

Non-invasive flow measurement of cryogenic liquids

FLUXUS Cryo extends the application range of the ultrasonic clamp-on flow measurement with Wavelnjector Cryo to cryogenic temperatures up to $-200\text{ }^{\circ}\text{C}$.

The patented mounting fixture thermally separates the ultrasonic transducers from cold pipes and at the same time ensures good acoustic contact. Therefore, FLEXIM's standard transducers are suitable for long-term operation even at extremely cold temperatures.

Features

- Non-invasive measurement without contact to the fluid
- Fluid temperature range: $-200\dots+80\text{ }^{\circ}\text{C}$
- Transducers and mounting fixture can be fully integrated into the insulation
- Bidirectional measurement
- Paired and factory-calibrated transducers: no zeroizing necessary, excellent zero-point stability
- High repeatability of measurement results
- Highly reliable: maintenance-free, no moving or vibrating parts, dual-beam redundant measurement
- Operationally safe: no gaskets, no leakage points
- No pipework necessary for installation

Applications

Flow measurement of:

- LNG
- Liquid ethane
- Liquid nitrogen
- Liquid oxygen
- Other cryogenic fluids



F721



F801

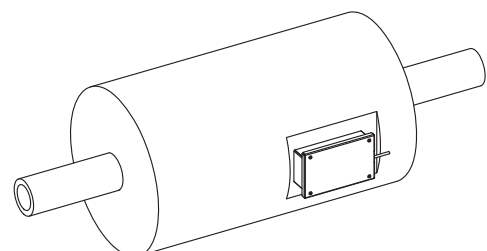


F809

Transmitters FLUXUS Cryo



Wavelnjector Cryo



Wavelnjector Cryo integrated in insulation

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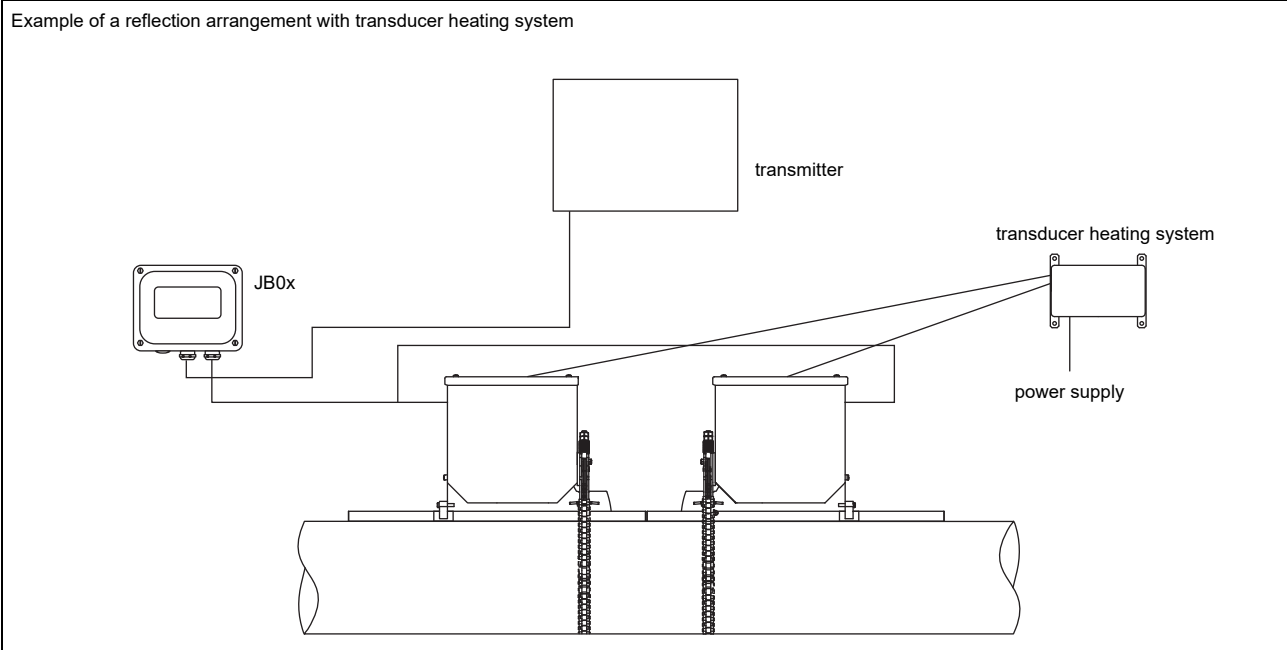
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Typical measurement setup



Transmitter F721

Technical data

	FLUXUS F721**-NN0*A	FLUXUS F721**-NN0*S	FLUXUS F721**-A20*S
			
design	standard field device nonEx	field device with stainless steel housing nonEx	field device with stainless steel housing zone 2
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 % of reading ± 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 (volumetric flow rate)			
measurement uncertainty of measuring system ¹	± 0.3 % of reading ± 0.005 m/s		
measurement uncertainty at the measuring point ²	± 1 % of reading ± 0.005 m/s		
transmitter			
power supply	<ul style="list-style-type: none"> • 100...230 V/50...60 Hz or • 20...32 V DC or • 11...16 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	stainless steel 316L (1.4404)
degree of protection		IP66	IP66
dimensions	mm	see dimensional drawing	
weight	kg	5.4	5.1
fixation		wall mounting, optional: 2" pipe mounting	
ambient temperature	°C	-40...+60 (< -20 °C without operation of the display)	
display		128 x 64 dots, backlight	
menu language		English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian	
explosion protection			
• ATEX/IECEx			
marking	-	-	CE 0637  IIC G IIC D Ex nA nC ic IIC T4 Gc Ex tb IIC T120 °C Db T _a -40...+60 °C
certification ATEX	-	-	IBExU11ATEX1015
certification IECEx	-	-	IECEx IBE 11.0008
measuring functions			
physical quantities		volumetric flow rate, mass flow rate, flow velocity, heat flow (if temperature inputs are installed)	
totalizer		volume, mass, optional: heat quantity	
calculation functions		average, difference, sum (2 measuring channels necessary)	
diagnostic functions		sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times	

¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ outside of explosive atmosphere (housing cover open)

