Flexim FLUXUS G731ST-LT
Ultrasonic Flowmeter





Steam Ultrasonic Flowmeter for Permanent Installation

Features

- Exact and highly reliable measurement of saturated and superheated steam for temperatures up to max. 200 °C by means of the clamp-on principle
- Synchronized channel averaging to reduce turbulence-related fluctuations of the measured value
- Physical quantities volumetric flow rate and mass flow rate available in a transmitter without additional steam calculator
- Installation and start-up do not require any pipe work and are carried out without any process interruptions and cooling down of the steam system
- Non-invasive, wear-free and pressure constant measurement
- Maintenance-free acoustic coupling using permanent coupling foil
- High measurement accuracy even at very low as well and high flow rates and independent of the flow direction (bidirectional)
- Automatic loading of calibration data and transducer recognition
- Bidirectional communication and support of common bus technologies (Modbus, Profibus PA, Foundation Fieldbus, BACnet)
- Advanced self-diagnosis and possibilities for event-based triggering of data recording for the supervision and control of critical processes
- Transmitter and transducers for use in hazardous areas are available
- Transmitter and transducers are separately calibrated (traceable to national standards)
- The measurement is zero point stable and drift free

Applications

- Food and beverage industry
- Pharmaceutical industry
- Chemical industry
- Manufacturing industries

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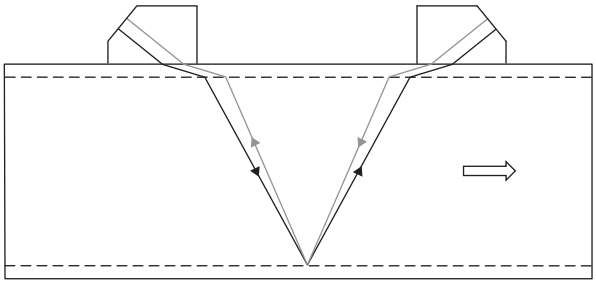
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Function

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

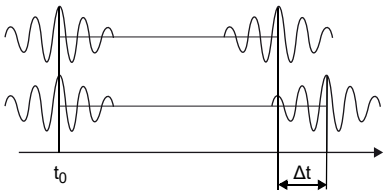


As the fluid where the ultrasound propagates is flowing, the transit time of the ultrasonic signal in flow direction is shorter than the one against the flow direction.

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



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 mass flow rate

The mass flow rate is calculated from the operating density and the volumetric flow rate:

$\dot{m} = \rho \cdot \dot{V}$

The operating density of the fluid is calculated as the function of pressure and temperature of the fluid:

$\rho = f(p, T)$

where

ρ - operating density

p - fluid pressure

T - fluid temperature

$\dot{m}$ - mass flow rate

$\dot{V}$ - volumetric flow rate

Number of sound paths

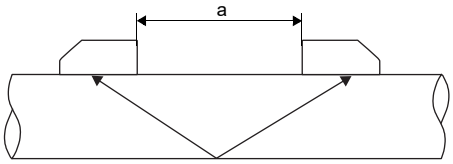
The number of sound paths is the number of transits of the ultrasonic signal through the fluid in the pipe. Depending on the number of sound paths, the following methods of installation exist:

- **reflection 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. In case of high signal attenuation by the fluid or pipe, diagonal arrangement with 1 sound path is used.

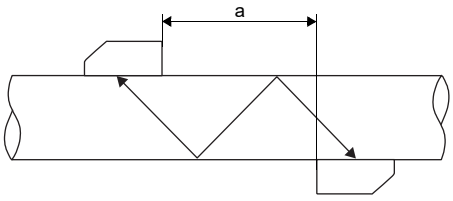
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

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

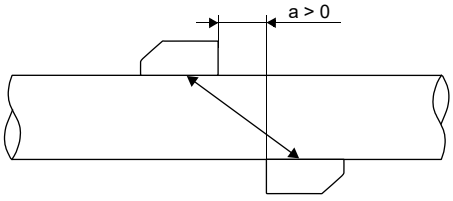
Reflection arrangement, number of sound paths: 2



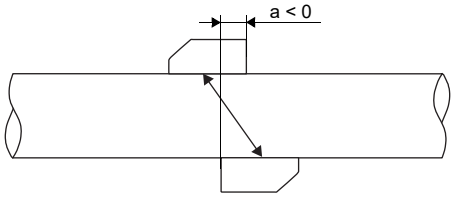
Diagonal arrangement, number of sound paths: 3



Diagonal arrangement, number of sound paths: 1



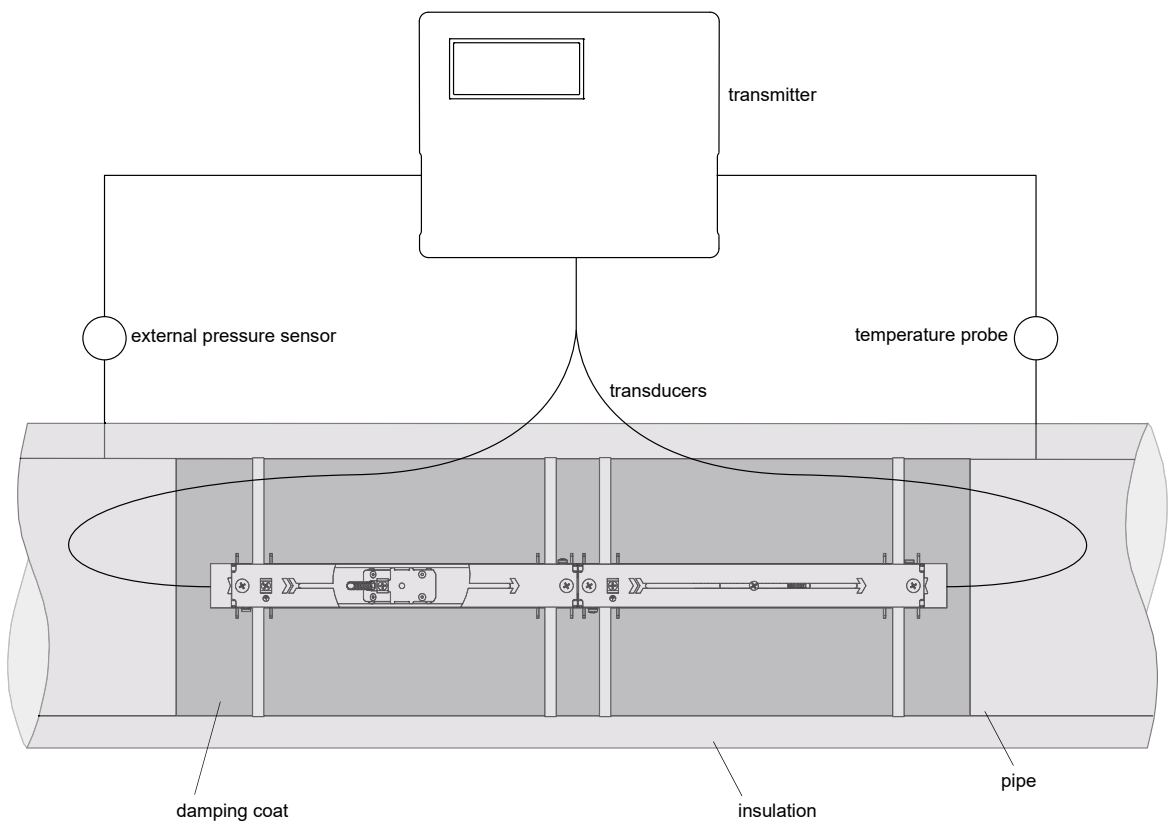
Diagonal arrangement, number of sound paths: 1, negative transducer distance



