

Permanently installed ultrasonic flowmeter for liquids

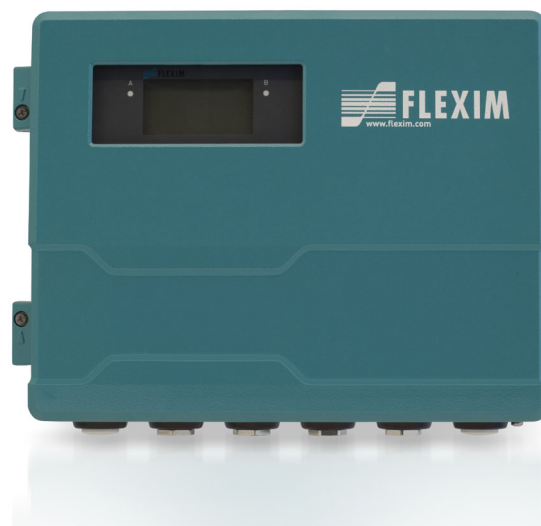
Transmitter for permanent outdoor wall or pipe mounting

Features

- Exact and highly reliable clamp-on volume and mass flow measurement
- High measurement accuracy even at very low as well as very high flow rates and independent of the flow direction (bidirectional)
- The measurement is zero point stable, drift free and independent of pipe material, process pressure, process temperature and process fluid
- Advanced self-diagnosis and possibilities for event-based triggering of data recording for the supervision and control of critical processes
- Bidirectional communication and support of common bus technologies (Profibus PA, Foundation Fieldbus, HART, Modbus, BACnet, M-Bus)
- Installation and start-up do not require any pipe work nor any process interruptions
- Transmitter and transducers are separately calibrated (traceable to national standards)
- Automatic loading of calibration data and transducer recognition
- Transducers available for a wide range of inner pipe diameters and fluid temperatures $-200...+600\text{ }^{\circ}\text{C}$
- Transmitter and transducers for use in hazardous areas are available
- Possibility to measure thermal energy quantities when using clamp-on or inline temperature probes

Applications

- Chemical industry
- Petrochemical industry
- Oil and gas industry
- Pharmaceutical industry
- Semiconductor industry
- Manufacturing industries
- Building technology/energy management
- Water and wastewater industry
- Mining industries



FLUXUS F721**-*A



FLUXUS F721**-*S



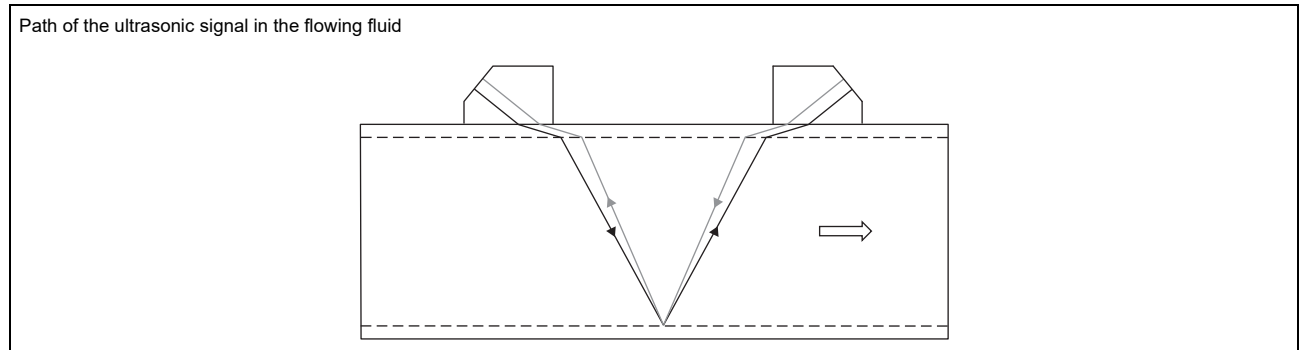
Variotix C

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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.

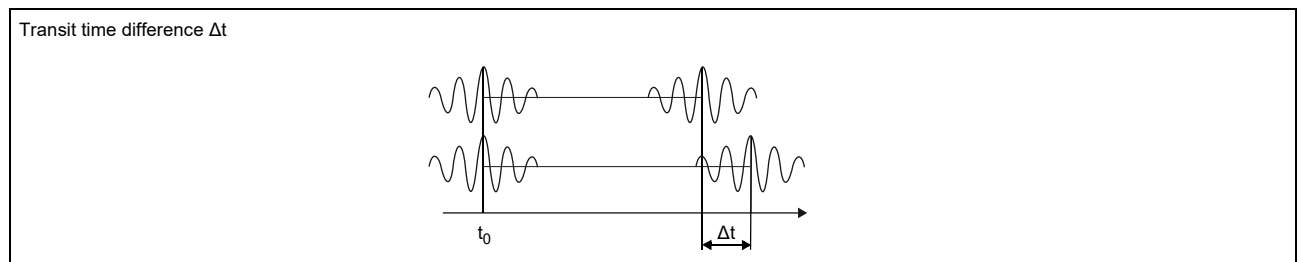


Transit time difference principle

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.



HybridTrek

If the gaseous or solid content in the fluid increases occasionally during measurement, a measurement with the transit time difference principle is no longer possible. NoiseTrek mode will then be selected by the flowmeter. This measurement method allows the flowmeter to achieve a stable measurement even with high gaseous or solid content.

The transmitter automatically toggles between the TransitTime and the NoiseTrek mode without having to change the measuring setup.

Calculation of volumetric flow rate

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

where

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

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.

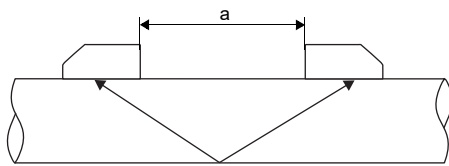
- **diagonal arrangement**

The number of sound paths is odd. The transducers are mounted on opposite sides of the pipe. In the case of a high signal attenuation by the fluid, pipe and coatings, diagonal arrangement with 1 sound path will be used.

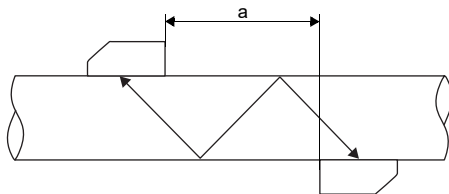
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

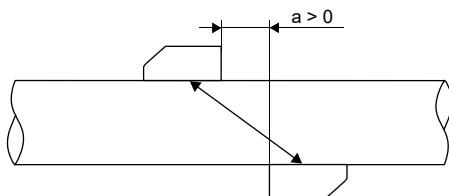
Reflection arrangement, number of sound paths: 2



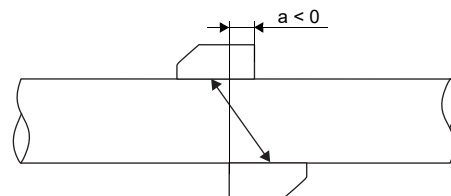
Diagonal arrangement, number of sound paths: 3



Diagonal arrangement, number of sound paths: 1




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



a - transducer distance

Transmitter

Technical data

		FLUXUS F721**-NN0*A F721**-NN0*S	FLUXUS F721**-E20*S
			
design		standard field device	standard field device zone 2
measurement			
measurement principle		transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content	
flow velocity	m/s	0.01...25	
repeatability		0.15 % MV ±0.005 m/s	
fluid		all acoustically conductive liquids with < 10 % gaseous or solid content in volume (transit time difference principle)	
temperature compensation		corresponding to the recommendations in ANSI/ASME MFC-5.1-2011	
measurement uncertainty		see metrological certificate	
transmitter			
power supply		• 100...230 V/50...60 Hz or • 20...32 V === or • 11...16 V ===	
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: 5.4 stainless steel housing: 5.1	
fixation		wall mounting, optional: 2" pipe mounting	
ambient temperature	°C	-40...+60 (< -20 without operation of the display)	
display		128 x 64 pixels, backlight	
menu language		English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian	
explosion protection			
• TR TS			
marking		-	2Ex nA nC [ic] IIC T4 Gc Ex tb IIC T120 °C Db от -40 °C до +60 °C пыль: от -40 °C до +50 °C
certification		-	ATEX [Ex] TC RU C-DE.BH02.B.00644
measuring functions			
physical quantities		volumetric flow rate, mass flow rate, flow velocity, thermal energy rate (if temperature inputs are installed)	
totaliser		volume, mass, optional: thermal energy	
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: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • M-Bus • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP
accessories			
data transmission kit		USB cable	
software		• FluxDiagReader: reading of measured values and parameters, graphical presentation • FluxDiag (optional): reading of measurement data, graphical presentation, report generation, parametrisation of the transmitter	