⁴ with inputs and including parametrization of the transmitter

	FLUXUS F721***-NN0*A	FLUXUS F721**-NN0*S	FLUXUS F721**-A20*S
communication interfaces			
service interfaces	measured value transmission, parametrization of the transmitter: <ul style="list-style-type: none"> • USB³ • LAN³ 		
process interfaces	max. 1 option: <ul style="list-style-type: none"> • RS485 (ASCII sender) • Modbus RTU⁴ • BACnet MS/TP • M-Bus • HART⁴ • Profibus PA⁴ • FF H1⁴ • Modbus TCP⁴ • BACnet IP 	max. 1 option: <ul style="list-style-type: none"> • RS485 (ASCII sender) • Modbus RTU⁴ • BACnet MS/TP • M-Bus • HART⁴ • Profibus PA⁴ • FF H1⁴ • Modbus TCP⁴ • BACnet IP 	max. 1 option: <ul style="list-style-type: none"> • RS485 (ASCII sender) • Modbus RTU⁴ • BACnet MS/TP • HART⁴ • Profibus PA⁴ • FF H1⁴ • Modbus TCP⁴ • BACnet IP
accessories			
serial data kit	USB cable		
software	<ul style="list-style-type: none"> • FluxDiagReader: download of measured values and parameters, graphical presentation • FluxDiag (optional): download of measurement data, graphical presentation, report generation, parametrization of the transmitter 		
data logger			
loggable values	all physical quantities, totalized values and diagnostic values		
capacity	max. 800 000 measured values		
outputs			
	The outputs are galvanically isolated from the transmitter.		
number	on request		
• switchable current output			
	The switchable current outputs are menu selectable all together as passive or active.		
range	mA	4...20 (3.2...22)	
accuracy		0.04 % of reading ±3 µA	
active output		$R_{ext} < 350 \Omega$	
passive output		$U_{ext} = 8...30 \text{ V}$, depending on R_{ext} ($R_{ext} < 1 \text{ k}\Omega$ at 30 V)	
• HART			
range	mA	4...20	
accuracy		0.1 % of reading ±15 µA	
active output		$U_{int} = 24 \text{ V}$, $R_{ext} < 500 \Omega$	
passive output		$U_{ext} = 10...24 \text{ V DC}$, depending on R_{ext} ($R_{ext} < 1 \text{ k}\Omega$ at 24 V)	
• voltage output			
range	V	0...1 or 0...10	
accuracy		0...1 V: 0.1 % of reading ±1 mV 0...10 V: 0.1 % of reading ±10 mV	
internal resistance		$R_{int} = 500 \Omega$	
• frequency output			
range	kHz	0...5	
optorelay		24 V/4 mA, $R_{int} = 66.5 \Omega$	
• binary output			
optorelay		26 V/100 mA	
Reed relay		48 V/100 mA, $R_{int} = 22 \Omega$	
binary output as alarm output			
• functions		limit, change of flow direction or error	
binary output as pulse output			
• functions		mainly for totalizing	
• pulse value	units	0.01...1000	
• pulse width	ms	optorelay: 1...1000 Reed relay: 80...1000	

¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ outside of explosive atmosphere (housing cover open)

⁴ with inputs and including parametrization of the transmitter

	FLUXUS F721**-NN0*A	FLUXUS F721**-NN0*S	FLUXUS F721**-A20*S
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 % of reading ±0.03 K		
• current input			
accuracy	0.1 % of reading ±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 % of reading ±1 mV		
internal resistance	R _{int} = 1 MΩ		
• binary input			
switching signal	5...30 V, 1 mA		
functions	<ul style="list-style-type: none"> • resetting the measured values • resetting the totalizers • stopping the totalizers • activation of the measuring mode for highly dynamic flows 		

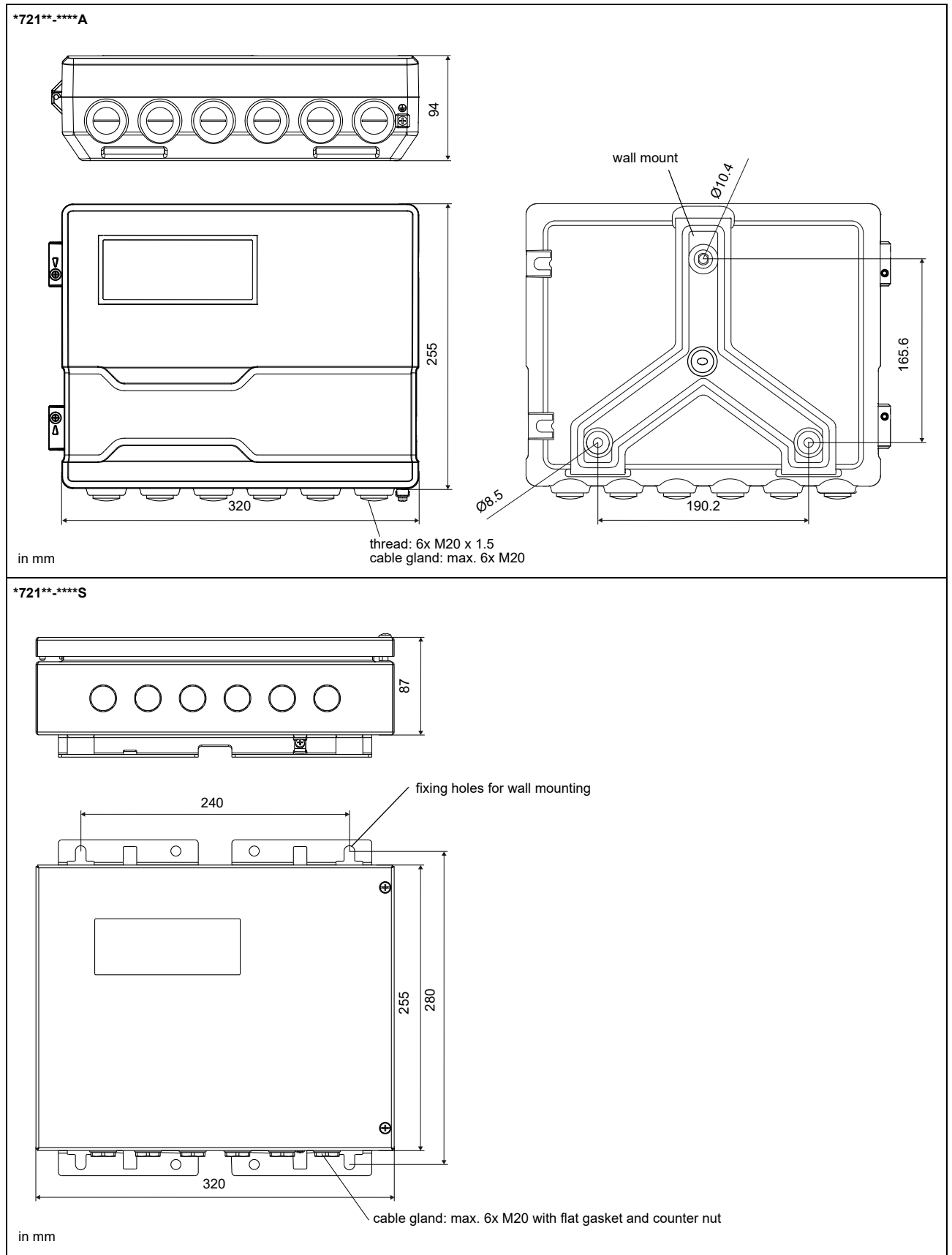
¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ outside of explosive atmosphere (housing cover open)

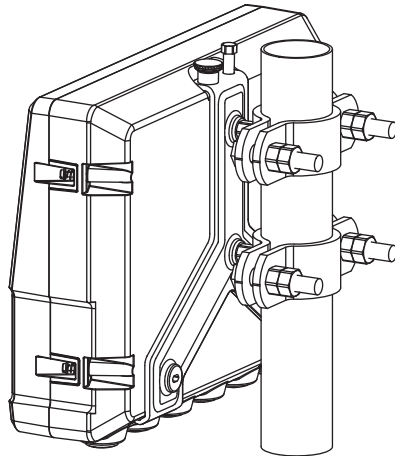
⁴ with inputs and including parametrization of the transmitter

