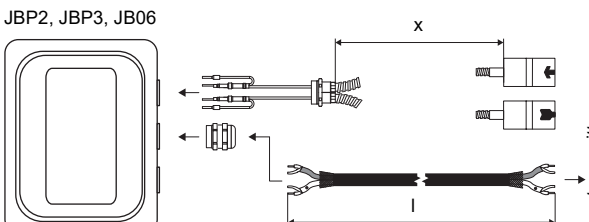
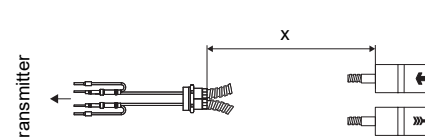
transducer		damping mat							
transducer mounting fixture	order code	type	number of layers	transducer damping mat			transducer damping mat + 2x pipe damping mat		
				max. installation length	number of rolls ¹		max. installation length	number of rolls ¹	
					[inch]	standard ²		extended ²	[inch]
VarioFix L									
VLK	GLK	E30R4	1	35	1	1	72	2	2
	GSK		1		1	1		2	2
VLM	GLM	E30R3	1	26	1	1	53.5	2	2
	GSM		1		1	1		2	2
VLP	GLP	E30R3	1	21.3	1	1	44.1	1	1
	GSP		1		1	1		1	1
VLQ	GLQ	E30R3	1	21.3	1	1	44.1	1	1
	GSQ		1		1	1		1	1

¹ calculation on the base of:

max. installation length (installation of one transducer mounting fixture per transducer in reflect arrangement) and max. recommended pipe diameter (standard) or max. extended pipe diameter (extended)

² calculation of the number of rolls when both transducers are mounted in one transducer mounting fixture (reflect arrangement) or in diagonal arrangement/ direct mode: number of rolls/2 and round up to the nearest integer

Connection systems

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

Cable

transducer cable		
type		1699
weight	lb/ft	0.06
ambient temperature	°F	-67 to +392
cable jacket		
material		PTFE
outer diameter	inch	0.11
thickness	inch	0.01
color		brown
shield		x
sheath		
material		stainless steel 316Ti
outer diameter	inch	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
*(DR)***5*	ft	16	≤ 984	13	≤ 984	9	≤ 295
*(LT)***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/UKEX		
junction box		JBP2
marking		<div><div><div>CE</div><div>UK</div><div>CA</div></div><div>Ex</div></div> 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		<div><div><div>FIA</div><div>IS</div></div><div>APPROVED</div></div> 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	

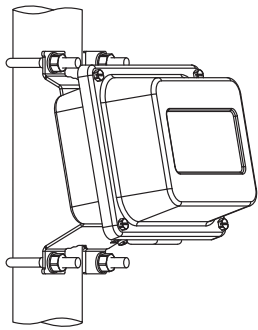
Extension cable

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

Dimensions

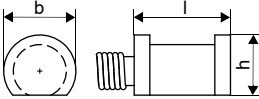
JB0*, JBP*	
in inch	

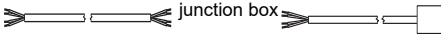

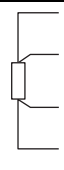
2" pipe mounting kit

<p>JB**</p> 	<p>item number: 751035-2</p>
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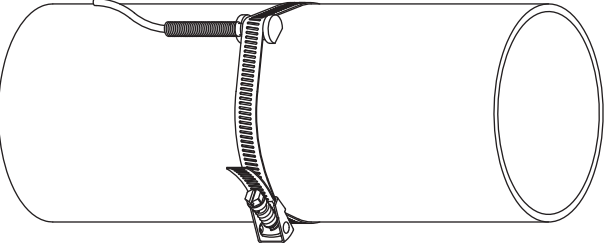
Clamp-on temperature probe (optional)

Technical data

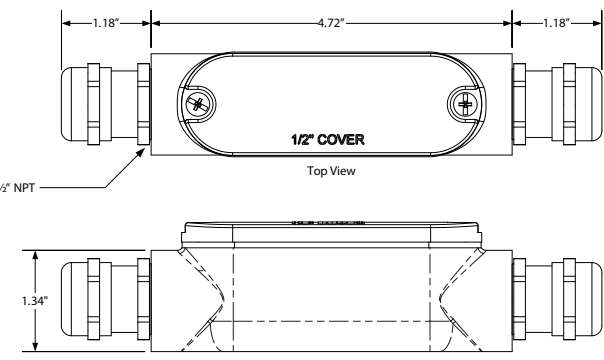
PT13N		
design		clamp-on
type		Pt1000
connection		4-wire
measuring range	°F	-40 to +392
accuracy T		$\pm(0.27\text{ }^{\circ}\text{F} + 2 \cdot 10^{-3} \cdot (T\text{ }[^{\circ}\text{F}] - 32\text{ }^{\circ}\text{F}))$ class A
accuracy ΔT (2x Pt matched according to EN 1434-1)		$\leq 0.03\text{ }^{\circ}\text{F}$ (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 		
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

Fixation

tension strap PT13N 	material: stainless steel 301, 410 thermal insulation necessary
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Junction box

	Connection <table> <tr> <th>temperature probe</th><th>extension cable</th></tr> <tr> <td>red</td><td>white</td></tr> <tr> <td>red</td><td>black</td></tr> <tr> <td>white</td><td>green</td></tr> <tr> <td>white</td><td>red</td></tr> </table>	temperature probe	extension cable	red	white	red	black	white	green	white	red
temperature probe	extension cable										
red	white										
red	black										
white	green										
white	red										

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