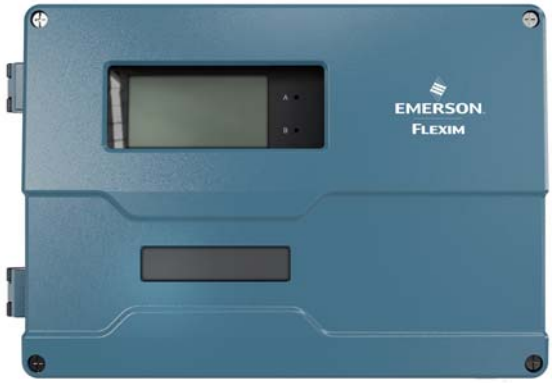
Flexim FLUXUS F731PW
Ultrasonic Flowmeter



Permanently Installed Ultrasonic Flowmeter for Process Water

Features

- Exact and highly reliable clamp-on measurement of volumetric and mass flow rate
- High measurement accuracy even at very low as well as very high flow rates and independent of the flow direction (bidirectional)
- Zero point stable and drift free measurement independent of pipe material, process pressure, temperature and fluid

Applications

- Measurement of process water in oil, gas and chemical industries
- Measurement of cooling water and seawater

Transmitter

Technical data

		FLUXUS F731PW ATEX/IECEx	FLUXUS F731PW FM Class I Div. 2
order code		DE7-F731PW-A2N**-*AL... (aluminum housing) DE7-F731PW-A2N**-*ST... (stainless steel housing)	DE7-F731PW-F2N**-*AL... (aluminum housing) DE7-F731PW-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		process water flow measurement	
measurement			
• flow			
measurement principle		transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content	
flow direction		bidirectional	
flow velocity	ft/s	0.03 to 82	
repeatability		0.15 % MV ±0.02 ft/s	
fluid		produced water, water, seawater, water/glycol	
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		• 731-ADN, 731-SNN: 100 to 240 V ±10 %/50 to 60 Hz or • 731-ANN, 731-SNN: 11 to 32 V DC	• 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	
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	731-ADN: -40* to +149 731-ANN, 731-SNN: -40* to +140 * < -4 without operation of the display	-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			
marking		CE 0637 UKCA Ex II3G Ex ec IIC T4 Gc II2D Ex tb IIIC 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	-
• FM			
marking		-	c FM us 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		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	

[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 F731PW ATEX/IECEx	FLUXUS F731PW FM Class I Div. 2
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	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, 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		0, 1, 2 or 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		0, 2 or 4	
functions		• frequency output • binary output • pulse output	
type		open collector (passive)	
operating parameters		**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) or **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	

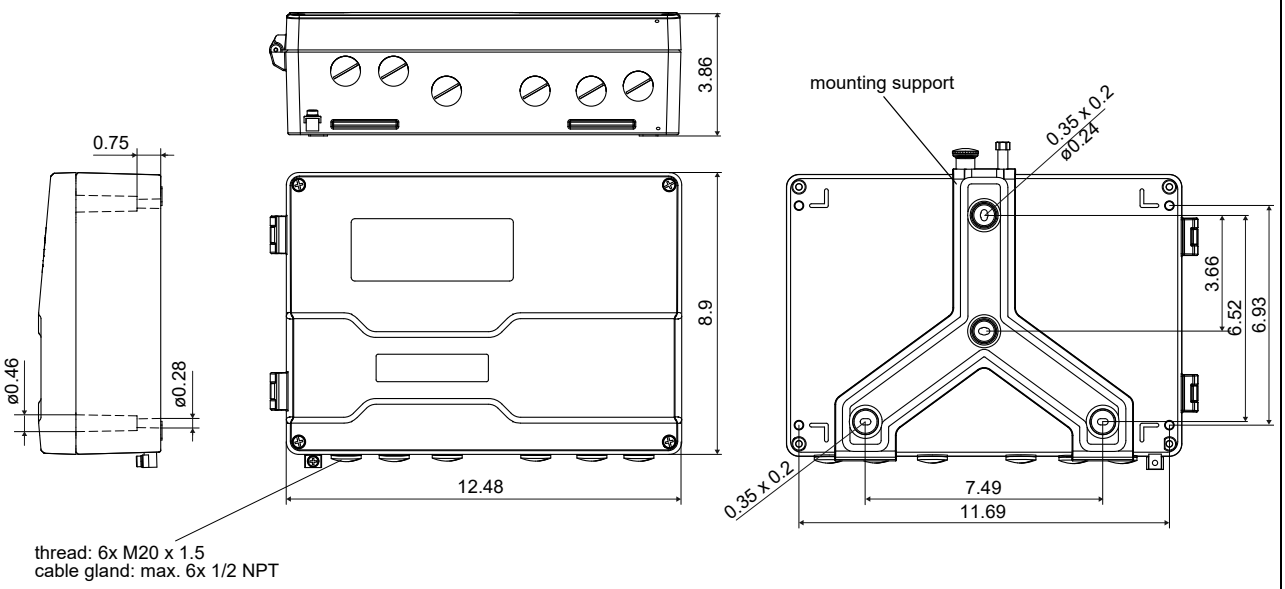
[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