a - transducer distance

Typical measurement setup

Example of a reflection arrangement



Transmitter

Technical data

		FLUXUS G731ST-LT nonEx	FLUXUS G731ST-LT ATEX/IECEx	FLUXUS G731ST-LT FM Class I Div. 2
design		DE7-G731ST-NNN**-*AL.../FLT (aluminum housing) DE7-G731ST-NNN**-*ST.../FLT (stainless steel housing)	DE7-G731ST-A2N**-*AL.../FLT (aluminum housing) DE7-G731ST-A2N**-*ST.../FLT (stainless steel housing)	DE7-G731ST-F2N**-*AL.../FLT (aluminum housing) DE7-G731ST-F2N**-*ST.../FLT (stainless steel housing)
		 		
certification type			aluminum housing: 731-ADN (100...240 V) 731-ANN (11...32 V DC) stainless steel housing: 731-SNN	F731**-F2N...
application		steam measurement[2]		
measurement				
measurement principle		transit time difference correlation principle		
flow direction		bidirectional		
synchronised channel averaging		x (2 measuring channels necessary)		
flow velocity	m/s	depending on pipe diameter and transducer, see diagrams		
repeatability		0.15 % MV ±0.005 m/s		
fluid		saturated steam, superheated steam		
fluid pressure	bar (a)	3...15,5		
fluid temperature	°C	135...200	135...185 (see pipe surface temperature (Ex) of selected transducer)	135...165
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 ±0.005 m/s		
measurement uncertainty at the measuring point		±1...3 % MV ±0.005 m/s, depending on the application		
transmitter				
power supply		• 100...240 V ±10 %/50...60 Hz or • 11...32 V DC	• 731-ADN, 731-SNN: 100...240 V ±10 %/ 50...60 Hz or • 731-ANN, 731-SNN: 11...32 V DC	• 100...240 V ±10 %/50...60 Hz or • 11...32 V DC
power consumption	W	< 15		
number of measuring channels		1, optional: 2		
damping	s	0...100 (adjustable)		
measuring cycle	Hz	100...1000 (1 channel)		
response time	s	1 (1 channel), option: 0.02		
housing material		aluminum, powder coated or stainless steel 316L (1.4404)		
degree of protection		IP66		
dimensions	mm	see dimensional drawing		
weight	kg	aluminum housing: 4.5 stainless steel housing: 5.8		
fixation		wall mounting, optional: 2" pipe mounting		
ambient temperature	°C	-40*...+60 aluminum housing and 240 V: -40*...+65 * < -20 without operation of the display	731-ADN: -40*...+65 731-ANN, 731-SNN: -40*...+60 * < -20 without operation of the display	-40...+60 (< -20 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	-

[1] with aperture calibration of the transducers

[2] test measurement to validate the application required in advance

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

		FLUXUS G731ST-LT nonEx	FLUXUS G731ST-LT ATEX/IECEx	FLUXUS G731ST-LT 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, mass flow rate, flow velocity		
totaliser		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, parametrisation of the transmitter: • USB[3] • LAN[3]		
process interfaces		max. 1 option: • Modbus RTU • BACnet MS/TP • M-Bus • 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, parametrisation of the transmitter		
data logger				
loggable values		all physical quantities, totalised physical quantities and diagnostic values		
capacity		max. 800 000 measured values		
outputs				
		The outputs are galvanically isolated from the transmitter.		
number		on request, current inputs and outputs: max. 4		
• switchable current output				
		configurable according to NAMUR NE 43 All switchable current outputs are jointly switched to active or passive.		
range	mA	4...20 (alarm current: 3.2...3.99, 20.01...24, hardware fault current: 3.2)		
uncertainty		0.04 % of output value ±3 µA		
active output		R_{ext} = 250...530 Ω, $U_{opencircuit}$ = 28 V DC		
passive output		U_{ext} = 9...30 V DC, depending on R_{ext} (R_{ext} < 458 Ω at 20 V)		
current output in HART mode		option		
• range	mA	4...20 (alarm current: 3.5...3.99, 20.01...22, hardware fault current: 3.2)		
• active output		R_{ext} = 250...530 Ω, $U_{opencircuit}$ = 28 V DC		
• passive output		U_{ext} = 9...30 V DC, depending on R_{ext} (R_{ext} = 250...458 Ω at 20 V)		
• digital output				
functions		• frequency output • binary output • pulse output		
type		open collector (passive)		
operating parameters		**OC30V** (IEC 60947-5-6) 5...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...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...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...10		
• damping	s	0...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...1000		
• pulse width	ms	0.05...1000		
• pulse rate		max. 10 000 pulses		

[1] with aperture calibration of the transducers

[2] test measurement to validate the application required in advance

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

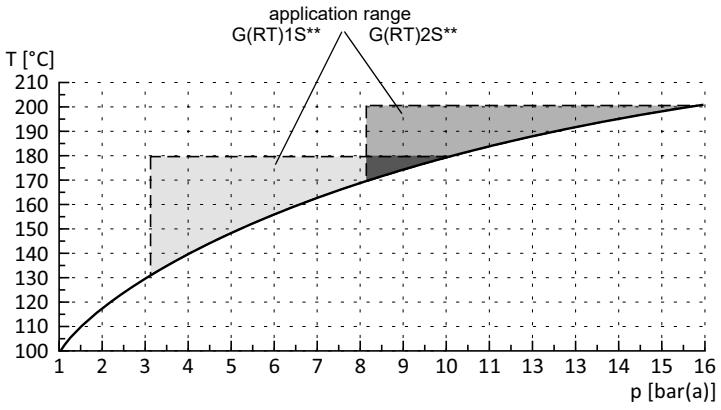
		FLUXUS G731ST-LT nonEx	FLUXUS G731ST-LT ATEX/IECEx	FLUXUS G731ST-LT FM Class I Div. 2
inputs				
		The inputs are galvanically isolated from the transmitter.		
number		on request, current inputs and outputs: max. 4		
• temperature input				
type		Pt100/Pt1000		
connection		4-wire		
range	°C	-150...+560		
resolution	K	0.01		
accuracy		±0.01 % MV ±0.03 K at 18...28 °C ±0.01 % MV ±0.03 K ±0.0005 %/K at <18 °C/>28 °C		
cable resistance	Ω	max. 1000		
• switchable current input				
		All switchable current inputs are jointly switched to active or passive.		
accuracy		±0.1 % MV ±0.01 mA at 18...28 °C ±0.1 % MV ±0.01 mA ±0.005 %/K at <18 °C/>28 °C		
resolution	µA	0.1		
active input • range	mA	R_{int} = 75 Ω, I_{max} ≤ 30 mA $U_{opencircuit}$ = 28 V (open circuit) U_{min} = 21.4 V at 20 mA 0...20		
passive input • range	mA	U_{ext} = 24 V, R_{int} = 35 Ω, I_{max} ≤ 24 mA 0...20		