Dimensions

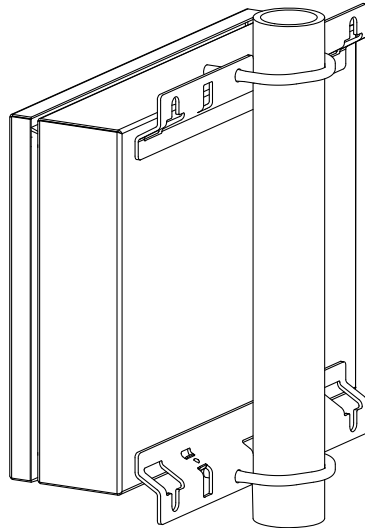


2" pipe mounting kit

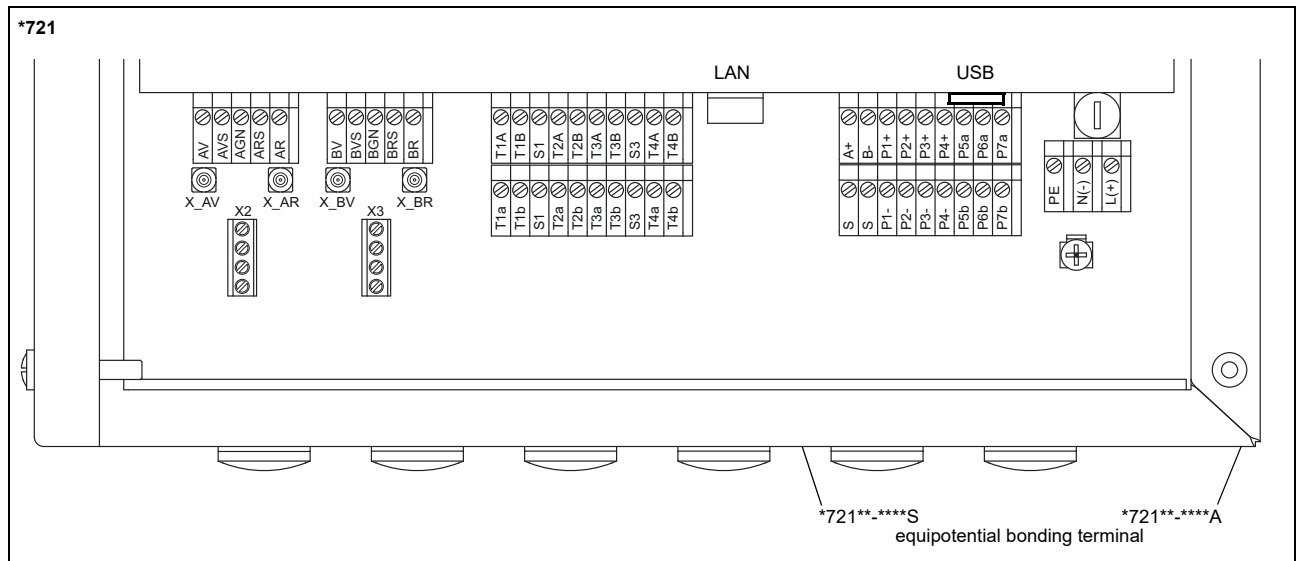
*721**_****A



*721**_****S



Terminal assignment



power supply ¹							
terminal		connection (AC)			connection (DC)		
PE		earth			earth		
N(-)		neutral			-		
L(+)		phase			+		
transducers							
transducer cable (transducers ****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	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 • Profibus PA¹ • FF H1¹ 			
		B-	signal -				
P5a...P7a P5b...P7b	binary output (optorelay)	S	shield				
		USB	type B	<ul style="list-style-type: none"> • service (FluxDiag/FluxDiagReader) 			
		LAN	RJ45	<ul style="list-style-type: none"> • service (FluxDiag/FluxDiagReader) • BACnet IP • Modbus TCP 			
analog inputs ^{1, 2}							
terminal	temperature probe		passive sensor		active sensor		
	direct connection	connection with extension cable	connection	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 leads, with insulated wire end ferrules, lead cross sectional area: 0.25...2.5 mm²
- outer diameter of the cable (*721**-****S with ferrite nut): max. 7.6 mm

² The number, type and terminal assignment will be customized.

Transmitter F801

Technical data

	FLUXUS F801**-A1		FLUXUS F801C24
order code	F801**-A10****-A F801**-A10****-P	F801**-A10****-FF	F801**-A1B
			
design	explosion proof offshore device		
supported transducer frequencies	K, M, P, Q on request: G		
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 % of reading \pm 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 (volumetric flow rate)			
measurement uncertainty of measuring system ¹	\pm 0.3 % of reading \pm 0.005 m/s		
measurement uncertainty at the measuring point ²	\pm 1 % of reading \pm 0.005 m/s		
transmitter			
power supply	<ul style="list-style-type: none"> • 100...230 V/50...60 Hz or • 20...32 V DC or • on request: 11...16 V DC 	• 24 V DC \pm 10 %	
power consumption	W	< 8	< 4
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: 0.07	
housing material	stainless steel 316/316L (1.4401, 1.4404, 1.4432)		
degree of protection	IP66		
dimensions	mm	see dimensional drawing	
weight	kg	6.6	
fixation	wall mounting, 2" pipe mounting		
ambient temperature	°C	-20...+60	-20...+50
display	2 x 16 characters, dot matrix, backlight		
menu language	English, German, French, Dutch, Spanish		
explosion protection			
• ATEX/IECEX			
marking	CE 0637 (Ex) II2G II2D Ex db eb IIC T6 Gb Ex tb IIIC T100 °C Db T _a -20...+60 °C	CE 0637 (Ex) II2G Ex db eb [ib] IIC T4 Gb T _a -20...+50 °C	
certification ATEX	IBExU05ATEX1078		IBExU05ATEX1078
certification IECEX	IECEX IBE 12.0020		-
intrinsic safety parameters	-		U _m = 250 V AC intrinsically safe outputs: U _i = 28.2 V P _i = 0.76 W L _i , C _i negligible
measuring functions			
physical quantities	volumetric flow rate, mass flow rate, flow velocity		
totalizer	volume, mass		
calculation functions	average, difference, sum (2 measuring channels necessary)		
diagnostic functions	sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times		

¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ connection of the interface RS232 outside of explosive atmosphere (housing cover open)