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

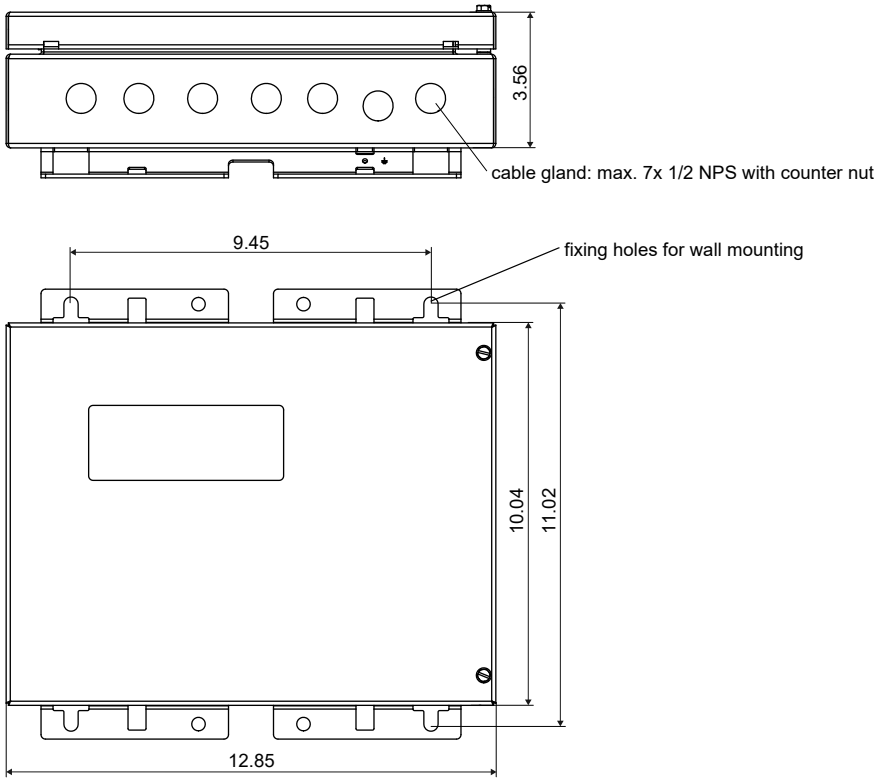
Dimensions

***731 (aluminum housing)**



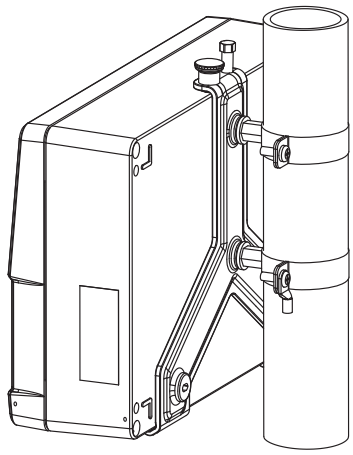
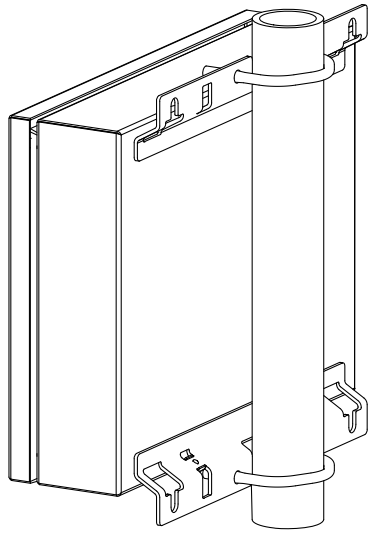
in inch

***731 (stainless steel housing)**



in inch

2" pipe mounting kit

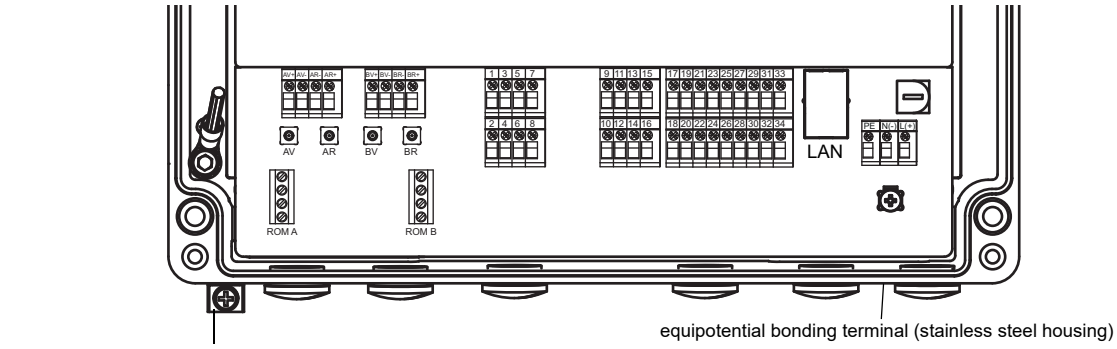
***731 (aluminum housing)** 	item number: 731037-1
***731 (stainless steel housing)** 	item number: 721110-4

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]			
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		
terminal	**connection**	**transducer**
AV or AV+	signal	
AVS or AV-	shield	
ARS or AR-	shield	
AR or AR+	signal	

transducers				
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
29+, 30-	passive current output/HART
29-, 30+	active current output/HART
29, 30	Modbus RTU, BACnet MS/TP, Profibus PA, FF H1

USB	type C Hi-Speed USB 2.0 Device	service (FluxDiag/FluxDiag Reader)
LAN	RJ45 10/100 Mbps Ethernet	• service (FluxDiag/FluxDiagReader) • Modbus TCP • BACnet IP

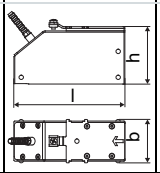
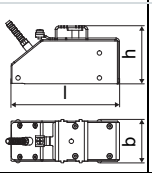
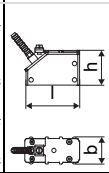
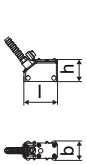
[1] cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

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

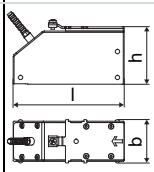
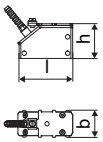
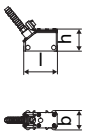
Transducers