[1] with aperture calibration of the transducers

[2] test measurement to validate the application required in advance

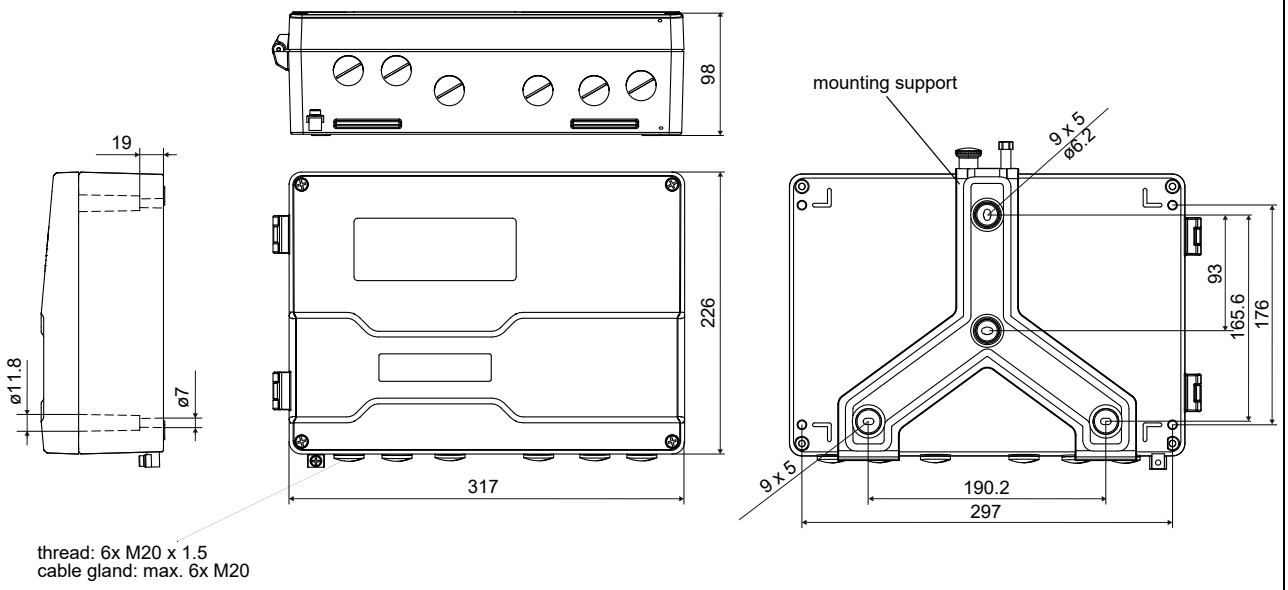
[3] outside the explosive atmosphere (housing cover open)

Saturated steam pressure curve



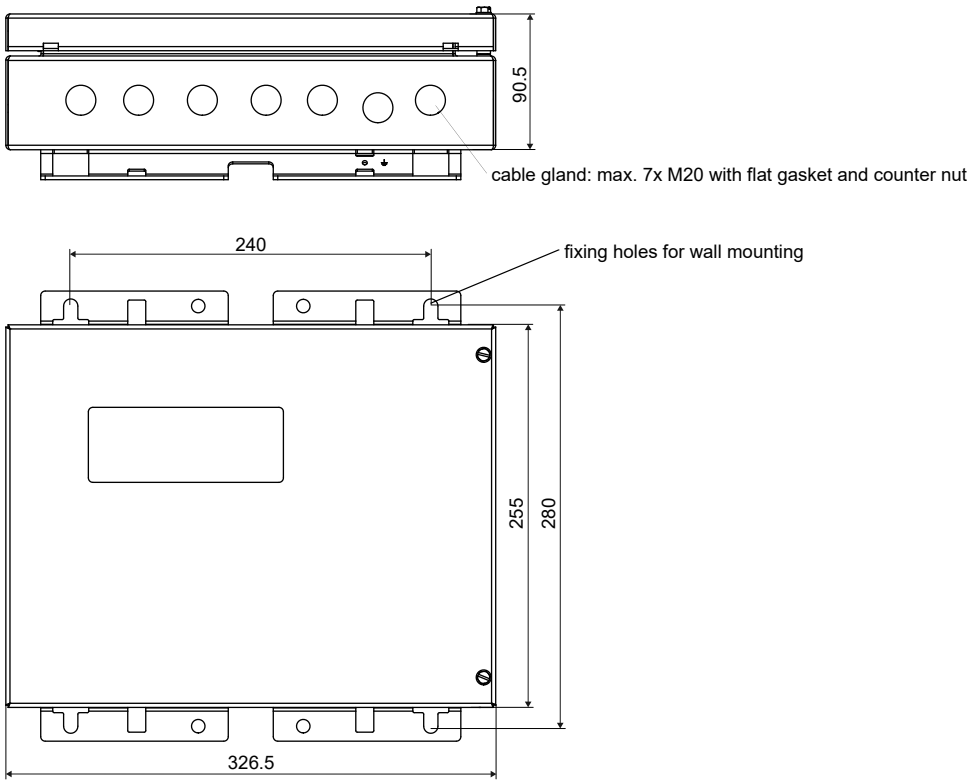
Dimensions

***731 (aluminum housing)**



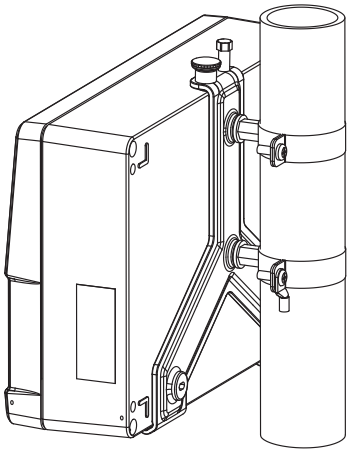
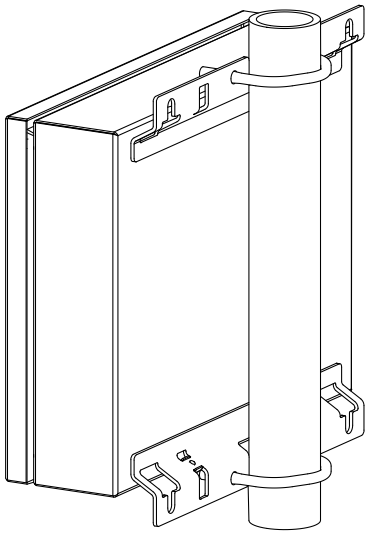
in mm

***731 (stainless steel housing)**



in mm

2" pipe mounting kit

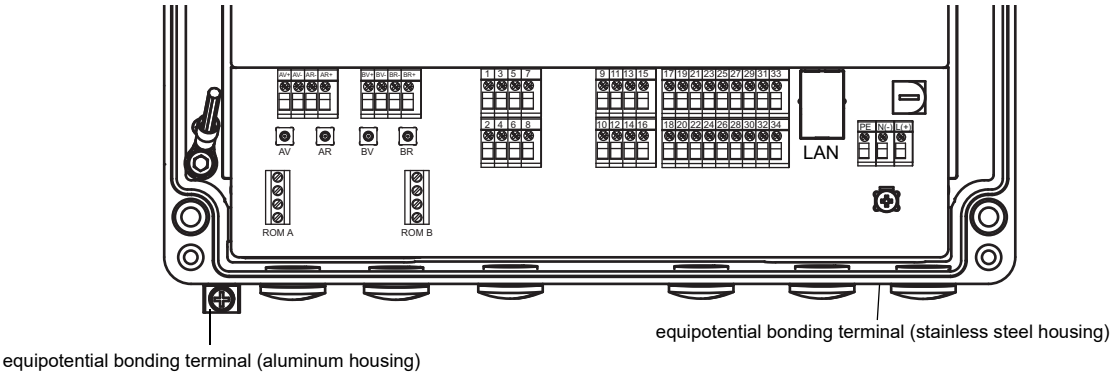
***731 (aluminum housing)** 	item number: 731037-1
***731 (stainless steel housing)** 	item number: 721110-4