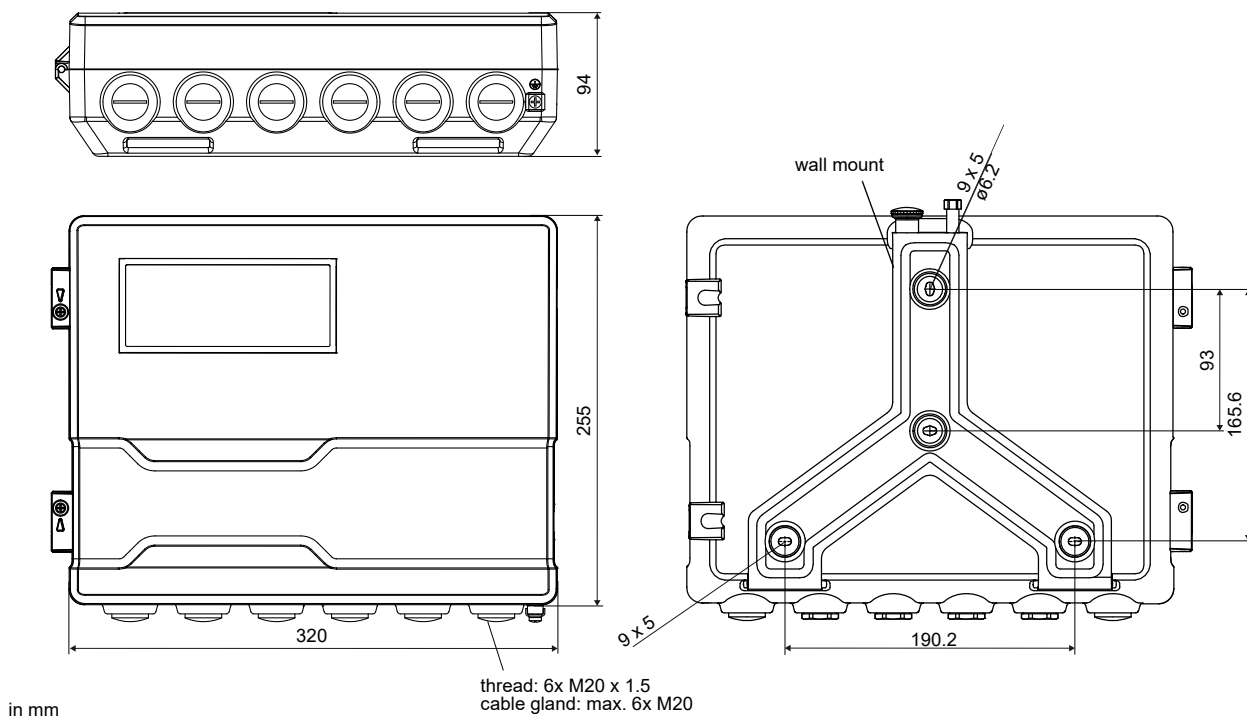
³ outside the explosive atmosphere (housing cover open)

		FLUXUS F721**-NN0*A F721**-NN0*S	FLUXUS F721**-E20*S
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	
• switchable current output			
		All switchable current outputs are jointly switched to active or passive.	
range	mA	4...20 (3.2...22)	
accuracy		0.04 % MV ±3 µA	
active output		R _{ext} < 350 Ω	
passive output		U _{ext} = 8...30 V, depending on R _{ext} (R _{ext} < 1 kΩ at 30 V)	
• HART			
range	mA	4...20	
accuracy		0.1 % MV ±15 µA	
active output		U _{int} = 24 V, R _{ext} < 500 Ω	
passive output		U _{ext} = 10...24 V ==, depending on R _{ext} (R _{ext} < 1 kΩ at 24 V)	
• voltage output			
range	V	0...1 or 0...10	
accuracy		0...1 V: 0.1 % MV ±1 mV 0...10 V: 0.1 % MV ±10 mV	
internal resistance		R _{int} = 500 Ω	
• frequency output			
range	kHz	-	0...5
optorelay		-	24 V/4 mA, R _{int} = 66.5 Ω
• binary output			
optorelay		-	26 V/100 mA
Reed relay		-	48 V/100 mA, R _{int} = 22 Ω
binary output as alarm output			
• functions		-	limit, change of flow direction or error
binary output as pulse output			
• functions		-	mainly for totalising
• pulse value	units	-	0.01...1000
• pulse width	ms	-	optorelay: 1...1000 Reed relay: 80...1000
• digital output			
functions		• frequency output • binary output • pulse output	-
number		3	-
operating parameters		5...30 V/< 100 mA	-
frequency output			
• range	kHz	0...5	-
binary output			
• binary output as alarm output		limit, change of flow direction or error	-
pulse output			
• functions		mainly for totalising	-
• pulse value	units	0.01...1000	-
• pulse width	ms	0.05...1000	-
inputs			
		The inputs are galvanically isolated from the transmitter.	
number		max. 4, on request	
• temperature input			
type		Pt100/Pt1000	
connection		4-wire	
range	°C	-150...+560	
resolution	K	0.01	
accuracy		±0.01 % MV ±0.03 K	
• current input			
accuracy		0.1 % MV ±10 µA	
active input		U _{int} = 24 V, R _{int} = 50 Ω, P _{int} < 0.5 W, not short-circuit proof	
• range	mA	0...20	
passive input		R _{int} = 50 Ω, P _{int} < 0.3 W	
• range	mA	-20...+20	
• voltage input			
range	V	0...1	
accuracy		0.1 % MV ±1 mV	
internal resistance		R _{int} = 1 MΩ	
• binary input			
switching signal		5...30 V, 1 mA	
functions		• reset of the measured values • reset of the totalisers • stop of the totalisers • activation of the measuring mode for highly dynamic flows	

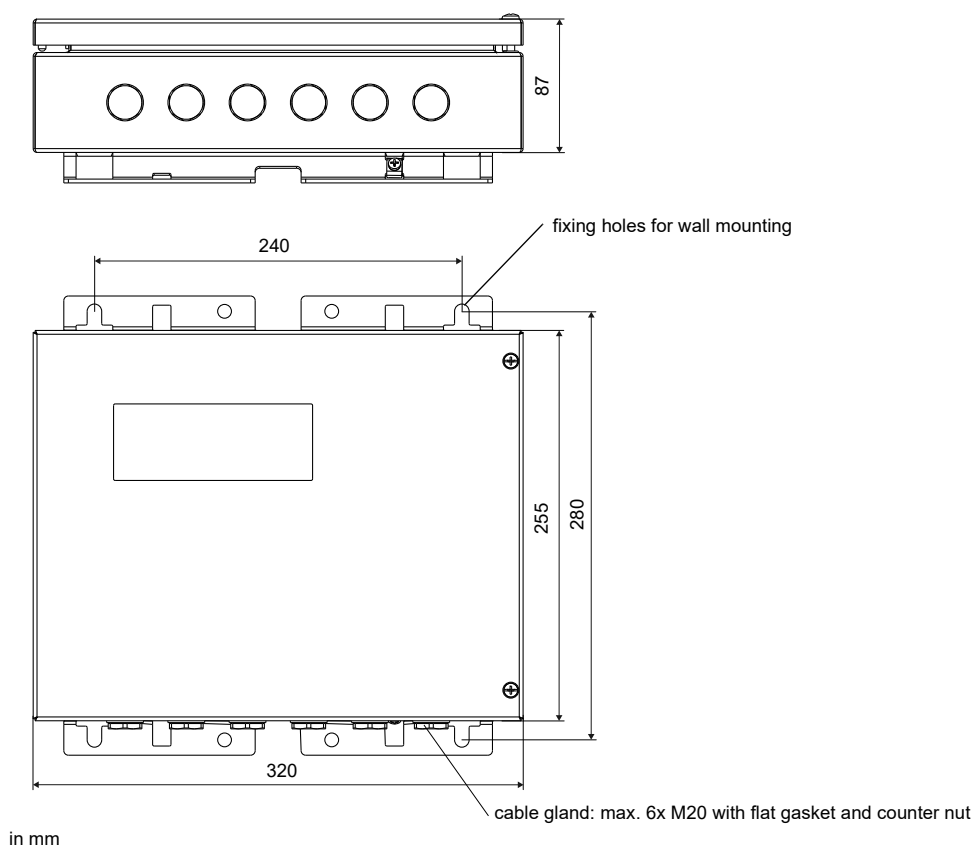
³ outside the explosive atmosphere (housing cover open)

Dimensions

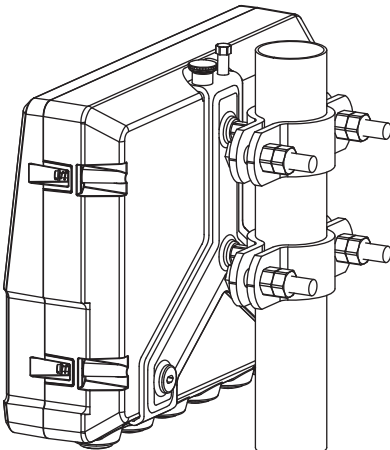
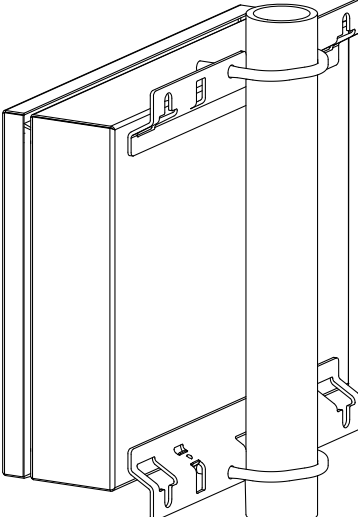
72-****A**