Technical data

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

order code		FSG-N***-**T1	FSK-N***-**T1	FSM-N***-**T1	FSP-N***-**T1	FSQ-N***-**T1
technical type		C(DL)G1N53	C(DL)K1N53	C(DL)M2N53	C(DL)P2N53	C(DL)Q2N53
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	inch	15.7	3.9	2	0.98	0.39
min. recommended	inch	19.7	7.9	3.9	2	0.98
max. recommended	inch	157.5	78.7	39.4	15.7	5.9
max. extended	inch	255.9	94.5	47.2	18.9	9.4
pipe wall thickness						
min.	inch	0.43	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	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		FSG-NA2*-**T1	FSK-NA2*-**T1	FSM-NA2*-**T1	FSP-NA2*-**T1	FSQ-NA2*-**T1
pipe surface temperature (Ex)	°C	gas: -55 to +175 dust: -55 to +180		gas: -55 to +190 dust: -55 to +180		
marking		CE 0637 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		FSG-NF2*-**T1	FSK-NF2*-**T1	FSM-NF2*-**T1	FSP-NF2*-**T1	FSQ-NF2*-**T1
pipe surface temperature (Ex)	°F	-40 to +257		-40 to +374		
degree of protection		IP66				
marking		FM APPROVED NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,F,G/ Temp. Codes dwg 3860				

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

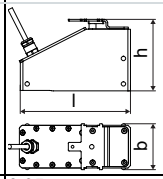
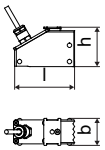
order code		FSG-E***-**T1	FSK-E***-**T1	FSM-E***-**T1	FSP-E***-**T1	FSQ-E***-**T1
technical type		C(DL)G1E53	C(DL)K1E53	C(DL)M2E53	C(DL)P2E53	C(DL)Q2E53
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	inch	15.7	3.9	2	0.98	0.39
min. recommended	inch	19.7	7.9	3.9	2	0.98
max. recommended	inch	157.5	78.7	39.4	15.7	5.9
max. extended	inch	255.9	94.5	47.2	18.9	9.4
pipe wall thickness						
min.	inch	0.43	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 +464[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		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		-	-	CE 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		FSG-EF2*-**T1	FSK-EF2*-**T1	FSM-EF2*-**T1	FSP-EF2*-**T1	FSQ-EF2*-**T1
pipe surface temperature (Ex)	°F	-40...+329		-40...+455		
degree of protection		IP66				
marking		FM APPROVED NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,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] nonEx: pipe surface temperature max. +200 °C/+392 °F

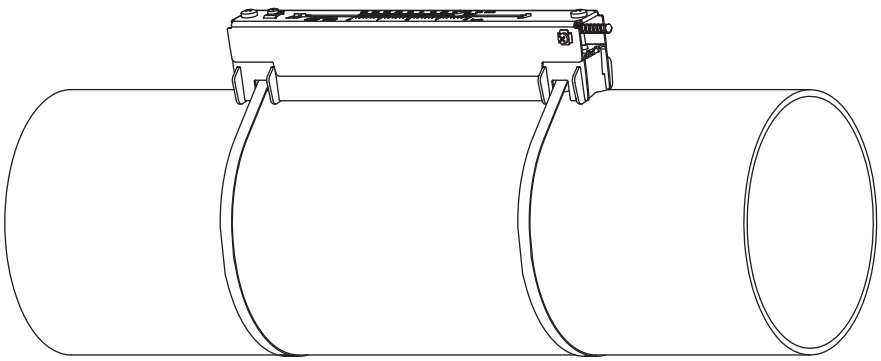
Shear wave transducers (zone 2, T1, IP68)