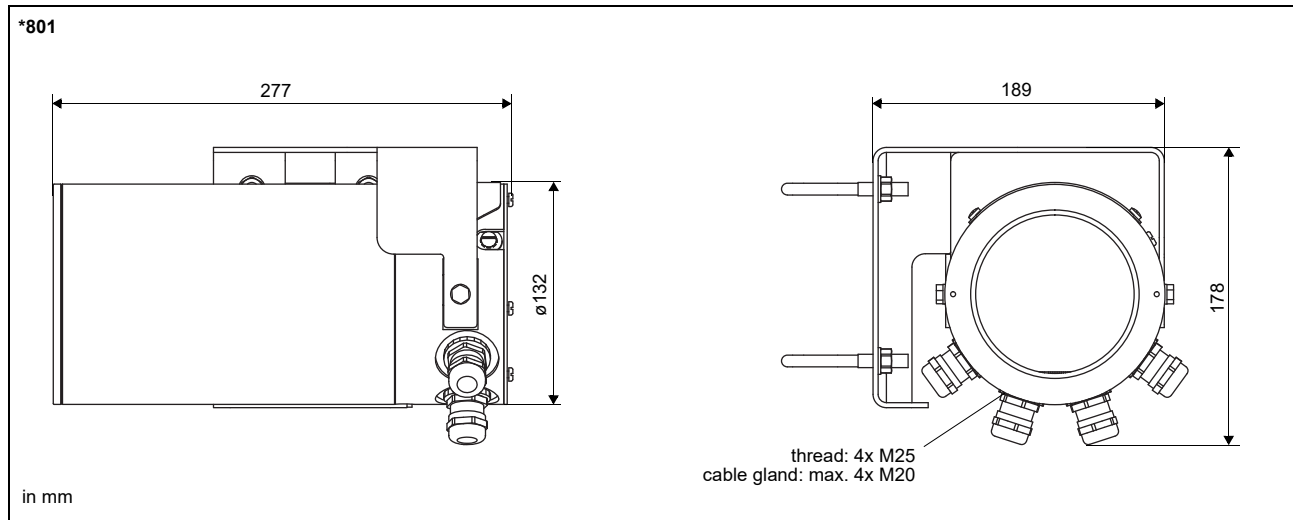
		FLUXUS F801** -A1	FLUXUS F801C24
communication interfaces			
service interfaces		<ul style="list-style-type: none"> • RS232³ • USB (with adapter)³ 	
process interfaces		max. 1 option: <ul style="list-style-type: none"> • RS485 (ASCII sender) • Modbus RTU • HART 	-
accessories			
serial data kit		RS232 RS232 - USB	
software		<ul style="list-style-type: none"> • FluxDiagReader: download of measured values and parameters, graphical presentation • FluxDiag (optional): download of measurement data, graphical presentation, report generation • FluxSubstanceLoader: upload of fluid data sets 	
data logger			
loggable values		all physical quantities, totalized values and diagnostic values	
capacity		> 100 000 measured values	
outputs			
		The outputs are galvanically isolated from the transmitter.	
number		• current output: 1...2 • binary output (open collector): 1...2 or • current output: 1...2 • binary output (open collector): 1 • binary output (Reed relay): 1	• frequency output: 1 • binary output (open collector): 1 • current output: 1 • binary output (open collector): 1
• current output			
range	mA	0/4...20	4...20
accuracy		0.1 % of reading ±15 µA	0.1 % of reading ±15 µA
active output		R _{ext} < 500 Ω	-
passive output		U _{ext} = 4...26.4 V, depending on R _{ext} (R _{ext} < 1 kΩ at 26.4 V)	U _{ext} = 4...28.2 V, depending on R _{ext} (R _{ext} < 1 kΩ at 28.2 V) intrinsic safety
current output in HART mode		I1	-
• range	mA	4...20	-
• active output		U _{int} = 24 V	-
• passive output		U _{ext} = 10...24 V	-
• frequency output			
range	kHz	-	0...5
open collector		-	30 V/100 mA I _{off} = 0.8 mA optional: 8.2 V DIN EN 60947-5-6 (NAMUR)
• binary output			
open collector		24 V/4 mA	30 V/100 mA I _{off} = 0.8 mA 24 V/4 mA intrinsic safety
Reed relay		48 V/100 mA	-
binary output as alarm output			
• functions		limit, change of flow direction or error	
binary output as pulse output			
• functions		mainly for totalizing	
• pulse value	units	0.01...1000	
• pulse width	ms	1...1000	

¹ with aperture calibration of the transducers

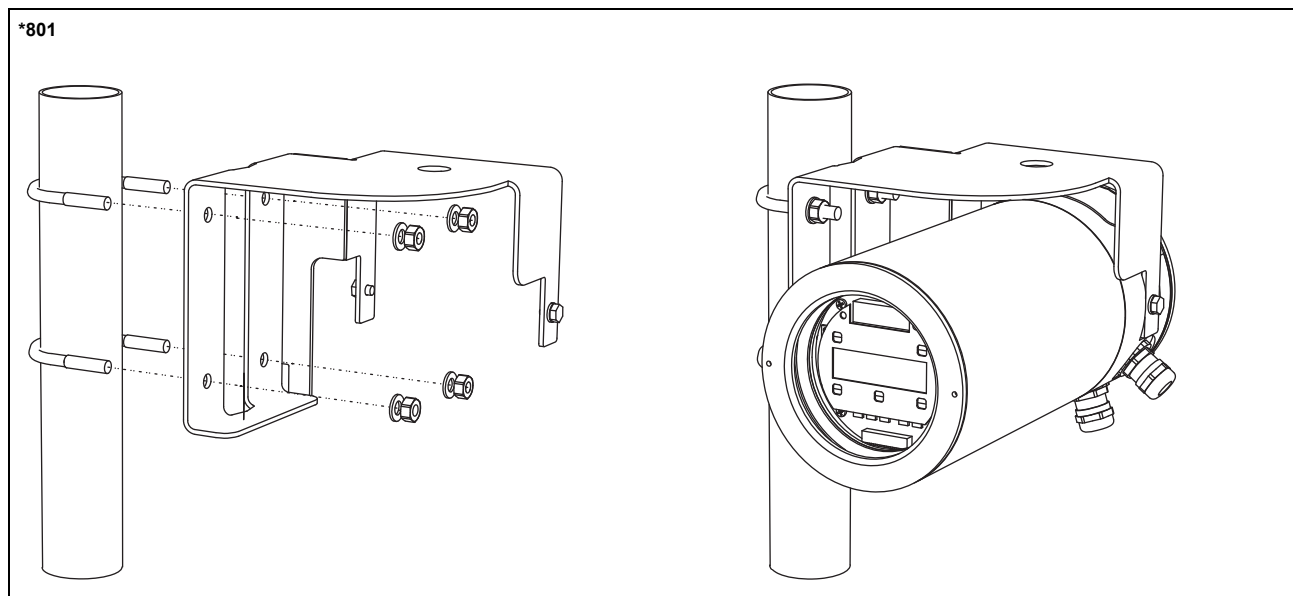
² for transit time difference principle and reference conditions

³ connection of the interface RS232 outside of explosive atmosphere (housing cover open)

Dimensions



Wall and 2" pipe mounting kit



Terminal assignment

801**-A10*-A, 801**-A10****-P**

power supply¹

AC		DC	
terminal	connection	terminal	connection
L1	phase	L+	+
N	neutral	L-	-
PE	earth	PE	earth

transducers, extension cable

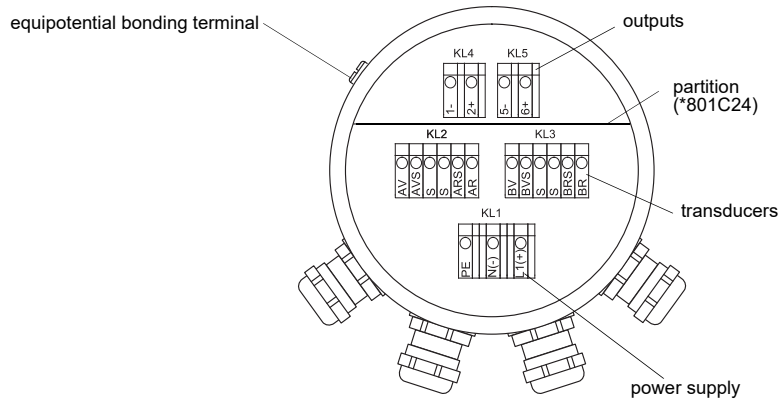
measuring channel A		measuring channel B		transducer
terminal	connection	terminal	connection	
AV	signal	BV	signal	↑
AVS	internal shield	BVS	internal shield	
ARS	internal shield	BRS	internal shield	⤴
AR	signal	BR	signal	
cable gland	external shield	cable gland	external shield	↑ ⤴

outputs¹

*801**-A10****-A		*801**-A10****-P	
terminal	connection	terminal	connection
1(-), 2(+)	active current output I1	1(+), 2(-)	passive current output I1
3(-), 4(+)	active current output I2 (optional)	3(+), 4(-)	passive current output I2 (optional)
5(-), 6(+)	binary output B1 (open collector)		
7(-), 8(+)	binary output B2 (open collector, optional)		
9(a), 10(b)	binary output B1 (open collector, Reed relay, optional)		
11(a), 12(b)	binary output B2 (open collector, Reed relay, optional)		
13(B-), 14(A+), 15 (shield)	communication interface		