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...+60 °C

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 (transducers *****53, *****8*), extension cable					transducer cable (transducers *****52)		
measuring channel A		**measuring channel B**			**measuring channel A**	**measuring channel B**	
terminal	**connection**	**terminal**	**connection**	**transducer**	**terminal**		**connection**
AV or AV+	signal	BV or BV+	signal		X_AV	X_BV	SMB connector
AVS or AV-	shield	BVS or BV-	shield				
ARS or AR-	shield	BRS or BR-	shield		X_AR	X_BR	SMB connector
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 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, M-Bus, Profibus PA, FF H1

temperature probe		
terminal	**direct connection**	**connection with extension cable**
1, 5, 9, 13	red	red
2, 6, 10, 14	white	white
3, 7, 11, 15	red/blue	grey
4, 8, 12, 16	white/blue	blue

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: 0.25...2.5 mm^2

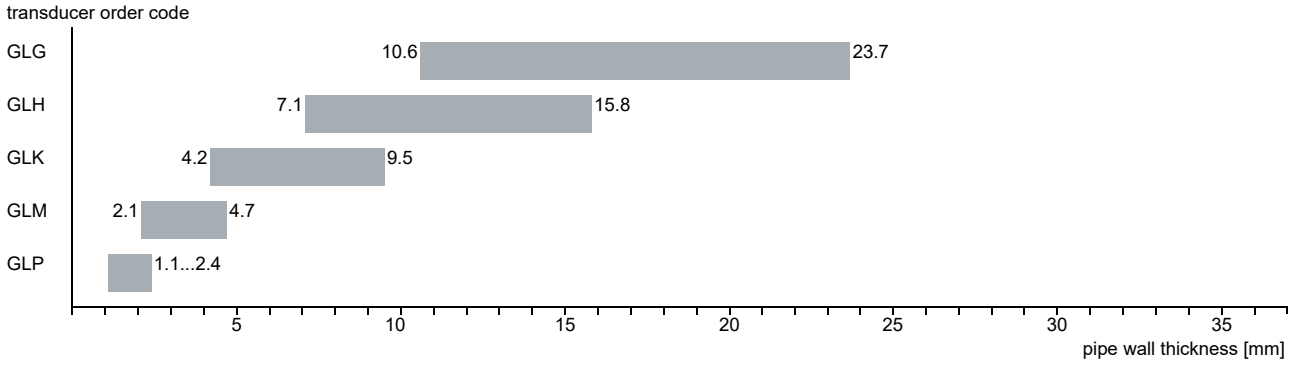
[2] The number, type and terminal assignment are customised.

Transducers

Transducer selection

Step 1

pipe wall thickness



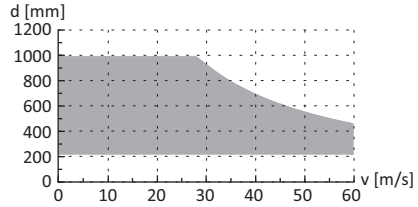
Step 2

inner pipe diameter d dependent on the flow velocity v of the fluid in the pipe

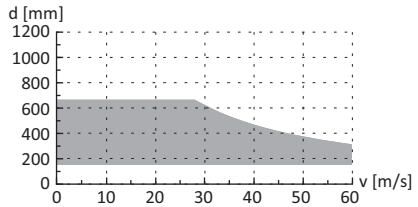
GL*-S

Diagonal arrangement, number of sound paths: 1

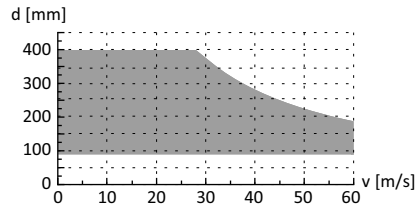
GLG-S



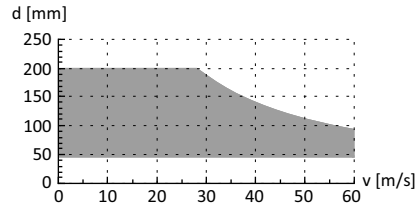
GLH-S



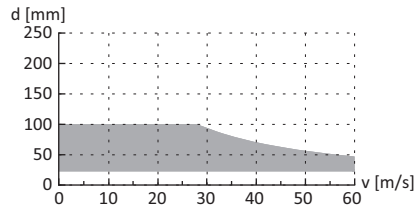
GLK-S



GLM-S

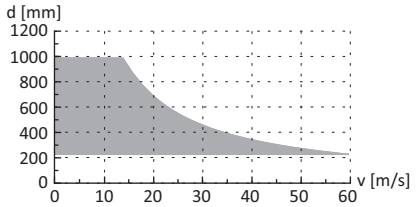


GLP-S

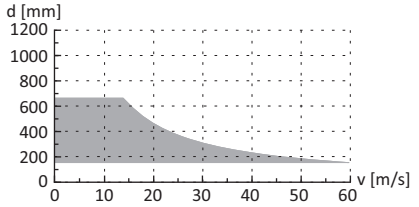


Reflection arrangement, number of sound paths: 2

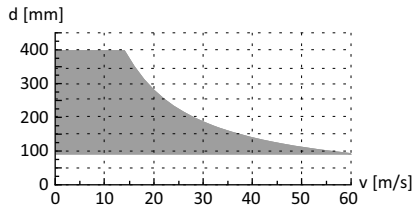
GLG-S



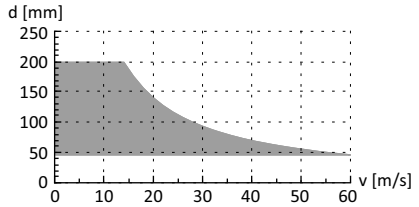
GLH-S



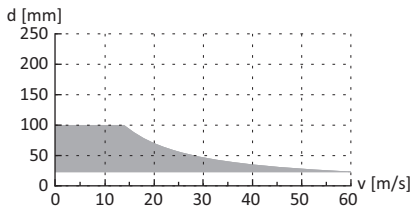
GLK-S



GLM-S



GLP-S

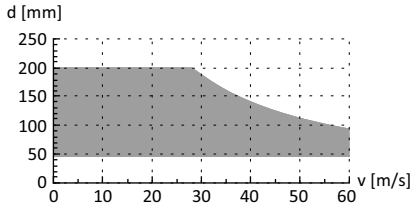


inner pipe diameter and max. flow velocity for a steam application

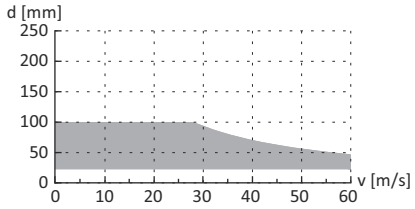
GL*-T

Diagonal arrangement, number of sound paths: 1

GLM-T

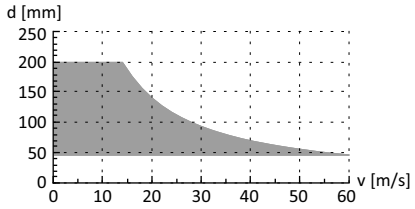


GLP-T

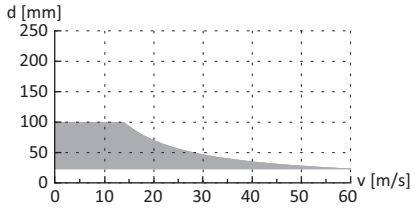


Reflection arrangement, number of sound paths: 2

GLM-T



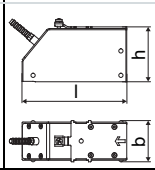
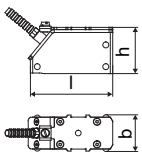
GLP-T