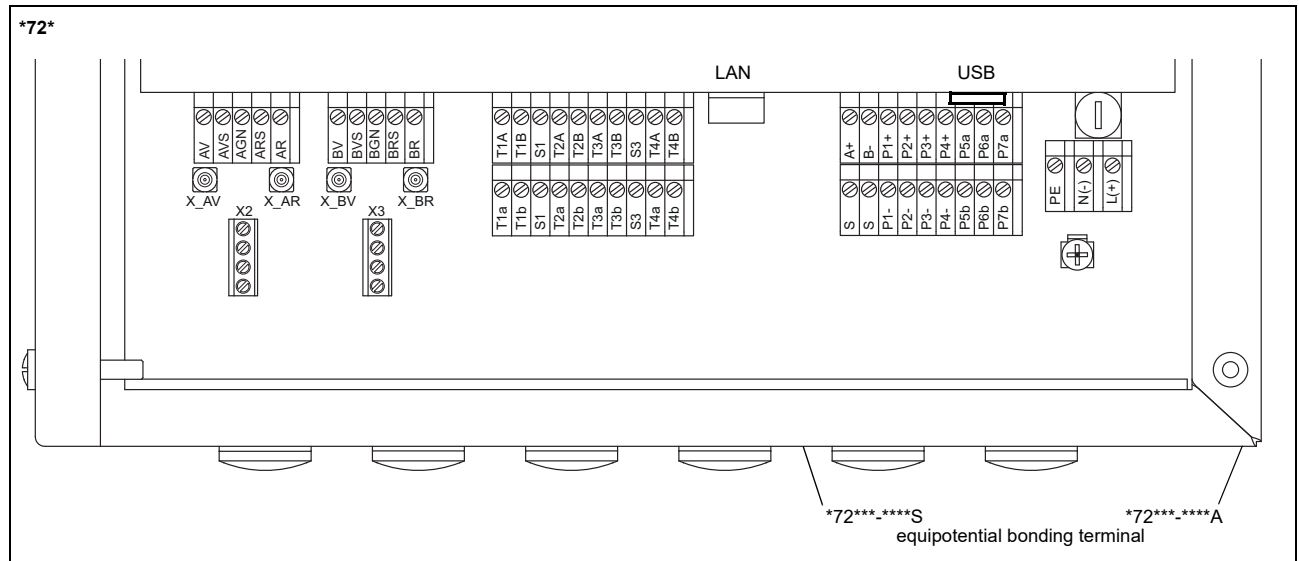
*72***-****S



2" pipe mounting kit

<div><div>*72***.****A</div><div></div></div>	<div><div>order code: ACC-PE-*721-/PMK4</div></div>
<div><div>*72***.****S</div><div></div></div>	<div><div>order code: ACC-PE-*721-/PMK6</div></div>

Terminal assignment



power supply ¹							
terminal				connection (AC)		connection (DC)	
PE				earth		earth	
N(-)				neutral		-	
L(+)				phase		+	
transducers							
transducer cable (transducers *****8*, ****LI*), 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	signal	BV	signal	↑	X_AV	X_BV	SMB connector
AVS	shield	BVS	shield				
ARS	shield	BRS	shield	↗	X_AR	X_BR	SMB connector
AR	signal	BR	signal				
outputs ^{1, 2}							
terminal		connection		terminal	connection	communication interface	
P1+...P4+ P1-...P4-		current output, voltage output, frequency output, binary output (Reed relay), HART (P1)		A+	signal +	<ul style="list-style-type: none">• RS485¹• Modbus RTU¹• BACnet MS/TP¹• M-Bus¹• Profibus PA¹• FF H1¹	
				B-	signal -		
P5a...P7a P5b...P7b		binary output (optorelay), digital output		S	shield		
				USB	type B Hi-Speed USB 2.0 Device	<ul style="list-style-type: none">• service (FluxDiag/ FluxDiagReader)	
				LAN	RJ45 10/100 Mbps Ethernet	<ul style="list-style-type: none">• service (FluxDiag/ FluxDiagReader)• BACnet IP• Modbus TCP	
analog inputs ^{1, 2}							
		temperature probe		passive sensor		active sensor	
terminal		direct connection	connection with extension cable	connection		connection	
T1a...T4a		red	red	not connected		not connected	
T1A...T4A		red/blue	grey	-		+	
T1b...T4b		white/blue	blue	+		not connected	
T1B...T4B		white	white	not connected		-	
S1, S3		shield	shield	not connected		not connected	
binary inputs ^{1, 2}							
terminal							
P1+...P2+, P1-...P2-							

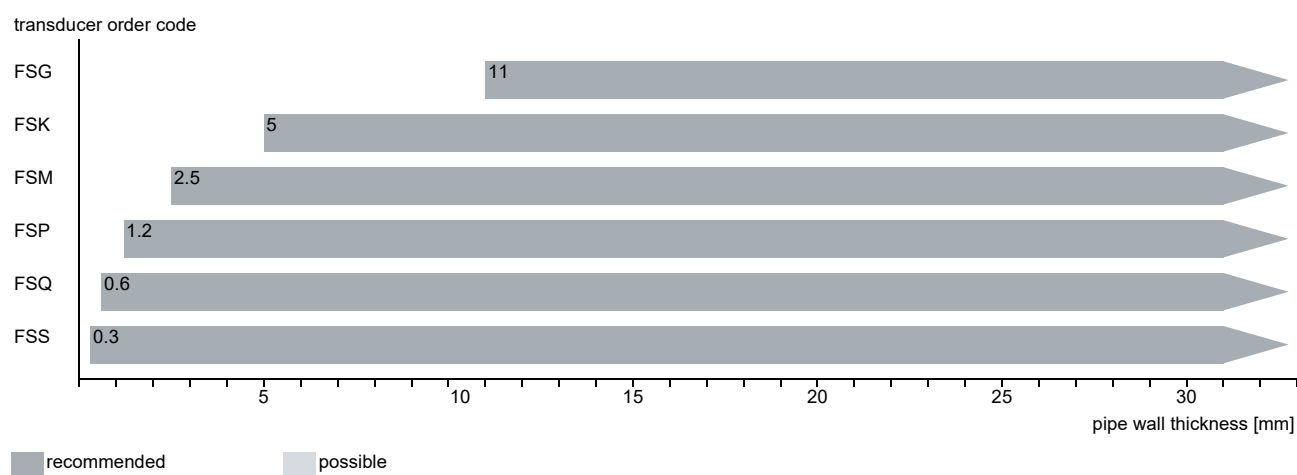
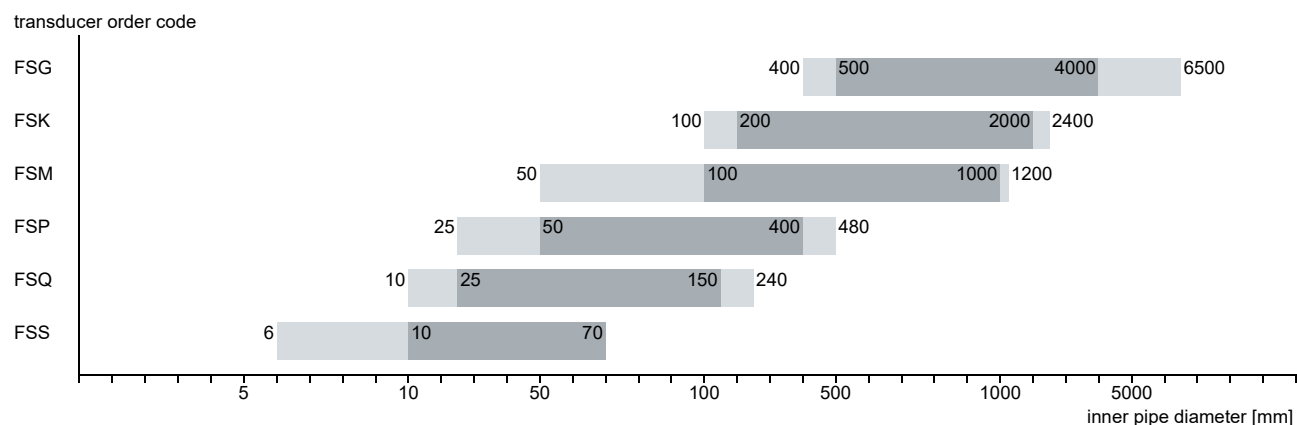
¹ cable (by customer):

- e.g. flexible wires, with insulated wire ferrules, wire cross-section: 0.25...2.5 mm²
- outer diameter of the cable (*72***-****S with ferrite nut): max. 7.6 mm

² The number, type and terminal assignment are customised.