¹ cable (by customer): e.g. flexible leads, with insulated wire end ferrules, lead cross sectional area: 0.25...2.5 mm²

801C24, *801**-A10*-FF**



power supply¹

AC		DC	
*801**-A10****-FF		*801C24, *801**-A10****-FF	
terminal	connection	terminal	connection
L1	phase	L+	+
N	neutral	L-	-
PE	earth	PE	earth

transducers, extension cable

measuring channel A		measuring channel B		transducer
terminal	connection	terminal	connection	
AV	signal	BV	signal	↑
AVS	internal shield	BVS	internal shield	↕
ARS	internal shield	BRS	internal shield	↕
AR	signal	BR	signal	
S	not connected	S	not connected	
cable gland	external shield	cable gland	external shield	↑ ↕


outputs¹

	*801C24	*801**-A10****-FF
colour of terminals	blue (intrinsic safety)	green
terminal	connection	
1(-), 2(+)	current output I1	frequency output F1
5(-), 6(+)	binary output B1	binary output B1

¹ cable (by customer): e.g. flexible leads, with insulated wire end ferrules, lead cross sectional area: 0.25...2.5 mm²

Transmitter F809

Technical data

	FLUXUS F809**-A1	FLUXUS F809**-A1A
		
design	explosion proof field device 1 or 2 measuring channels zone 1	explosion proof field device 1 or 2 measuring channels zone 1 (intrinsically safe current output)
supported transducer frequencies	K, M, P, Q on request: G	K, M, P, Q on request: G
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 % of reading ±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 (volumetric flow rate)		
measurement uncertainty of measuring system ¹	±0.3 % of reading ±0.005 m/s	
measurement uncertainty at the measuring point ²	±1 % of reading ±0.005 m/s	
transmitter		
power supply	<ul style="list-style-type: none"> • 100...230 V/50...60 Hz or • 20...32 V DC 	• 20...32 V DC
power consumption	W	< 8
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: 0.07
housing material	cast aluminum, special heavy-duty coating	
degree of protection	IP66	
dimensions	mm	see dimensional drawing
weight	kg	7.1
fixation	wall mounting, 2" pipe mounting	
ambient temperature	°C	-30...+60 (< -20 °C without operation of the display)
display	2 x 16 characters, dot matrix, backlight	
menu language	English, German, French, Dutch, Spanish	
explosion protection		
• ATEX/IECEX		
marking	CE 0637 Ex II2G II2D Ex db eb IIC T6 Gb Ex tb IIIC T100 °C Db T _a -40...+60 °C	CE 0637 Ex II2G II2D Ex db eb ia IIC T6 Gb Ex tb ia IIIC T100 °C Db T _a -40...+60 °C
certification ATEX	IBExU11ATEX1022 X	
certification IECEX	IECEX IBE 11.0006X	
intrinsic safety parameters	-	U _m = 250 V U _i = 30 V DC I _i = 100 mA P _i = 0.75 W C _i = 3 nF L _i negligible
measuring functions		
physical quantities	volumetric flow rate, mass flow rate, flow velocity	
totalizer	volume, mass	
calculation functions	average, difference, sum (2 measuring channels necessary)	
diagnostic functions	sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times	

¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ connection of the interface RS232 outside of explosive atmosphere (housing cover open)