inner pipe diameter and max. flow velocity for a steam application

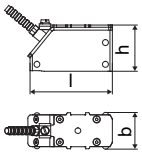
Technical data

Lamb wave transducers (zone 2 - FM Class I Div. 2 - nonEx, TS, steam measurement - max. 180 °C)

order code		GLG-S***-**TS	GLH-S***-**TS	GLK-S***-**TS	GLM-S***-**TS	GLP-SNNN-**TS
technical type		G(RT)G1S52	G(RT)H1S52	G(RT)K1S52	G(RT)M1S52	G(RT)P1S52
transducer frequency	MHz	0.2	0.3	0.5	1	2
fluid pressure		see saturated steam pressure curve				
inner pipe diameter d						
min.	mm	225	150	90	45	23
max.	mm	1000	667	400	200	100
pipe wall thickness						
min.	mm	10.6	7.1	4.2	2.1	1.1
max.	mm	23.7	15.8	9.5	4.7	2.4
material						
housing		PPSU with stainless steel cover 316Ti (1.4571)				
contact surface		PPSU				
degree of protection		IP66				
transducer cable						
type		1699				
length	m	5			4	
dimensions						
length l	mm	128.5			74	
width b	mm	51			32	
height h	mm	67.5			40.5	
dimensional drawing						
weight (without cable)	kg	0.8			0.16	
storing temperature	°C	-40...+155				
operating temperature	°C	135...180				
warm-up time	h	3			1	
temperature compensation		x				
explosion protection						
• **ATEX/IECEx**						
order code		GLG-SA2*-**TS	GLH-SA2*-**TS	GLK-SA2*-**TS	GLM-SA2*-**TS	-
pipe surface temperature (Ex)	°C	gas: -50...+165 dust: -50...+155				-
marking		CE 0637 Ex II3G II2D Ex nA IIC T6...T3 Gc Ex tb IIIC T80 °C...T160 °C Db				-
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X				-
• **FM**						
order code		GLG-SF2*-**TS	GLH-SF2*-**TS	GLK-SF2*-**TS	GLM-SF2*-**TS	-
pipe surface temperature (Ex)	°C	Class I: -40...+165 Class II, III: -40...+155				-
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				-

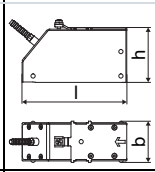
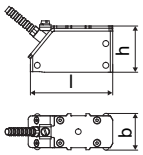
completely thermically insulated transducer installation necessary

Lamb wave transducers (nonEx, TS, steam measurement - max. 200 °C)

order code		GLM-T***-**TS	GLP-T***-**TS
technical type		G(RT)M2S52	G(RT)P2S52
transducer frequency	MHz	1	2
fluid pressure		see saturated steam pressure curve	
inner pipe diameter d			
min.	mm	45	23
max.	mm	200	100
pipe wall thickness			
min.	mm	2.1	1.1
max.	mm	4.7	2.4
material			
housing		PI with stainless steel cover 316Ti (1.4571)	
contact surface		PI	
degree of protection		IP66	
transducer cable			
type		6111	
length	m	4	
dimensions			
length l	mm	74	
width b	mm	32	
height h	mm	40.5	
dimensional drawing			
weight (without cable)	kg	0.18	
storing temperature			
storing temperature	°C	-30...+155	
operating temperature	°C	170…200	
warm-up time	h	1	
temperature compensation		x	

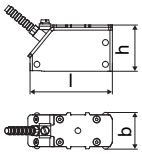
completely thermically insulated transducer installation necessary

Lamb wave transducers (zone 2 - FM Class I Div. 2 - nonEx, T1, steam measurement - max. 180 °C)

order code		GLG-S***-**T1	GLH-S***-**T1	GLK-S***-**T1	GLM-S***-**T1	GLP-SNNN-**T1
technical type		G(RT)G1S53	G(RT)H1S53	G(RT)K1S53	G(RT)M1S53	G(RT)P1S53
transducer frequency	MHz	0.2	0.3	0.5	1	2
fluid pressure		see saturated steam pressure curve				
inner pipe diameter d						
min.	mm	225	150	90	45	23
max.	mm	1000	667	400	200	100
pipe wall thickness						
min.	mm	10.6	7.1	4.2	2.1	1.1
max.	mm	23.7	15.8	9.5	4.7	2.4
material						
housing		PPSU with stainless steel cover 316Ti (1.4571)				
contact surface		PPSU				
degree of protection		IP66				
transducer cable						
type		1699				
length	m	5			4	
dimensions						
length l	mm	128.5			74	
width b	mm	51			32	
height h	mm	67.5			40.5	
dimensional drawing						
weight (without cable)	kg	0.8			0.16	
storing temperature	°C	-40...+155				
operating temperature	°C	135...180				
warm-up time	h	3			1	
temperature compensation		x				
explosion protection						
• **ATEX/IECEx**						
order code		GLG-SA2*-**T1	GLH-SA2*-**T1	GLK-SA2*-**T1	GLM-SA2*-**T1	-
pipe surface temperature (Ex)	°C	gas: -50...+165 dust: -50...+155				-
marking		CE 0637 Ex II3G II2D Ex nA IIC T6...T3 Gc Ex tb IIIC T80 °C...T160 °C Db				-
certification		IBExU10ATEX1163 X, IECEx IBE 12.0005X				-
• **FM**						
order code		GLG-SF2*-**T1	GLH-SF2*-**T1	GLK-SF2*-**T1	GLM-SF2*-**T1	-
pipe surface temperature (Ex)	°C	Class I: -40...+165 Class II, III: -40...+155				-
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				-

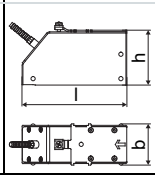
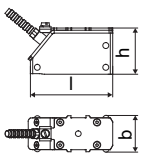
completely thermically insulated transducer installation necessary

Lamb wave transducers (nonEx, T1, steam measurement - max. 200 °C)

order code		GLM-T***-**T1	GLP-T***-**T1
technical type		G(RT)M2S53	G(RT)P2S53
transducer frequency	MHz	1	2
fluid pressure		see saturated steam pressure curve	
inner pipe diameter d			
min.	mm	45	23
max.	mm	200	100
pipe wall thickness			
min.	mm	2.1	1.1
max.	mm	4.7	2.4
material			
housing		PI with stainless steel cover 316Ti (1.4571)	
contact surface		PI	
degree of protection		IP66	
transducer cable			
type		6111	
length	m	4	
dimensions			
length l	mm	74	
width b	mm	32	
height h	mm	40.5	
dimensional drawing			
weight (without cable)	kg	0.18	
storing temperature			
storing temperature	°C	-30...+155	
operating temperature	°C	170…200	
warm-up time	h	1	
temperature compensation		x	

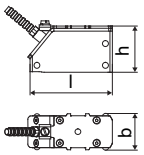
completely thermically insulated transducer installation necessary