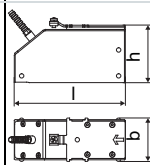
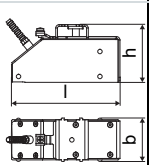
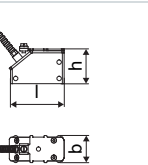
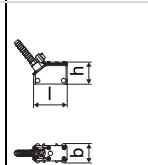
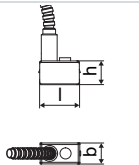
Transducers

Transducer selection

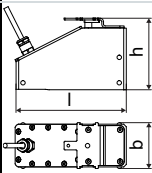
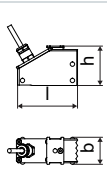



Technical data

Shear wave transducers (zone 2 - nonEx, TS)

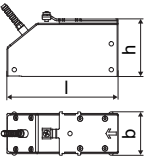
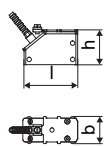
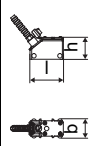
order code		FSG-N**TS/**	FSK-N**TS/**	FSM-N**TS/**	FSP-N**TS/**	FSQ-N**TS/**	FSS-N**TS/**
technical type		C(DL)G1N52	C(DL)K1N52	C(DL)M2N52	C(DL)P2N52	C(DL)Q2N52	CDS1N52
transducer frequency	MHz	0.2	0.5	1	2	4	8
inner pipe diameter d							
min. extended	mm	400	100	50	25	10	6
min. recommended	mm	500	200	100	50	25	10
max. recommended	mm	4000	2000	1000	400	150	70
max. extended	mm	6500	2400	1200	480	240	70
pipe wall thickness							
min.	mm	11	5	2.5	1.2	0.6	0.3
material							
housing		PEEK with stainless steel cover 304 (1.4301), ***-*****/OS: 316L (1.4404)					stainless steel 304 (1.4301)
contact surface		PEEK					PEI
degree of protection		IP67					IP65
transducer cable							
type		1699					
length	m	5		4		3	2
length (***-*****/LC)	m	9 (not for *L **** with ***-*E****)					-
dimensions							
length l	mm	129.5	126.5	64		40	25
width b	mm	51	51	32		22	13
height h	mm	67	67.5	40.5		25.5	17
dimensional drawing							
weight (without cable)	kg	0.47	0.36	0.066		0.016	0.004
pipe surface temperature							
min.	°C	-40					-30
max.	°C	+130					+130
ambient temperature							
min.	°C	-40					-30
max.	°C	+130					+130
temperature compensation		x					-
explosion protection							
• TR TS							
order code		FSG-NE2TS/**	FSK-NE2TS/**	FSM-NE2TS/**	FSP-NE2TS/**	FSQ-NE2TS/**	-
technical type		CDG1N52	CDK1N52	CDM2N52	CDP2N52	CDQ2N52	-
marking		2Ex nA IIC T6...T3 Gc Ex tb IIIC T180 °C...T65 °C Db от -55 °C до +180 °C					-
certification		EAC Ex TC RU C-DE.BH02.B.00644					-

Shear wave transducers (zone 2 - nonEx, T1, IP68)

order code		FSG-N**T1/IP68	FSK-N**T1/IP68	FSM-N**T1/IP68	FSP-N**T1/IP68
technical type		CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8
transducer frequency	MHz	0.2	0.5	1	2
inner pipe diameter d					
min. extended	mm	400	100	50	25
min. recommended	mm	500	200	100	50
max. recommended	mm	4000	2000	1000	400
max. extended	mm	6500	2400	1200	480
pipe wall thickness					
min.	mm	11	5	2.5	1.2
material					
housing		PEEK with stainless steel cover 316Ti (1.4571)			
contact surface		PEEK			
degree of protection		IP68 ¹			
transducer cable					
type		2550			
length	m	12			
dimensions					
length l	mm	130		72	
width b	mm	54		32	
height h	mm	83.5		46	
dimensional drawing					
weight (without cable)	kg	0.43		0.085	
pipe surface temperature					
min.	°C	-40			
max.	°C	+100			
ambient temperature					
min.	°C	-40			
max.	°C	+100			
temperature compensation		x			
explosion protection					
• TR TS					
order code		FSG-NE2T1/IP68	FSK-NE2T1/IP68	-	-
marking		2Ex nA IIC T6...T5 Gc Ex tb IIIC T90 °C...75 °C Db от -40 °C до +90 °C			
certification		EAC  TC RU C-DE.BH02.B.00644		-	-

¹ test conditions: 3 months/2 bar (20 m)/20 °C

Shear wave transducers (zone 2 - nonEx, TS, extended temperature range)

order code		FSG-ENNTS/**	FSK-ENNTS/**	FSM-E**TS/**	FSP-E**TS/**	FSQ-E**TS/**
technical type		C(DL)G1E52	C(DL)K1E52	C(DL)M2E52	C(DL)P2E52	C(DL)Q2E52
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	mm	400	100	50	25	10
min. recommended	mm	500	200	100	50	25
max. recommended	mm	4000	2000	1000	400	150
max. extended	mm	6500	2400	1200	480	240
pipe wall thickness						
min.	mm	11	5	2.5	1.2	0.6
material						
housing		PPSU with stainless steel cover 304 (1.4301), ***-*****/OS: 316L (1.4404)		PI with stainless steel cover 304 (1.4301), ***-*****/OS: 316L (1.4404)		
contact surface		PPSU		PI		
degree of protection		IP65		IP56		
transducer cable						
type		1699		6111		
length	m	5		4		3
length (***-*****/LC)	m	9		9 (not for *L**** with ***-E***)		
dimensions						
length l	mm	129.5		64		40
width b	mm	51		32		22
height h	mm	67		40.5		25.5
dimensional drawing						
weight (without cable)	kg	0.82		0.066		0.017
pipe surface temperature						
min.	°C	-40		-30		-30
max.	°C	+180		+240 ¹		+200
ambient temperature						
min.	°C	-40		-30		-30
max.	°C	+180		+40 +60 ² +200 ³		+200
temperature compensation		x		x		
explosion protection						
• TR TS						
order code		-	-	FSM-EE2TS/**	FSP-EE2TS/**	FSQ-EE2TS/**
technical type		-	-	CDM2E52	CDP2E52	CDQ2E52
marking		-	-	2Ex nA IIC T6...T2 Gc Ex tb IIIA T215 °C...65 °C Db от -45 °C до +225 °C ¹		
certification		-	-	EAC Ex TC RU C-DE.BH02.B.00644		

¹ > +200 °C:

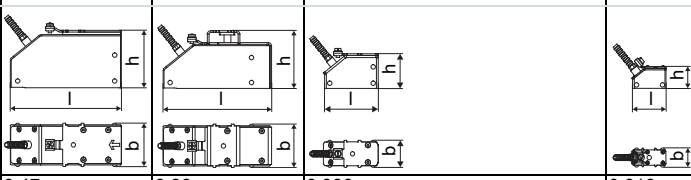
Variotix C without cover or Variotix L

observe the insulation instruction

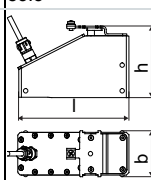
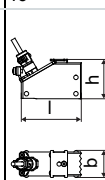

Ex: ambient temperature max. +40 °C

² pipe surface temperature +200...+240 °C: Variotix C without cover³ pipe surface temperature max. +200 °C

Shear wave transducers (zone 1, T1)

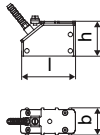
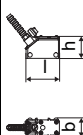
order code		FSG-N*1T1/**	FSK-N*1T1/**	FSM-N*1T1/**	FSP-N*1T1/**	FSQ-N*1T1/**
technical type		CDG1N81	CDK1N81	CDM2N81	CDP2N81	CDQ2N81
transducer frequency	MHz	0.2	0.5	1	2	4
inner pipe diameter d						
min. extended	mm	400	100	50	25	10
min. recommended	mm	500	200	100	50	25
max. recommended	mm	4000	2000	1000	400	150
max. extended	mm	6500	2400	1200	480	240
pipe wall thickness						
min.	mm	11	5	2.5	1.2	0.6
material						
housing		PEEK with stainless steel cover 304 (1.4301), ***-*****/OS: 316L (1.4404)				
contact surface		PEEK				
degree of protection		IP65	IP66			IP65
transducer cable						
type		1699				
length	m	5		4		3
dimensions						
length l	mm	129.5	126.5	64		40
width b	mm	51	51	32		22
height h	mm	67	67.5	40.5		25.5
dimensional drawing						
weight (without cable)	kg	0.47	0.36	0.066		0.016
pipe surface temperature						
min.	°C	-40				
max.	°C	+130				
ambient temperature						
min.	°C	-40				
max.	°C	+130				
temperature compensation		x				
explosion protection						
• TR TS						
order code		FSG-NE1T1/**	FSK-NE1T1/**	FSM-NE1T1/**	FSP-NE1T1/**	FSQ-NE1T1/**
marking		1Ex e q IIC T6...T3 Gb Ex tb IIIC T130 °C Db от -55 °C до +140 °C				
certification		EAC Ex TC RU C-DE.BH02.B.00644				