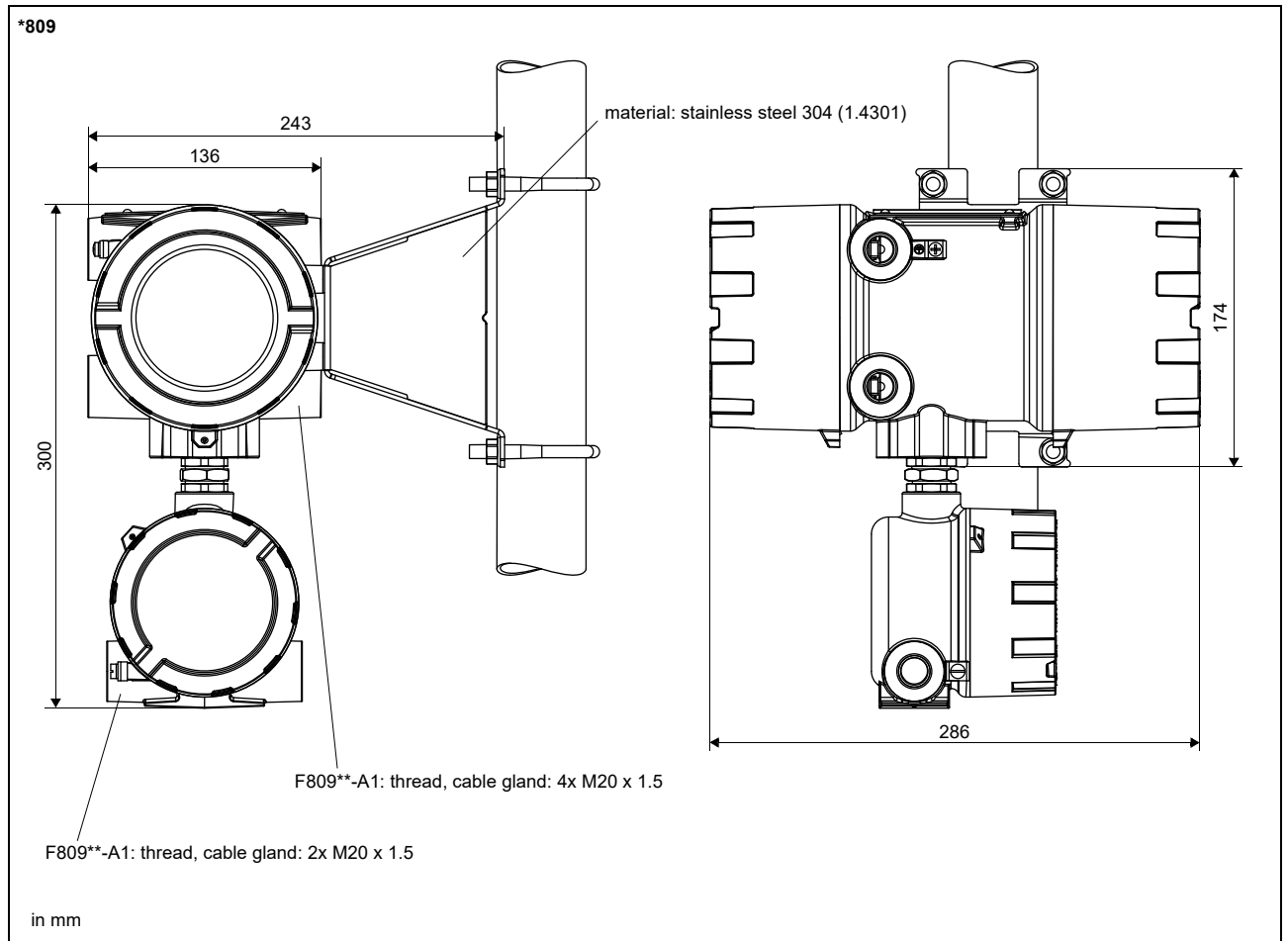
		FLUXUS F809**-A1	FLUXUS F809**-A1A
communication interfaces			
service interfaces		<ul style="list-style-type: none"> • RS232³ • USB (with adapter)³ 	
process interfaces		max. 1 option: <ul style="list-style-type: none"> • RS485 (ASCII sender) • Modbus RTU • HART 	<ul style="list-style-type: none"> • HART
accessories			
serial data kit		RS232 RS232 - USB	
software		<ul style="list-style-type: none"> • FluxDiagReader: download of measured values and parameters, graphical presentation • FluxDiag (optional): download of measurement data, graphical presentation, report generation • FluxSubstanceLoader: upload of fluid data sets 	
data logger			
loggable values		all physical quantities, totalized values and diagnostic values	
capacity		> 100 000 measured values	
outputs			
The outputs are galvanically isolated from the transmitter.			
number		max. 4	1
• current output			
number		max. 2 (I1, I2)	1 (I1, intrinsic safety)
range	mA	0/4...20	4...20
accuracy		0.1 % of reading ±15 µA	0.04 % of reading ±3 µA
active output		$R_{ext} < 500 \Omega$	-
passive output		$U_{ext} = 4...26.4 \text{ V}$, depending on R_{ext} ($R_{ext} < 1 \text{ k}\Omega$ at 26.4 V)	$U_{ext} = 7...30 \text{ V}$, depending on R_{ext} ($R_{ext} < 1 \text{ k}\Omega$ at 30 V)
current output in HART mode		I1	I1
• range	mA	4...20	4...20
• active output		$U_{int} = 24 \text{ V}$	-
• passive output		$U_{ext} = 7...30 \text{ V DC}$	$U_{ext} = 7...30 \text{ V DC}$
• frequency output			
number		max. 1	-
range	kHz	0...5	-
open collector		30 V/100 mA or 8.2 V DIN EN 60947-5-6 (NAMUR) or 24 V/4 mA (on request)	-
• binary output			
number		max. 2	-
open collector		24 V/4 mA optional: <ul style="list-style-type: none"> • 30 V/100 mA or • 8.2 V DIN EN 60947-5-6 (NAMUR) 	-
Reed relay		48 V/100 mA	-
binary output as alarm output			
• functions		limit, change of flow direction or error	-
binary output as pulse output			
• functions		mainly for totalizing	-
• pulse value	units	0.01...1000	-
• pulse width	ms	1...1000	-

¹ with aperture calibration of the transducers

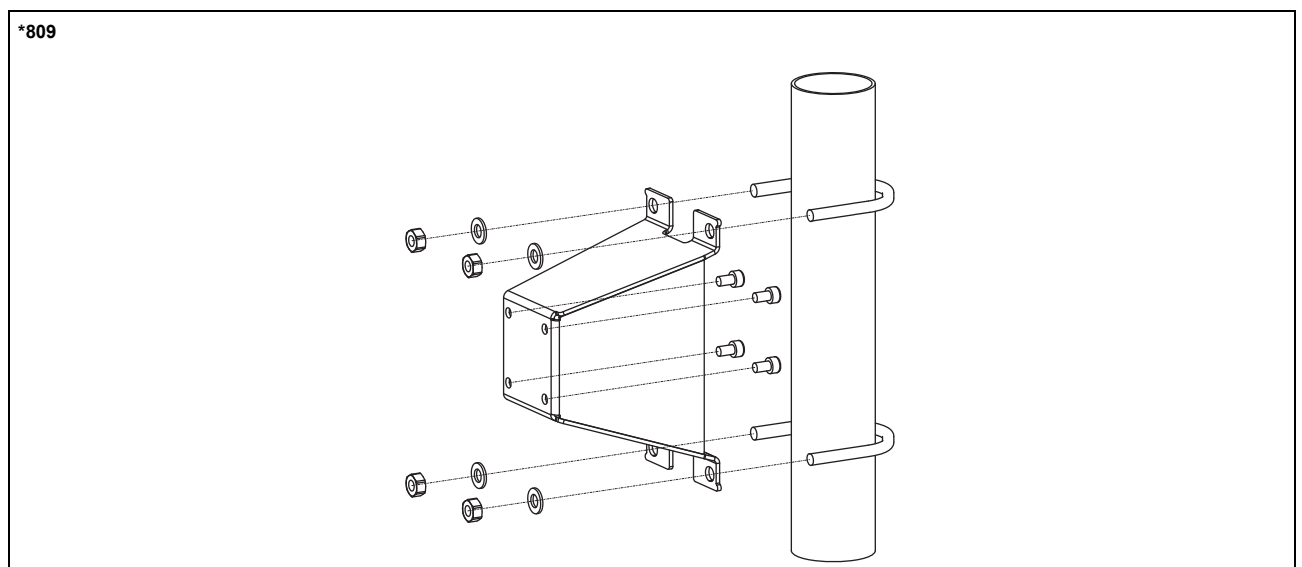
² for transit time difference principle and reference conditions

³ connection of the interface RS232 outside of explosive atmosphere (housing cover open)