order code		FSG-L***-**T1/H68	FSK-L***-**T1/H68	FSM-L***-**T1/H68	FSP-L***-**T1/H68
technical type		CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8
transducer frequency	MHz	0.2	0.5	1	2
inner pipe diameter d					
min. extended	inch	15.7	3.9	2	0.98
min. recommended	inch	19.7	7.9	3.9	2
max. recommended	inch	157.5	78.7	39.4	15.7
max. extended	inch	255.9	94.5	47.2	18.9
pipe wall thickness					
min.	inch	0.43	0.2	0.1	0.05
material					
housing		PEEK with stainless steel cover 316Ti			
contact surface		PEEK			
degree of protection		IP68[1]			
transducer cable					
type		2550			
length	ft	39			
dimensions					
length l	inch	5.12		2.76	
width b	inch	2.13		1.26	
height h	inch	3.29		1.81	
dimensional drawing					
weight (without cable)	lb	0.95		0.19	
pipe surface temperature	°F	-40 to +212			
ambient temperature	°F	-40 to +212			
temperature compensation		x			
explosion protection					
• ATEX/IECEx					
order code		FSG-LA2N-**T1/H68	FSK-LA2N-**T1/H68	FSM-LA2N-**T1/H68	FSP-LA2N-**T1/H68
pipe surface temperature (Ex)	°C	gas: -40 to +90 dust: -40 to +80			
marking		CE 0637 Ex II3G II2D Ex nA IIC T6...T5 Gc Ex tb IIIC T80 °C...T85 °C Db			
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X			

[1] test conditions: 3 months/29 psi (65 ft)/36 °F

Transducer mounting fixture

Variofix L (VL)



material: stainless steel 316Ti, 316L, 17-7PH

inner length:
VL(GK): 13.7 inch,
option H68: 14.5 inch
VL(MP): 9.2 inch
VLQ: 6.9 inch

dimensions:
VL(GK): 16.65 x 3.54 x 3.66 inch
option H68: 17.44 x 3.7 x 4.13 inch
VL(MP): 12.17 x 2.24 x 2.48 inch
VLQ: 9.72 x 1.69 x 1.85 inch

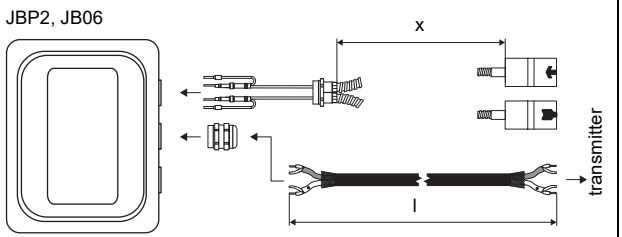
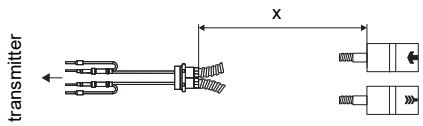
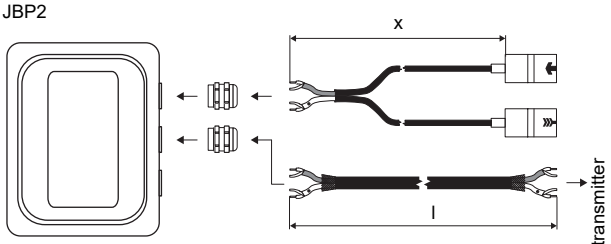
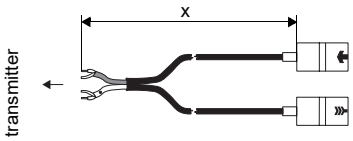
Coupling materials for transducers

	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 N or type 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

Technical data

type	**ambient temperature** °F	**remark**
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	fluid temperature 392 °F: min. 2 years
coupling pad type TF	392 to 464	

Connection systems

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

Cable

transducer cable				
type		**1699**	**2550**	**6111**
weight	lb/ft	0.06	0.02	0.06
ambient temperature	°F	-67 to +392	-40 to +212	-148 to +437
properties			longitudinal watertight	
cable jacket				
material		PTFE	PUR	PFA
outer diameter	inch	0.11	0.2 ±0.01	0.11
thickness	inch	0.01	0.04	0.02
color		brown	gray	white
shield		x	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 fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2	halogen-free fire propagation test according to IEC 60332-1 combustion test according to IEC 60754-2
cable jacket			
material		PUR	PUR
outer diameter	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		**G, 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
option H68: ****LI*	ft	39	≤ 984	39	≤ 984	-	-

x = transducer cable length

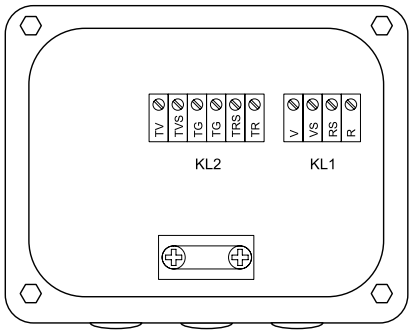
l = max. length of extension cable (depending on the application)