Shear wave transducers (zone 1, T1, IP68)

order code		FSG-N*1T1/IP68	FSK-N*1T1/IP68	FSM-N*1T1/IP68	FSP-N*1T1/IP68
technical type		CDG1LI1	CDK1LI1	CDM2LI1	CDP2LI1
transducer frequency	MHz	0.2	0.5	1	2
inner pipe diameter d					
min. extended	mm	400	100	50	25
min. recommended	mm	500	200	100	50
max. recommended	mm	4000	2000	1000	400
max. extended	mm	6500	2400	1200	480
pipe wall thickness					
min.	mm	11	5	2.5	1.2
material					
housing		PEEK with stainless steel cover 316Ti (1.4571)			
contact surface		PEEK			
degree of protection		IP68 ¹			
transducer cable					
type		2550			
length	m	12			
dimensions					
length l	mm	130		72	
width b	mm	54		32	
height h	mm	83.5		46	
dimensional drawing					
weight (without cable)	kg	0.43		0.085	
pipe surface temperature					
min.	°C	-40			
max.	°C	+100			
ambient temperature					
min.	°C	-40			
max.	°C	+100			
temperature compensation		x			
explosion protection					
• TR TS					
order code		FSG-NE1T1/IP68	FSK-NE1T1/IP68	FSM-NE1T1/IP68	FSP-NE1T1/IP68
marking		1Ex q IIC T6...T3 Gb Ex tb IIIC T130 °C Db от -40 °C до +80 °C			
certification		EAC  TC RU C-DE.BH02.B.00644			

¹ test conditions: 3 months/2 bar (20 m)/20 °C

Shear wave transducers (zone 1, T1, extended temperature range)

order code		FSM-E*1T1/**	FSP-E*1T1/**	FSQ-E*1T1/**
technical type		CDM2E85	CDP2E85	CDQ2E85
transducer frequency	MHz	1	2	4
inner pipe diameter d				
min. extended	mm	50	25	10
min. recommended	mm	100	50	25
max. recommended	mm	1000	400	150
max. extended	mm	1200	480	240
pipe wall thickness				
min.	mm	2.5	1.2	0.6
material				
housing		PI with stainless steel cover 304 (1.4301), ***-*****/OS: 316L (1.4404)		
contact surface		PI		
degree of protection		IP66		IP56
transducer cable				
type		6111		
length	m	4		3
dimensions				
length l	mm	64		40
width b	mm	32		22
height h	mm	40.5		25.5
dimensional drawing				
weight (without cable)	kg	0.066		0.017
pipe surface temperature				
min.	°C	-30		-30
max.	°C	+240 ¹		+200
ambient temperature				
min.	°C	-30		-30
max.	°C	+40 +200 ²		+200
temperature compensation		x		
explosion protection				
• TR TS				
order code		FSM-EE1T1/**	FSP-EE1T1/**	FSQ-EE1T1/**
marking		1Ex e q IIC T6...T2 Gb Ex tb IIIA T215 °C...65 °C Db от -45 °C до +225 °C ¹		
certification		[Ex] TC RU C-DE.BH02.B.00644		

¹ > +200 °C :

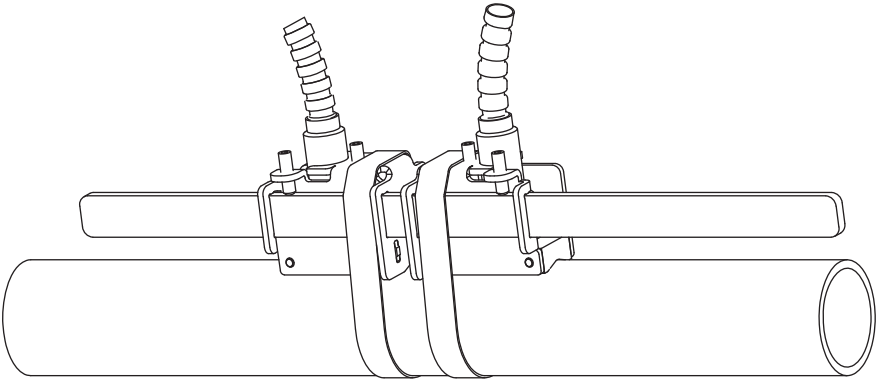
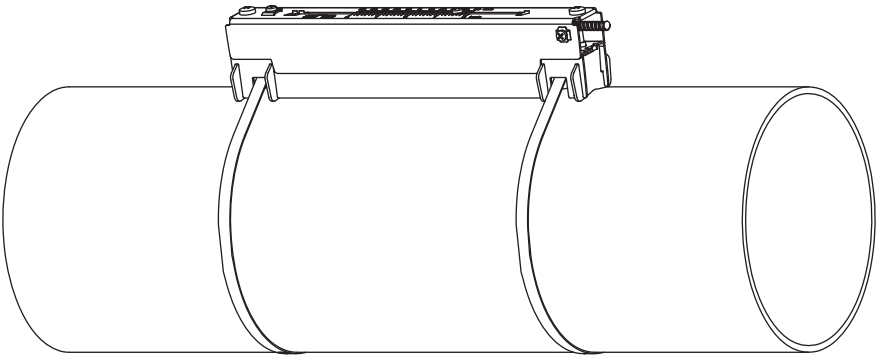
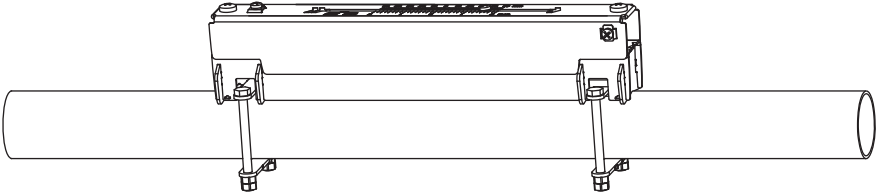
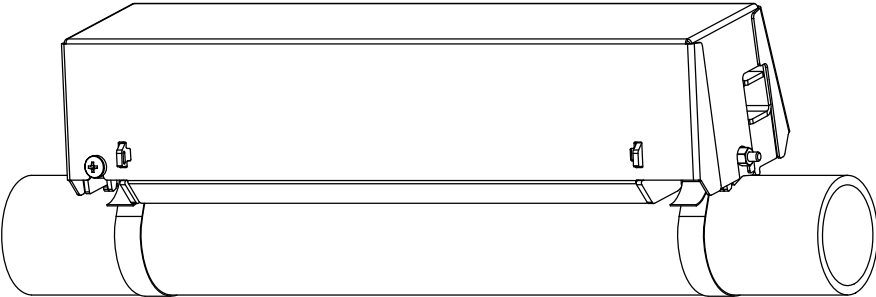
Variofix L or Variofix C
observe the insulation instruction
ambient temperature max. +40 °C

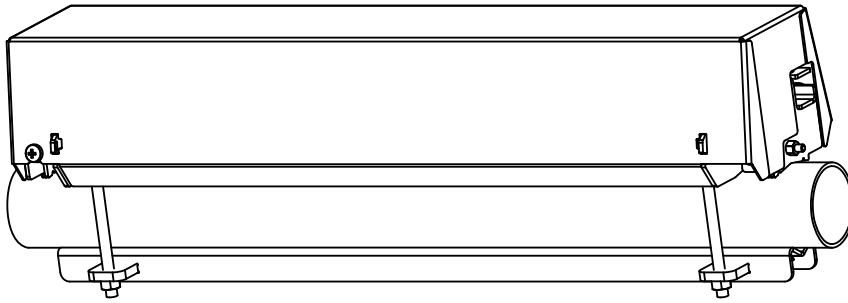
² pipe surface temperature max. +200 °C

Transducer mounting fixture

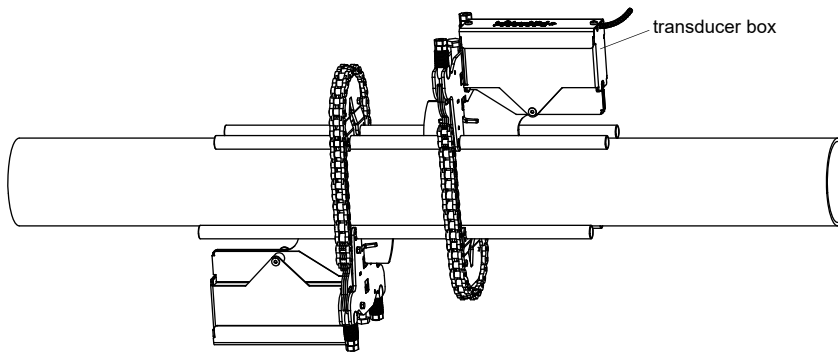
Order code

1, 2	3	4	5	6	7...9	no. of character				
transducer mounting fixture	transducer	-	measurement arrangement	size	-	fixation	outer pipe diameter	/	option	description
VL										
VC										Variofix C
WI										transducer box for WaveInjector
	K									transducers with transducer frequency G, K
	M									transducers with transducer frequency M, P
	Q									transducers with transducer frequency Q
	S									transducers with transducer frequency S
		D								reflection arrangement or diagonal arrangement
		R								reflection arrangement
			S							small
			M							medium
			L							large
					B					bolts
					S					tension straps
					W					welding
					N					without fixation
						002				10...20 mm
						004				20...40 mm
						T36				40...360 mm
						013				10...130 mm
						036				130...360 mm
						092				360...920 mm
						200				920...2000 mm
						450				2000...4500 mm
						940				4500...9400 mm
						NDR				any
								IP68		for transducers with degree of protection IP68
								OS		housing with stainless steel 316
								Z		special design