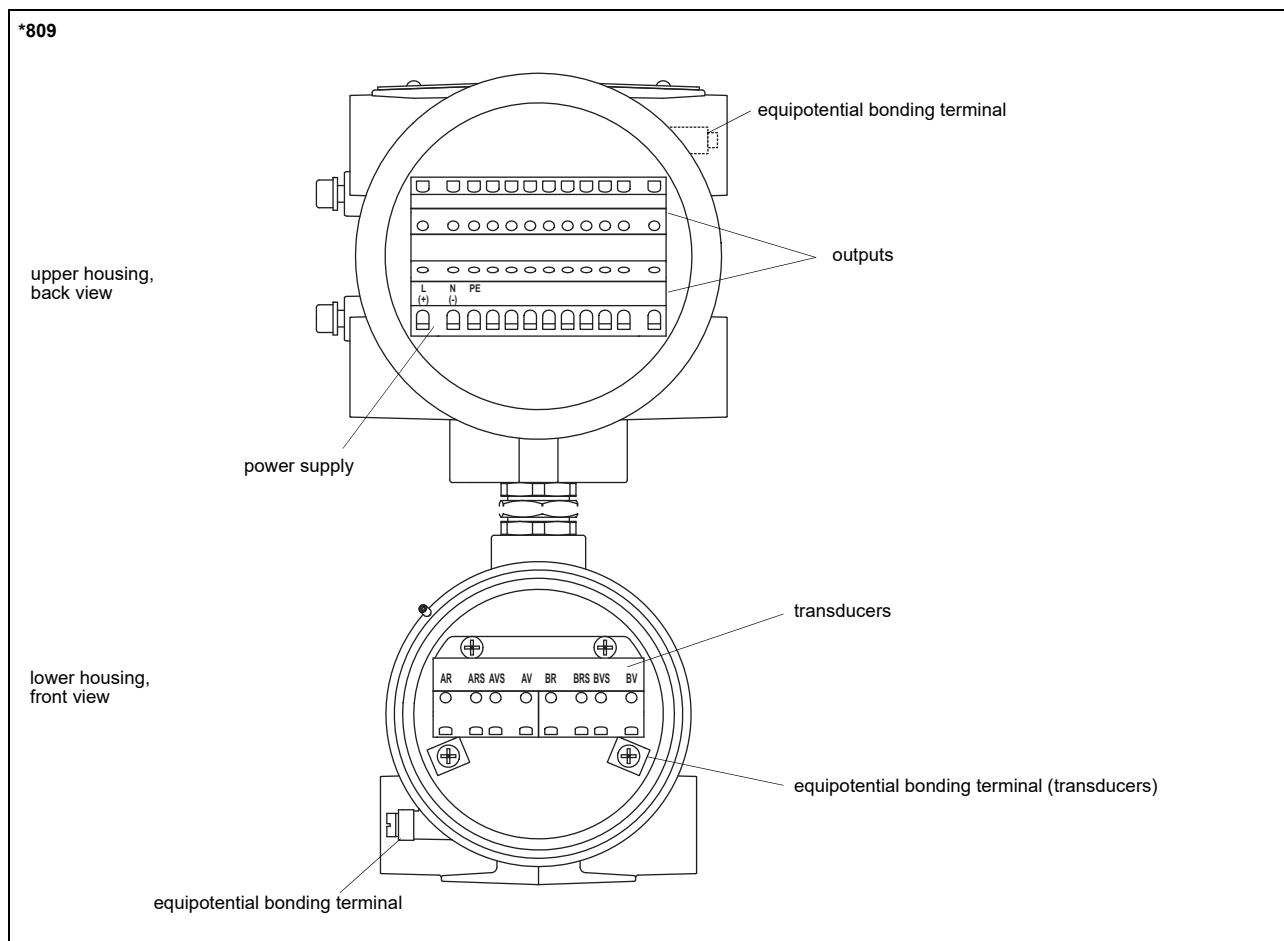
Dimensions



Wall and 2" pipe mounting kit



Terminal assignment



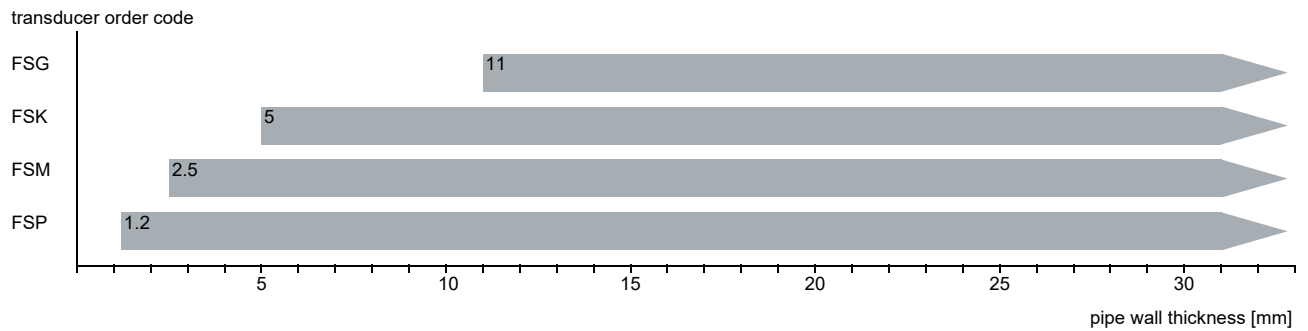
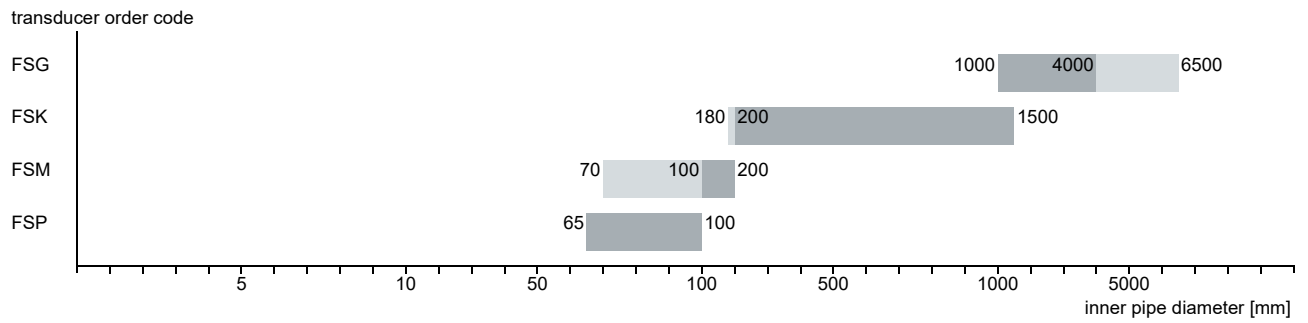
power supply ¹				
AC		DC		
terminal	connection	terminal	connection	
L	phase	L+	+	
N	neutral	N-	-	
PE	earth	PE	earth	
transducers, extension cable				
measuring channel A		measuring channel B		transducer
terminal	connection	terminal	connection	
AV	signal	BV	signal	↑
AVS	internal shield	BVS	internal shield	↕
ARS	internal shield	BRS	internal shield	↕
AR	signal	BR	signal	↕
cable gland or equipotential bonding terminal (transducers)	external shield	cable gland or equipotential bonding terminal (transducers)	external shield	↑ ↕
outputs (options) ¹				
terminal	connection			
1(-), 2(+)	current output I1	frequency output F1		
3(-), 4(+)	current output I2			
5(-), 6(+)	binary output B1 (open collector)			
7(-), 8(+)	binary output B2 (open collector)			
9(-), 10(+)	binary output B1 (Reed relay)	binary output B1 (open collector)		
A+, B-, S	communication interface			

¹ cable (by customer): e.g. flexible leads, with insulated wire end ferrules, lead cross sectional area: 0.25...2.5 mm²

Transducers

Transducer selection

- for LNG, others on request
- transducer mounting fixture available for outer pipe diameter 70...1000 mm
on request: 40...70 mm, > 1000 mm



recommended
 possible

Installation recommendation

inner pipe diameter	measurement arrangement	number of sound paths	min. number of measuring channels
mm			
65...100	diagonal arrangement	3	1
>100...180	reflection arrangement	2	1
>180	diagonal arrangement	1	2