Lamb wave transducers (zone 1, T1, steam measurement - max. 155 °C)

order code		GLG-S*1*-**T1	GLH-S*1*-**T1	GLK-S*1*-**T1	GLM-S*1*-**T1
technical type		G(RT)G1S83	G(RT)H1S83	G(RT)K1S83	G(RT)M1S83
transducer frequency	MHz	0.2	0.3	0.5	1
fluid pressure		see saturated steam pressure curve			
inner pipe diameter d					
min.	mm	225	150	90	45
max.	mm	1000	667	400	200
pipe wall thickness					
min.	mm	10.6	7.1	4.2	2.1
max.	mm	23.7	15.8	9.5	4.7
material					
housing		PPSU with stainless steel cover 316Ti (1.4571)			
contact surface		PPSU			
degree of protection		IP66			
transducer cable					
type		1699			
length	m	5			4
dimensions					
length l	mm	128.5			74
width b	mm	51			32
height h	mm	67.5			40.5
dimensional drawing					
weight (without cable)	kg	0.8			0.16
storing temperature	°C	-40...+155			
operating temperature	°C	135...155			
warm-up time	h	3			1
temperature compensation		x			
explosion protection					
• **ATEX/IECEx, UKEX**					
order code		GLG-SA1*-**T1	GLH-SA1*-**T1	GLK-SA1*-**T1	GLM-SA1*-**T1
pipe surface temperature (Ex)	°C	-50...+155			
marking		CE 0637 Ex II2G UK CA II2D Ex q IIC T6...T3 Gb Ex tb IIIC T80 °C...T160 °C Db			
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X			

completely thermically insulated transducer installation necessary

Lamb wave transducers (zone 1, T1, steam measurement - max. 185 °C)

order code		GLM-T*1N-**T1	GLP-T*1N-**T1
technical type		G(RT)M2S83	G(RT)P2S83
transducer frequency	MHz	1	2
fluid pressure		see saturated steam pressure curve	
inner pipe diameter d			
min.	mm	50	25
max.	mm	100	50
pipe wall thickness			
min.	mm	2.1	1.1
max.	mm	4.7	2.4
material			
housing		PI with stainless steel cover 316Ti (1.4571)	
contact surface		PI	
degree of protection		IP66	
transducer cable			
type		6111	
length	m	4	
dimensions			
length l	mm	74	
width b	mm	32	
height h	mm	40.5	
dimensional drawing			
weight (without cable)	kg	0.18	
storing temperature	°C	-30...+185	
operating temperature	°C	170…185	
warm-up time	h	1	
temperature compensation		x	
explosion protection			
• **ATEX/IECEx**			
order code		GLM-TA1N-**T1	GLP-TA1N-**T1
pipe surface temperature (Ex)	°C	-45…+185	
marking		CE 0637 Ex II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC T80 °C...T185 °C Db	
certification		IBExU07ATEX1168 X, IECEx IBE 08.0007X	

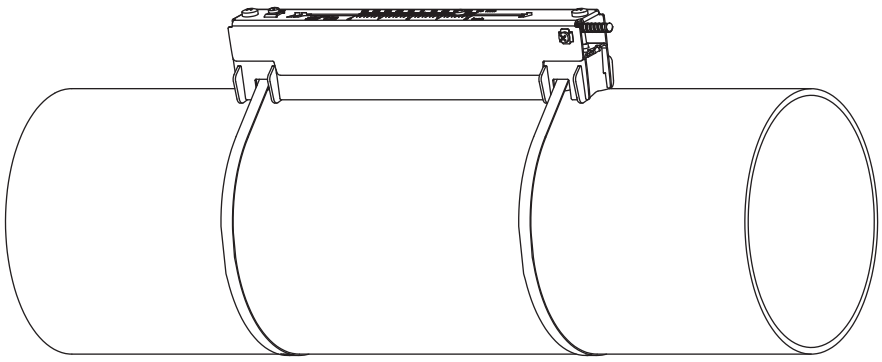
completely thermically insulated transducer installation necessary

Transducer mounting fixture

Order code

1, 2	3		4	5		6	7...10			no. of character
transducer mounting fixture	**transducer**	**-**	**measurement arrangement**	**size**	**-**	**fixation**	**outer pipe diameter**	**/**	**option**	**description**
VL										Variofix L
	G									transducers with transducer frequency G
	H									transducers with transducer frequency H
	K									transducers with transducer frequency K
	M									transducers with transducer frequency M
	P									transducers with transducer frequency P
			D							reflection arrangement or diagonal arrangement
				S						small
						S				tension straps
						W				welding
							T360			40...360 mm
							0130			10...130 mm
							0360			130...360 mm
							0920			360...920 mm
							2000			920...2000 mm
							4500			2000...4500 mm

Variofix L (VL)



material: stainless steel 316Ti (1.4571), 316L (1.4404), 17-7PH (1.4568)

inner length:
VL(GHK): 348 mm,
VL(MP): 234 mm

dimensions:
VL(GHK): 423 x 90 x 93 mm
VL(MP): 309 x 57 x 63 mm

Coupling materials for transducers

type	ambient temperature °C
coupling foil type VT[1]	-10...+200
coupling compound type E[2]	-30...+200

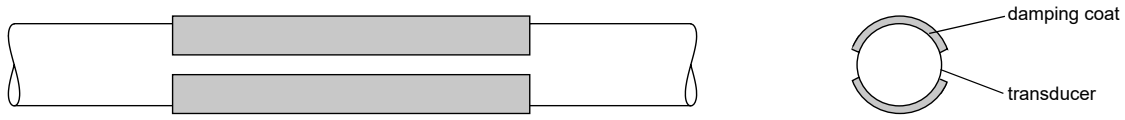
[1] fluid temperature 200 °C: min. 2 years

[2] in combination with type VT only

Damping coat

The damping coat will be used to reduce acoustic noise influences on the measurement.

Example (diagonal arrangement)



Technical data

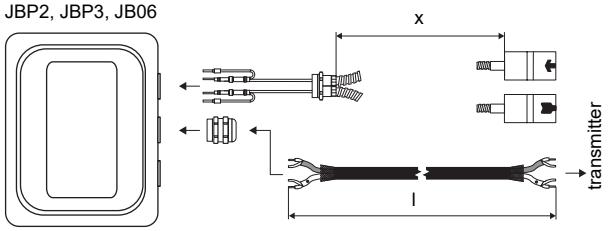
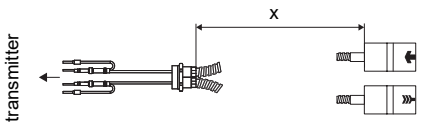
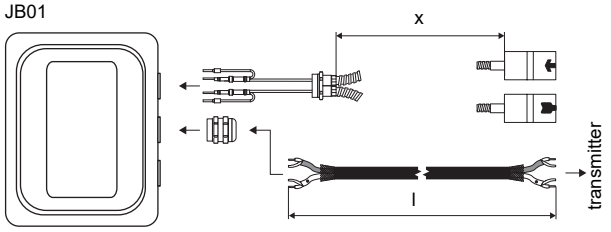
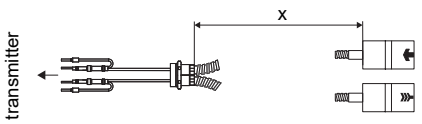
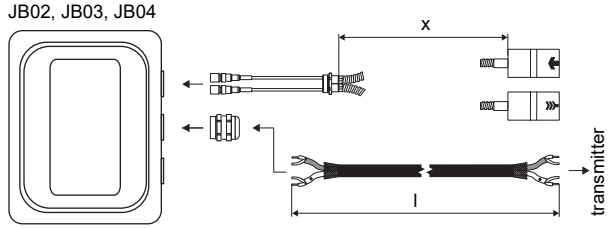
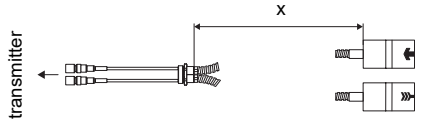
item number		992080-13
material		multipolymeric matrix/inorganic ceramic coating
packing drum	l	1
properties		heat-resistant, inert
fluid temperature when applying	°C	10...200
drying time (example)		approx. 3 h at 20 °C approx. 15 min at 150 °C
temperature resistance in dry state	°C	max. 650
durability of the packing drum (unopened)		2 years

Observe installation instructions (TI_DampingCoat).