<p>Variofix L (VLS)</p> 	<p>transducer frequency: S material: stainless steel 304 (1.4301), 303 (1.4305)</p>
<p>Variofix L (VLK, VLM, VLQ)</p> 	<p>material: stainless steel 304 (1.4301), 301 (1.4310), 410 (1.4006) option OS: 316Ti (1.4571), 316L (1.4404), 17-7PH (1.4568) inner length: VLK: 348 mm, option IP68: 368 mm VLM: 234 mm VLQ: 176 mm dimensions: VLK: 423 x 90 x 93 mm option IP68: 443 x 94 x 105 mm VLM: 309 x 57 x 63 mm VLQ: 247 x 43 x 47 mm</p>
<p>Variofix L with bolt mounting plates (VL*-**-B)</p> 	<p>material: stainless steel 304 (1.4301), 301 (1.4310), 410 (1.4006) option OS: 316Ti (1.4571), 316L (1.4404), 17-7PH (1.4568) inner length: VLM: 234 mm VLQ: 176 mm dimensions: VLM: 309 x 57 x 63 mm VLQ: 247 x 43 x 47 mm outer pipe diameter: max. 48 mm</p>
<p>Variofix C (VC)</p> 	<p>material: stainless steel 316Ti (1.4571) inner length: VCK-*L: 500 mm VCK-*S: 350 mm VCM: 400 mm VCQ: 250 mm dimensions: VCK-*L: 560 x 126 x 125 mm VCK-*S: 410 x 126 x 125 mm VCM: 460 x 96 x 82 mm VCQ: 310 x 85 x 71 mm</p>

Variofix C (VC) with bolt mounting plates (VCM--B, VCQ-**-B)**

material: stainless steel 316Ti (1.4571)
inner length:
VCM: 400 mm
VCQ: 250 mm
dimensions:
VCM: 460 x 96 x 82 mm
VCQ: 310 x 85 x 71 mm
outer pipe diameter:
VCM: max. 46 mm
VCQ: max. 36 mm

transducer box WI for WaveInjector

see Technical specification
TSWaveInjectorVx-x

Coupling materials for transducers

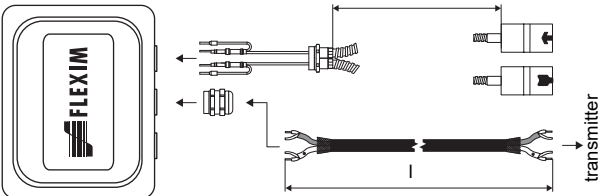
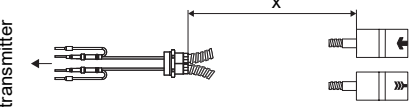
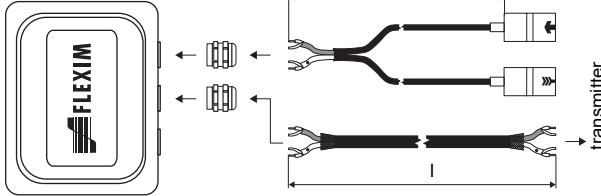
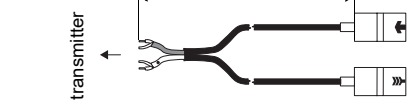
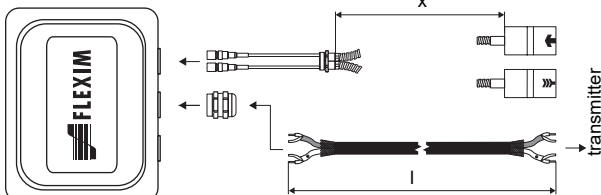
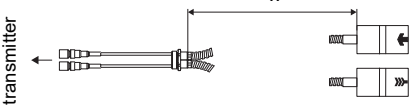
	normal temperature range (4th character of transducer order code = N)		extended temperature range (4th character of transducer order code = E)			WaveInjector WI-400	
	< 100 °C	< 170 °C	< 150 °C	< 200 °C	200...240 °C	< 280 °C	280...400 °C
< 24 h	coupling compound type N or coupling foil type VT	coupling compound type E or coupling foil type VT	coupling compound type E or coupling foil type VT	coupling compound type E or H or coupling foil type VT	coupling foil type TF	coupling foil type A and coupling foil type VT	coupling foil type B and coupling foil type VT
long time measurement	coupling foil type VT	coupling foil type VT	coupling foil type VT	coupling foil type VT	coupling foil type TF	coupling foil type A and coupling foil type VT	coupling foil type B and coupling foil type VT

type VT: fluid temperature 200 °C: min. 2 years

Technical data

type	ambient temperature °C
coupling compound type N	-30...+130
coupling compound type E	-30...+200
coupling compound type H	-30...+250
coupling foil type A	max. 280
coupling foil type B	280...400
coupling foil type VT	-10...+200
coupling foil type TF	200...240

Connection systems

connection system T1		
connection with extension cable	direct connection	transducers technical type
<p>JB01</p> 		<p>*****8*</p>
<p>JB01, JBP2, JBP3</p> 		<p>*****L*</p>
connection system TS		
connection with extension cable	direct connection	transducers technical type
<p>JB02, JB03</p> 		<p>*****52</p>

Cable

transducer cable				
type		1699	2550	6111
weight	kg/m	0.094	0.035	0.092
ambient temperature	°C	-55...+200	-40...+100	-100...+225
properties			longitudinal watertight	
cable jacket				
material		PTFE	PUR	PFA
outer diameter	mm	2.9	5.2 ±0.2	2.7
thickness	mm	0.3	0.9	0.5
colour		brown	grey	white
shield	x		x	x
sheath				
material		stainless steel 304 (1.4301) option OS: 316Ti (1.4571)	-	stainless steel 304 (1.4301) option OS: 316Ti (1.4571)
outer diameter	mm	8	-	8

extension cable			
type		2615	5245
order code		ACC-PE- GNNN-/EXEXXXX	ACC-PE- GNNN-/EXA1XXX
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

XXX - cable length in m

Cable length

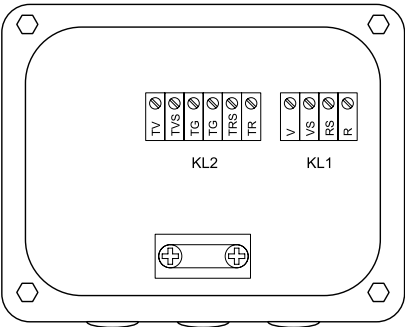
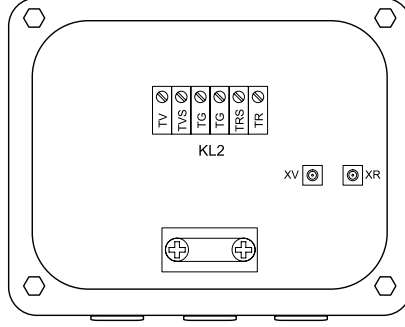
transducer frequency		F, G, H, K		M, P		Q		S	
connection system TS									
transducers technical type		x	l	x	l	x	l	x	l
*(DR)***8*	m	5	≤ 300	4	≤ 300	3	≤ 90	-	-
*(DR)***5*	m	5	≤ 300	4	≤ 300	3	≤ 90	2	≤ 40
option LC: *(LT)***5*	m	9	≤ 300	9	≤ 300	9	≤ 90	-	-
option IP68: ****L**	m	12	≤ 300	12	≤ 300	-	-	-	-

x - transducer cable length

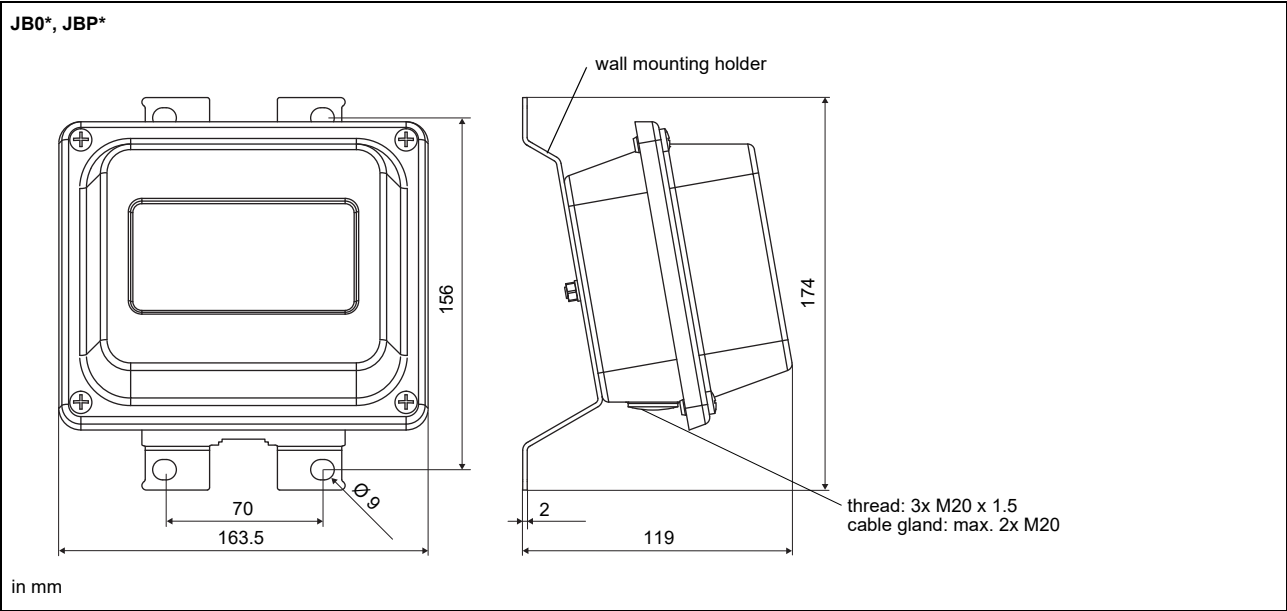
l - max. length of extension cable (depending on the application)