Junction box

Technical data

JBP2, JB06		
weight	lb	2.6 lb
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L
gasket		silicone
degree of protection		JBP2: IP66/IP67 JB06: Type 4X, IP66
ambient temperature	°F	-40 to +176
explosion protection		
• ATEX/UKEX		
junction box		JBP2
marking		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		NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ T6 Ta = -40...+60 °C

Connection



Transducers

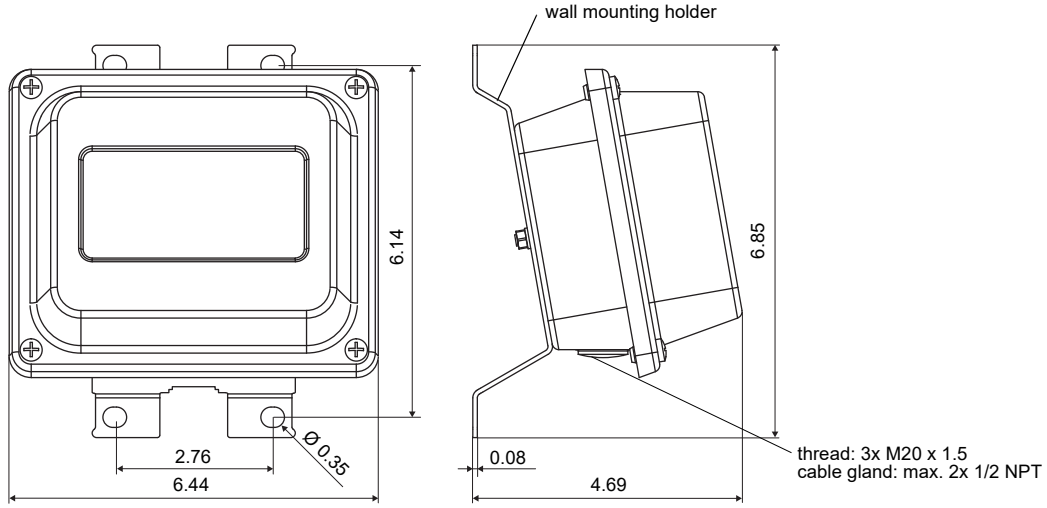
terminal strip	terminal	connection	transducer
KL1	V	signal	
	VS	internal shield	
	RS	internal shield	
	R	signal	

Extension cable

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

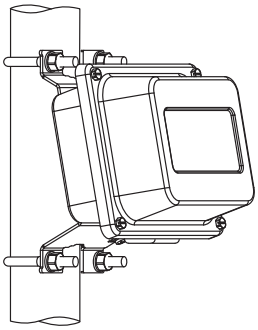
Dimensions

JB0*, JBP*



in inch

2" pipe mounting kit

JB** 	item number: 751035-2

Annex

Reference conditions

as available at e.g. the test facilities of Physikalisch-Technische Bundesanstalt

measurement principle		transit time difference correlation principle
all uncertainties	%	95
fluid temperature		77 °F ±9 °F
ambient temperature		77 °F ±9 °F
warm-up time	min	10
flow profile at the measuring point		fully developed, rotationally symmetric
installation		installation according to specifications using the recommended transducers
Reynolds number		> 10 000
pipe diameter uncertainty	%	0.2
pipe wall thickness uncertainty	%	1
circularity tolerance		0.08 % of inner pipe diameter
SCNR	dB	> 48
SNR	dB	> 12

For more information: **Emerson.com**