Dimensioning

transducer frequency	**number of packing drums**		
	outer pipe diameter		
	≤300	≤500	≤700
	mm		
G	2	3	4
H	2	2	3
K	2	2	-
M	2	-	-
P	1	-	-

Connection systems

connection system T1		
connection with extension cable	direct connection	transducers technical type
JBP2, JBP3, JB06 		*****53
JB01 		*****8*
connection system TS		
connection with extension cable	direct connection	transducers technical type
JB02, JB03, JB04 		*****52

Cable

transducer cable		
type		**1699**
weight	kg/m	0.094
ambient temperature	°C	-55...+200
cable jacket		
material		PTFE
outer diameter	mm	2.9
thickness	mm	0.3
colour		brown
shield		x
sheath		
material		stainless steel 316Ti (1.4571)
outer diameter	mm	8

extension cable			
type		**2615**	**5245**
weight	kg/m	0.18	0.38
ambient temperature	°C	-30...+70	-30...+70
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	mm	max. 12	max. 12
thickness	mm	2	2
colour		black	black
shield		x	x
sheath			
material		-	steel wire braid with copolymer sheath
outer diameter	mm	-	max. 15.5

Cable length

transducer frequency		**G, H, K**		**M, P**	
transducers technical type		x	l	x	l
*R***8*		5	≤ 300	4	≤ 300
*T***8*		9	≤ 300	9	≤ 300
*R***5*	m	5	≤ 300	4	≤ 300
*T***5*	m	9	≤ 300	9	≤ 300

x - transducer cable length

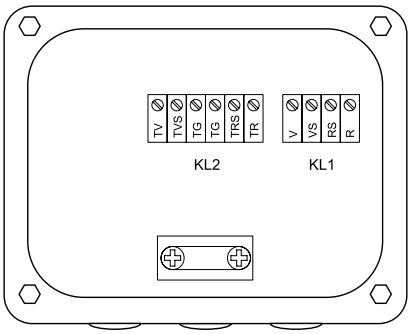
l - max. length of extension cable (depending on the application)

Junction box

Technical data

JB01S4E3M		
weight	kg	1.2 kg
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L (1.4404)
gasket		silicone
degree of protection		IP66/IP67
ambient temperature	°C	-40...+80
explosion protection		
• ATEX/IECEx, UKEX		
marking		CE 0637 Ex II2G UK CA II2D Ex eb mb IIC T6...T4 Gb Ex tb IIIC T100 °C Db Ta -40...+70/80 °C
certification		IBExU06ATEX1161 IECEx IBE 08.0006
type of protection		gas: increased safety decoupling network: encapsulation dust: protection by enclosure

Connection



Transducers

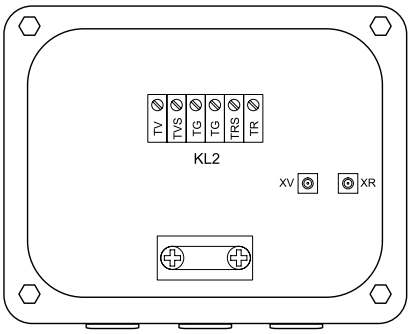
terminal strip	terminal	connection	transducer
KL1	V	signal	
	VS	internal shield	
	RS	internal shield	
	R	signal	

Extension cable

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

JB02, JB03, JB04		
weight	kg	1.2 kg
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L (1.4404)
gasket		silicone
degree of protection		JB02, JB03: IP66/IP67 JB04: Type 4X, IP66
ambient temperature	°C	-40...+80
explosion protection		
• ATEX, UKEX		
junction box		JB02
marking		CE Ex UK CA II3G Ex nA IIC T6...T4 Gc II3D Ex tc IIIC T 100 °C Dc -40 ≤ Ta ≤ +70 °C/+80 °C
• FM		
junction box		JB04
certification type		JBC24
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

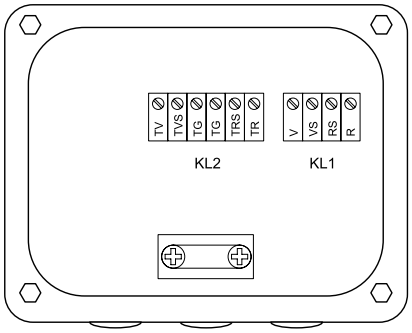
	terminal	connection	transducer
	XV	SMB connector	
	XR	SMB connector	

Extension cable

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

JBP2, JBP3, JB06		
weight	kg	1.2 kg
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L (1.4404)
gasket		silicone
degree of protection		JBP2, JBP3: IP66/IP67 JB06: Type 4X, IP66
ambient temperature	°C	-40...+80
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

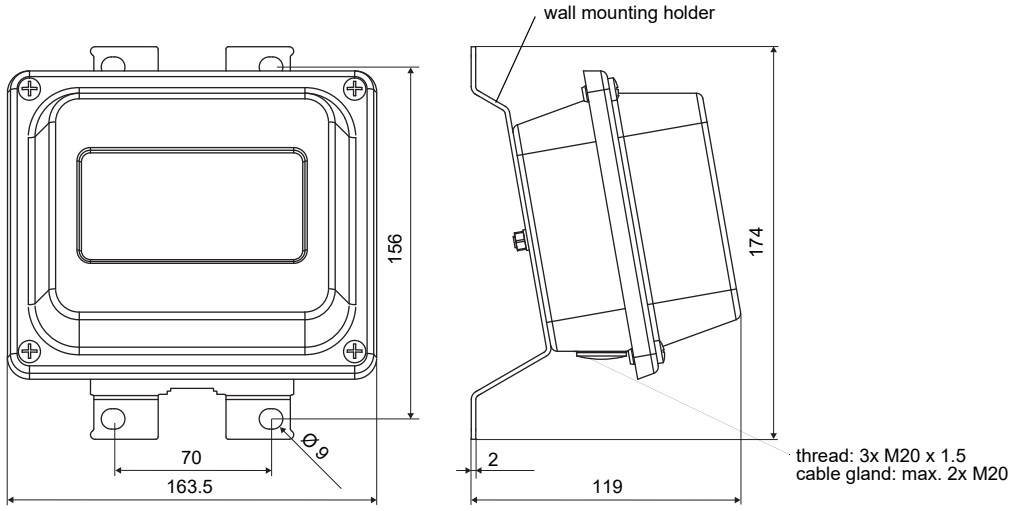
terminal strip	terminal	connection	transducer
KL1	V	signal	
	VS	internal shield	
	RS	internal shield	
	R	signal	

Extension cable

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

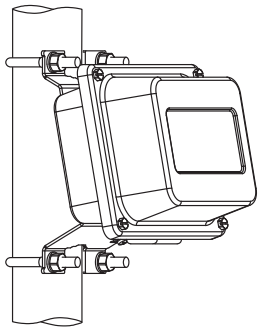
Dimensions

JB0*, JBP*



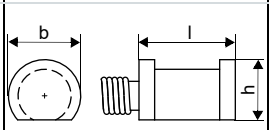
in mm

2" pipe mounting kit

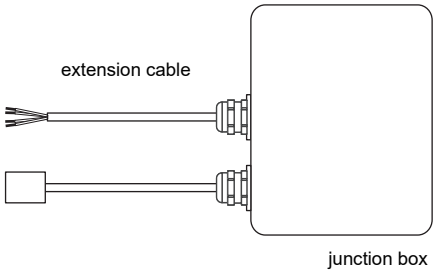
JB** 	item number: 751035-2

Clamp-on temperature probe (optional)