Junction box

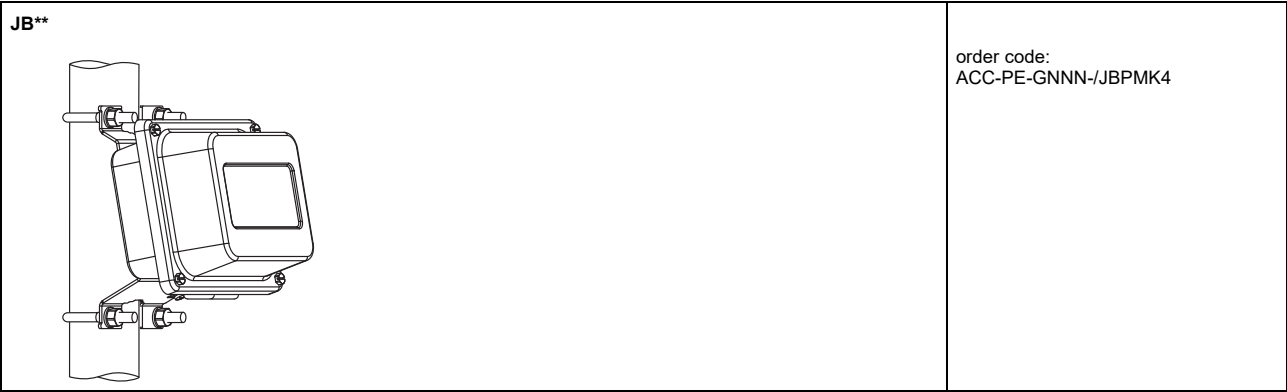
Technical data

JB01S4E3M, JBP2, JBP3			
weight	kg	1.2 kg	
fixation		wall mounting optional: 2" pipe mounting	
material			
housing		stainless steel 316L (1.4404)	
gasket		silicone	
degree of protection		IP67	
ambient temperature			
min.	°C	-40	
max.	°C	+80	
explosion protection			
• TR TS (zone 1)			
junction box		JB01S4E3M	
marking		1Ex e mb II T6...T4 Gb Ex tb IIIC 100°C Db T6: от -40 °C до +70 °C T4, T5: от -40 °C до +80 °C	
certification		ERC Ex TC RU C-DE.BH02.B.00644	
type of protection		gas: increased safety decoupled network: encapsulation dust: protection by enclosure	
• TR TS (zone 2)			
junction box		JBP2	
marking		2Ex nA IIC T6...T4 Gc Ex tc IIIC 80°C Dc T6: от -40 °C до +70 °C T4, T5: от -40 °C до +80 °C	
certification		ERC Ex TC RU C-DE.BH02.B.00644	
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			
weight	kg	1.2 kg	
fixation		wall mounting optional: 2" pipe mounting	
material			
housing		stainless steel 316L (1.4404)	
gasket		silicone	
degree of protection		IP67	
ambient temperature			
min.	°C	-40	
max.	°C	+80	
explosion protection			
• TR TS			
junction box		JB02	
marking		2Ex nA IIC T6...T4 Gc Ex tc IIIC 80°C Dc T6: от -40 °C до +70 °C T4, T5: от -40 °C до +80 °C	
certification		ERC Ex TC RU C-DE.BH02.B.00644	
Connection			
			
Transducers			
	terminal	connection	transducer
	XV	SMB connector	↑
	XR	SMB connector	⤴
Extension cable			
terminal strip	terminal	connection	
KL2	TV	signal	
	TVS	internal shield	
	TRS	internal shield	
	TR	signal	

Dimensions

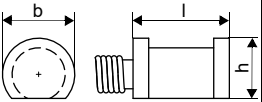



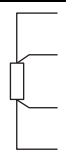
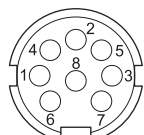
2" pipe mounting kit



Clamp-on temperature probe (optional)

Technical data

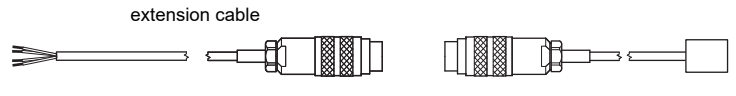
PT12N			
order code		<ul style="list-style-type: none">ACC-PO-#601-/T311ACC-PO-#601-/T511 (matched)	
design		clamp-on with connector	
type		Pt100	
connection		4-wire	
measuring range	°C	-30...+250	
accuracy T		±(0.15 °C + 2 · 10 ⁻³ · T [°C]) class A	
accuracy ΔT (2x Pt matched according to EN 1434-1)		≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1	
response time	s	50 (t ₅₀ , T ₁ = 25 °C, T ₂ = 60 °C)	
housing		aluminum	
degree of protection		IP54	
dimensions			
length l	mm	20	
width b	mm	15	
height h	mm	13	
dimensional drawing			
weight	kg	0.25 (without connector)	
accessories			
thermal conductivity paste 200 °C		x	
thermal conductivity foil 250 °C		x	

Connection system				
direct connection/connection with extension cable				
				
Connection				
	temperature probe	extension cable	connector	
			pin	
	red	grey	2	
	red/blue	red	6	
	white/blue	blue	1	
white	white	7		

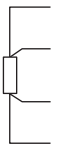
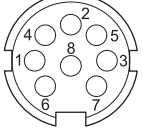
Cable			
	temperature probe	extension cable	
type		4 x 0.22 mm ²	
standard length	m	3	
max. length	m	-	
max. temperature	°C	-30...+250	
min. bend radius	mm	27	
cable jacket			
material		PFA	PVC
outer diameter	mm	3.8 ±0.15	4.8 ±2
colour		black	grey

Connection system

direct connection/connection with extension cable



Connection

	temperature probe	extension cable	connector	
			pin	
	red	grey	2	
	red/blue	red	6	
	white/blue	blue	1	
	white	white	7	

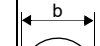
Cable

		temperature probe	extension cable
type		4 x 0.22 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	27	68
cable jacket			
material		PFA	PVC
outer diameter	mm	3.8 ± 0.15	4.8 ± 2
colour		black	grey

PT12N

order code		<ul style="list-style-type: none"> • ACC-PE-GN-NN-/T312 • ACC-PE-GN-NN-/T512 (matched)
design		clamp-on
type		Pt100
connection		4-wire
measuring range		-30...+250
accuracy T	°C	$\pm(0.15 \text{ °C} + 2 \cdot 10^{-3} \cdot T \text{ [°C]})$ class A
accuracy ΔT (2x Pt matched according to EN 1434-1)		$\leq 0.1 \text{ K}$ ($3 \text{ K} < \Delta T < 6 \text{ K}$), more corresponding to EN 1434-1
response time	s	50 (t50, T1 = 25 °C, T2 = 60 °C)
housing		aluminum
degree of protection		IP54

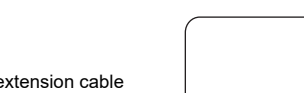

dimensions

length l	mm	20
width b	mm	15
height h	mm	13
dimensional drawing		
weight	kg	0.25


weight
accessories

thermal conductivity foil 250 °C		x
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Connection system

connection with extension cable	direct connection
	

Connection

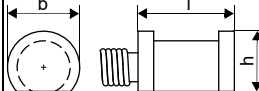
	temperature probe
	red
	red/blue
	white/blue
	white

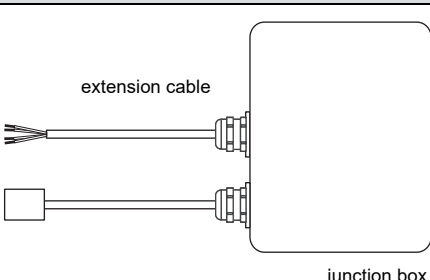
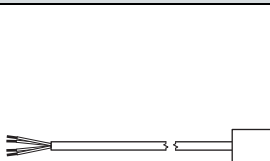
Cable

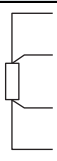
		temperature probe	extension cable
type		4 x 0.22 mm ²	LIYCY 8 x 0.14 mm ²
standard length	m	3	5/10/25
max. length	m	-	200
ambient temperature	°C	-30...+250	-25...+80
min. bend radius	mm	27	68

	cable jacket
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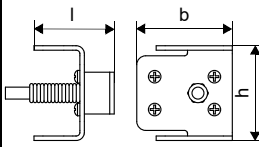
material		PFA	PVC
outer diameter	mm	3.8 ±0.15	4.8 ±2
colour		black	grey