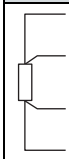
Technical data

PT12N, PT12N-LC		
item number		**PT12N:** • 770415-1 **PT12N-LC:** • 770415-4
design		clamp-on option: with long cable
type		Pt100
connection		4-wire
measuring range	°C	-30...+250
accuracy T		±(0.15 °C + 2 · 10^{-3} · |T [°C]|) class A
response time	s	50
housing material		aluminum
degree of protection		IP54
dimensions		
length l	mm	20
width b	mm	15
height h	mm	13
dimensional drawing		
weight	kg	0.25
accessories		
thermal conductivity foil 250 °C		x

Connection system

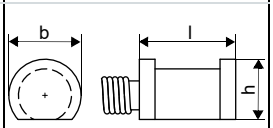
connection with extension cable	direct connection
	

Connection

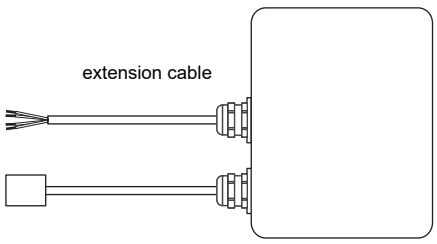
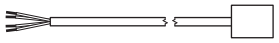
	temperature probe
	red
	red/blue
	white/blue
	white

Cable

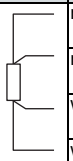
		PT12N	PT12N-LC	extension cable
type		4 x 0.22 mm^2		LIYCY 8 x 0.14 mm^2 grey
standard length	m	3	15	5/10/25
max. length	m	-		200
ambient temperature	°C	-30...+250		-25...+80
min. bend radius	mm	27		68
cable jacket				
material		PFA		PVC
outer diameter	mm	3.8 ±0.15		4.8 ±0.2
colour		black		grey

PT12N		
order code		770415-1A2
design		clamp-on ATEX, UKEX
type		Pt100
connection		4-wire
measuring range	°C	-30...+250
accuracy T		±(0.15 °C + 2 · 10^{-3} · |T [°C]|) class A
response time	s	50
housing		aluminum
degree of protection		IP67
dimensions		
length l	mm	20
width b	mm	15
height h	mm	13
dimensional drawing		
weight	kg	0.25
accessories		
thermal conductivity foil 250 °C		x
explosion protection		
• **ATEX, UKEX**		
marking		II3G Ex nA IIC T6...T2 Gc Ta -30...+250 °C

Connection system

connection with extension cable	direct connection
	

Connection

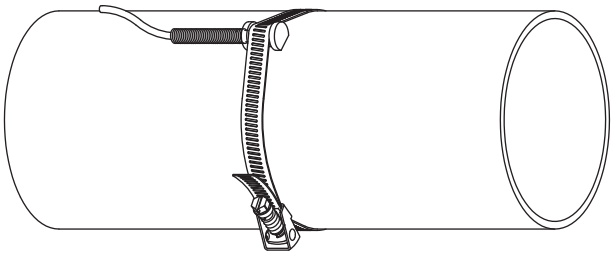
	temperature probe
	red
	red/blue
	white
	white/blue

Cable

		temperature probe	extension cable
type		4 x 0.25 mm^2	LIYCY 8 x 0.14 mm^2
standard length	m	3	5/10/25
max. length	m	-	200
ambient temperature	°C	-30...+250	-25...+80
min. bend radius	mm	19	68
cable jacket			
material		PTFE	PVC
outer diameter	mm	3.8	4.8 ±0.2
colour		black	grey

Fixation

tension strap PT12N

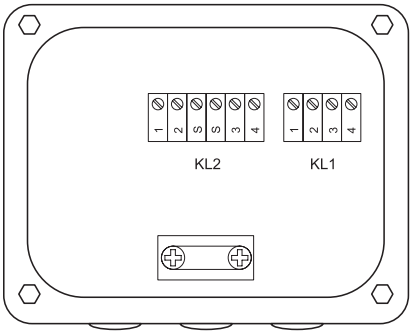


material: stainless steel 301 (1.4310), 410 (1.4006)
thermal insulation necessary

Junction box

JBT2, JBT3		
item number		• JBT2:770428-5A2 • JBT3: 751040-36
weight	kg	1.2 kg
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L (1.4404)
gasket		silicone
degree of protection		IP66/IP67
ambient temperature		
min.	°C	-40
max.	°C	+80
explosion protection		
• **ATEX**		
junction box		JBT2
marking		II3G Ex nA IIC T6...T4 Gc II3D Ex tc IIIC T 100 °C Dc -40 ≤ Ta ≤ +70 °C/+80 °C

Connection



Temperature probe

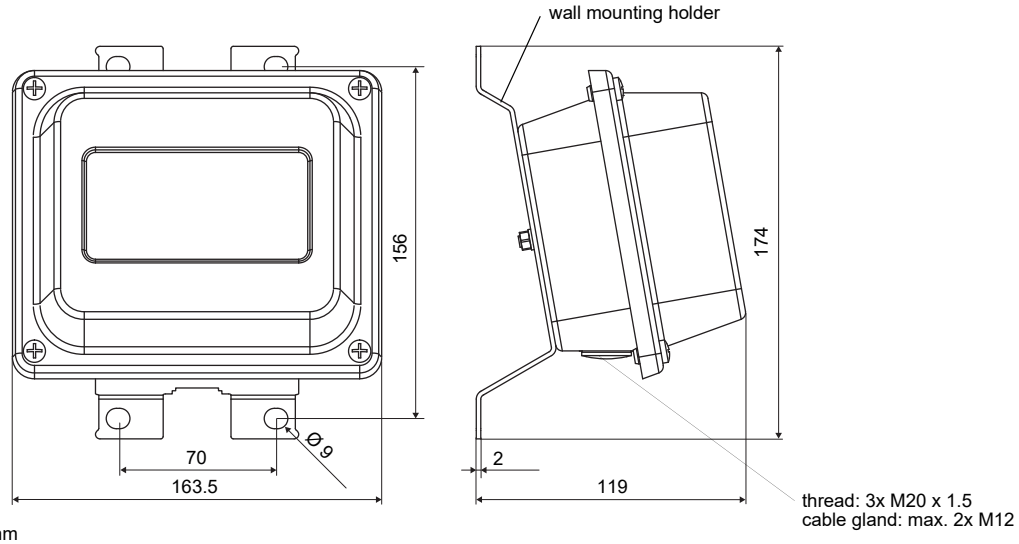
terminal strip	terminal	connection
KL1	1	red
	2	red/blue
	3	white
	4	white/blue

Extension cable

terminal strip	terminal	connection
KL2	1	red
	2	grey
	3	white
	4	blue

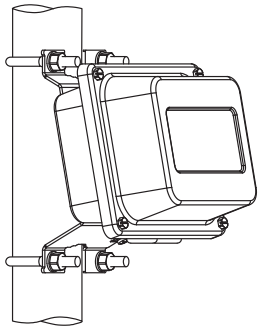
Dimensions

JBT*



in mm

2" pipe mounting kit

JB** 	item number: 751035-2

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