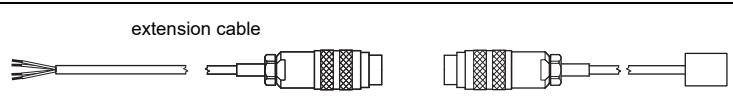
PT12N		
order code		<ul style="list-style-type: none">• ACC-PE-GNNN-/T362• ACC-PE-GNNN-/T562 (matched)
design		clamp-on TR TS
type		Pt100
connection		4-wire
measuring range	°C	-30...+250
accuracy T		$\pm(0.15\text{ °C} + 2 \cdot 10^{-3} \cdot T\text{ [°C]})$ class A
accuracy ΔT (2x Pt matched according to EN 1434-1)		≤ 0.1 K (3 K < ΔT ≤ 6 K), more corresponding to EN 1434-1
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		
• TR TS		
marking		2Ex nA IIC T6...T2 Gc от -30°C до +250 °C
certification		ATEX RU C-DE.BH02.B.00644

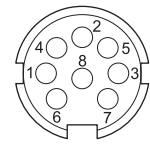
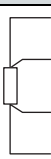
Connection system	
connection with extension cable	direct connection
	

Connection	
	temperature probe
	red
	red/blue
	white
	white/blue

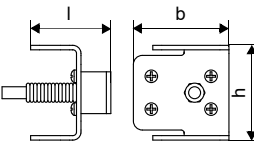
Cable		
	temperature probe	extension cable
type	4 x 0.25 mm²	LIYCY 8 x 0.14 mm²
standard length	m	3
max. length	m	-
ambient temperature	°C	-30...+250
min. bend radius	mm	19
cable jacket		
material	PTFE	PVC
outer diameter	mm	3.8
colour	black	grey

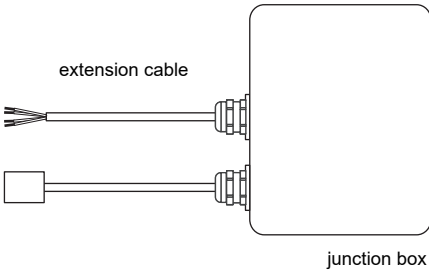

PT12F			
order code		<ul style="list-style-type: none">ACC-PO-#601-/T111ACC-PO-#601-/T211 (matched)	
design		clamp-on short response time, with connector	
type		Pt100	
connection		4-wire	
measuring range	°C	-50...+250	
accuracy T		±(0.15 °C + 2 · 10 ⁻³ · T [°C]) class A	
accuracy ΔT (2x Pt matched according to EN 1434-1)		≤ 0.1 K (3 K < ΔT < 6 K), more corresponding to EN 1434-1	
response time	s	8 (t ₅₀ , T ₁ = 25 °C, T ₂ = 60 °C)	
housing		PEEK, stainless steel 304 (1.4301), copper	
degree of protection		IP54	
dimensions			
length l	mm	14	
width b	mm	30	
height h	mm	27	
dimensional drawing			
weight	kg	0.32 (without connector)	
accessories			
thermal conductivity paste 200 °C		x	
thermal conductivity foil 250 °C		x	
plastic protection plate, insulation foam		x	

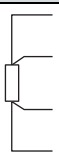
Connection system			
			

Connection				
	temperature probe	extension cable	connector	
			pin	
	red	grey	2	
	red/blue	red	6	
	white/blue	blue	1	
	white	white	7	

Cable			
		temperature probe	extension cable
type		4 x 0.22 mm ²	LIYCY 8 x 0.14 mm ²
standard length	m	3	5/10/25
max. length	m	-	200
ambient temperature	°C	-50...+250	-25...+80
min. bend radius	mm	27	68
cable jacket			
material		PFA	PVC
outer diameter	mm	3.8 ±0.15	4.8 ±2
colour		black	grey

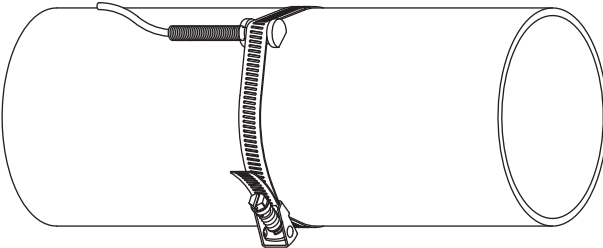
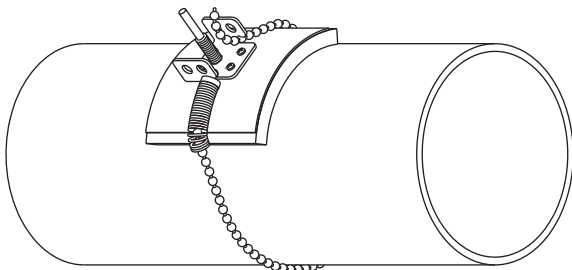
PT12F		
order code		• ACC-PE-GNNN-/T112
design		clamp-on short response time
type		Pt100
connection		4-wire
measuring range	°C	-50...+250
accuracy T		±(0.15 °C + 2 · 10 ⁻³ · T [°C]) class A
response time	s	8 (t50, T1 = 25 °C, T2 = 60 °C)
housing		PEEK, stainless steel 304 (1.4301), copper
degree of protection		IP54
dimensions		
length l	mm	14
width b	mm	30
height h	mm	27
dimensional drawing		
weight	kg	0.32
accessories		
thermal conductivity paste 200 °C	x	
thermal conductivity foil 250 °C	x	
plastic protection plate, insulation foam	x	

Connection system	
connection with extension cable	direct connection
	


	temperature probe
	red
	red/blue
	white/blue
	white

Cable		
	temperature probe	extension cable
type	4 x 0.22 mm ²	LIYCY 8 x 0.14 mm ²
standard length	m	3
max. length	m	-
ambient temperature	°C	-50...+250
min. bend radius	mm	27
cable jacket		
material	PFA	PVC
outer diameter	mm	3.8 ±0.15
colour	black	grey

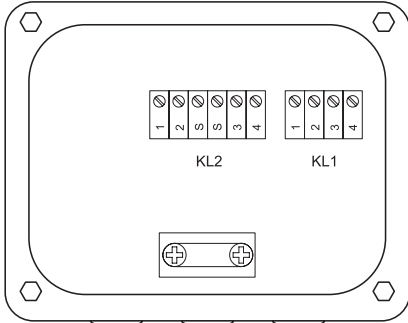
Fixation

tension strap PT12N 	material: stainless steel 301 (1.4310), 410 (1.4006) thermal insulation necessary
ball chain PT12F 	material: stainless steel 316L (1.4404) length: 1 m

Junction box

JBT2, JBT3		
order code		• JBT2: ACC-PE-GNNN-/JB5 • JBT3: ACC-PE-GNNN-/JB6
weight	kg	1.2 kg
fixation		wall mounting optional: 2" pipe mounting
material		
housing		stainless steel 316L (1.4404)
gasket		silicone
degree of protection		IP67
ambient temperature		
min.	°C	-40
max.	°C	+80
explosion protection		
• TR TS		
junction box marking		JBT2 2Ex nA IIC T6...T4 Gc Ex tc IIIC 80°C Dc T6: от -40 °C до +70 °C T4, T5: от -40 °C до +80 °C
certification		ERC  TC RU C-DE.BH02.B.00644

Connection



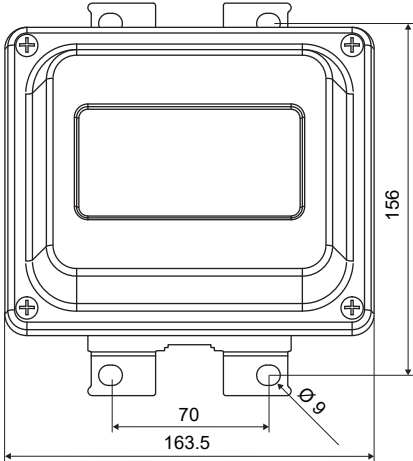
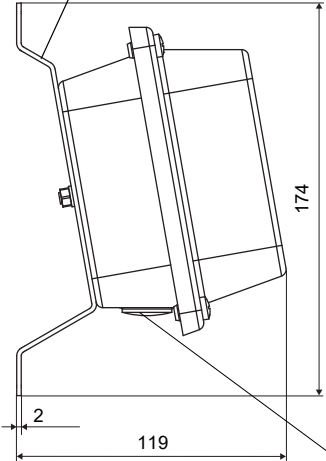
The diagram shows a rectangular junction box with four mounting holes at the corners. Inside, there are two terminal strips: KL2 on the left and KL1 on the right. Each strip has four terminals numbered 1 to 4. Below the strips is a temperature probe connection point with two terminals, each marked with a plus sign.

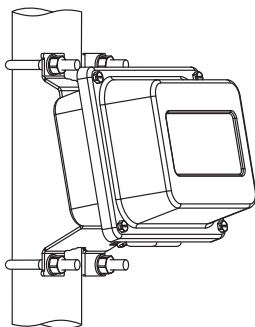
terminal strip	terminal	connection
KL1	1	red
	2	red/blue
	3	white
	4	white/blue

Extension cable

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

Dimensions

JBT*	
	
in mm	thread: 3x M20 x 1.5 cable gland: max. 2x M12

2" pipe mounting kit**JB****order code:
ACC-PE-GNNN-JBPMK4

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