Technical data

Shear wave transducers (zone 2 - nonEx, TS)

order code		FSG-N**TS/**	FSK-N**TS/**	FSM-N**TS/**	FSP-N**TS/**
technical type		C(DL)G1N52	C(DL)K1N52	C(DL)M2N52	C(DL)P2N52
transducer frequency	MHz	0.2	0.5	1	2
inner pipe diameter		see Transducer selection			
pipe wall thickness					
min.	mm	11	5	2.5	1.2
material					
housing		PEEK with stainless steel cap 304 (1.4301), ***-*****/OS: 316L (1.4404)			
contact surface		PEEK			
degree of protection		IP67			
transducer cable					
type		1699			
length	m	5		4	
length (**-*****/LC)	m	9			
dimensions					
length l	mm	129.5	126.5	64	
width b	mm	51	51	32	
height h	mm	67	67.5	40.5	
dimensional drawing					
weight (without cable)	kg	0.47	0.36	0.066	
pipe surface temperature					
min.	°C	-40			
max.	°C	+130			
ambient temperature					
min.	°C	-40			
max.	°C	+130			
temperature compensation		x			
explosion protection					
• ATEX/IECEx					
order code		FSG-NA2TS/**	FSK-NA2TS/**	FSM-NA2TS/**	FSP-NA2TS/**
pipe surface temperature (Ex)					
• min.	°C	-55			
• max.	°C	gas: +190, dust: +180			
marking		CE 0637 Ex II 3G II 2D Ex nA IIC T6...T2 Gc Ex tb IIIC TX Db			
certification ATEX		IBExU10ATEX1163 X			
certification IECEx		IECEx IBE 12.0005X			

¹ pipe surface temperature when using transducers with WI-CYO: min. -200 °C

The specified temperatures at the transducer contact surface are met if the transducers are installed with the correct insulation and heating.

Shear wave transducers (zone 1, TS)

order code		FSG-N*1TS/**	FSK-N*1TS/**	FSM-N*1TS/**	FSP-N*1TS/**
technical type		C(DL)G1N81	C(DL)K1N81	C(DL)M2N81	C(DL)P2N81
transducer frequency	MHz	0.2	0.5	1	2
inner pipe diameter		see Transducer selection			
pipe wall thickness					
min.	mm	11	5	2.5	1.2
material					
housing		PEEK with stainless steel cap 304 (1.4301), ***-****/OS: 316L (1.4404)			
contact surface		PEEK			
degree of protection		IP65	IP66		
transducer cable					
type		1699			
length	m	5		4	
length (**-****/LC)	m	9			
dimensions					
length l	mm	129.5	126.5	64	
width b	mm	51	51	32	
height h	mm	67	67.5	40.5	
dimensional drawing					
weight (without cable)	kg	0.47	0.36	0.066	
pipe surface temperature¹					
min.	°C	-40			
max.	°C	+130			
ambient temperature					
min.	°C	-40			
max.	°C	+130			
temperature compensation		x			
explosion protection					
• ATEX/IECEX					
order code		FSG-NA1TS/**	FSK-NA1TS/**	FSM-NA1TS/**	FSP-NA1TS/**
pipe surface temperature (Ex)					
• min.	°C	-55			
• max.	°C	+180			
marking		CE 0637 Ex q IIC T6...T3 Gb Ex tb IIIC TX Db II2G II2D			
certification ATEX		IBExU07ATEX1168 X			
certification IECEX		IECEX IBE 08.0007X			
remark		F801, F809: on request			

¹ pipe surface temperature when using transducers with WI-CYO: min. -200 °C
 The specified temperatures at the transducer contact surface are met if the transducers are installed with the correct insulation and heating.

Transducer mounting fixture

Order code

1...6	7	8	9	10	11...13	14	15	no. of character	
Waveinjector	transducer	measurement arrangement	size	fixation	outer pipe diameter ¹	coupling foil	tool	option	description
WI-CYO									type
	K								shear wave transducers with transducer frequency G, K
	M								shear wave transducers with transducer frequency M, P
		D							reflection arrangement or diagonal arrangement
			L						large
				C					chains
					017				70...170 mm
					038				80...380 mm
					056				350...560 mm
					085				560...850 mm
					100				600...1000 mm
						D			coupling foil -200...+80 °C
							A		automatic WI tool
							M		mechanical WI tool (pipe planer)
							O		WIT-R tool 110 V
							R		WIT-R tool 230 V
							N		without tool
								B	cryo insulation boxes for measuring channel (without transducer heating system)

¹ outer pipe diameter > 1000 mm on request

Waveinjector WI-CYO

dimensions:

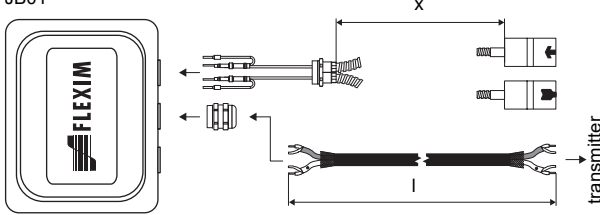
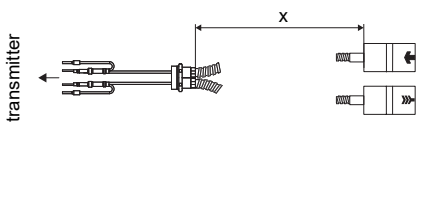
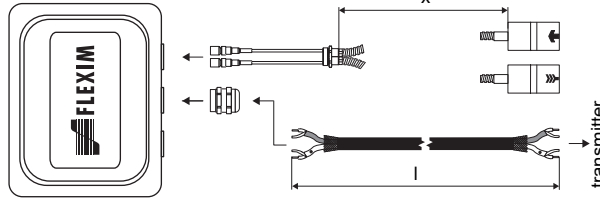
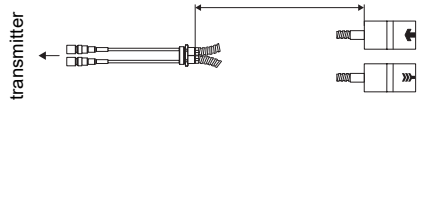
- length: $2 \cdot l + l_{cp}$
 $l = 273 \text{ mm}$
 $l_{cp} = \text{depending on application}$
- width:
 outer pipe diameter + 32 mm
 (min. 203 mm)
- height:
 outer pipe diameter + $2 \cdot h$
 $h = 285 \text{ mm}$

material: stainless steel 304 (1.4301)

Coupling materials for transducers

type	ambient temperature °C	position
coupling foil type SI	-40...+80	coupling plate - transducer
coupling foil type D	-200...+80	pipe - coupling plate

Connection systems

connection system TS		
connection with extension cable	direct connection	transducers technical type
<p>JB01</p> 		****6*
<p>JB02, JB03</p> 		****52

Cable

transducer cable		
type		1699
weight	kg/m	0.094
ambient temperature	°C	-55...+200
properties		
cable jacket		
material		PTFE
outer diameter	mm	2.9
thickness	mm	0.3
colour		brown
shield		x
sheath		
material		stainless steel 304 (1.4301) option OS: 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	12	12
thickness	mm	2	2
colour		black	black
shield		x	x
sheath			
material		-	steel wire braid with copolymer sheath
outer diameter	mm	-	15.6

Cable length

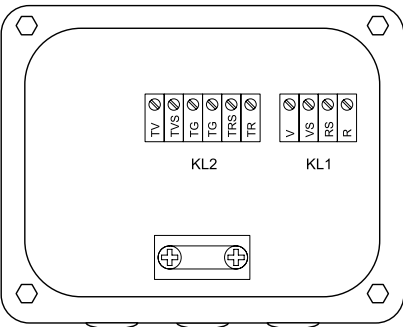
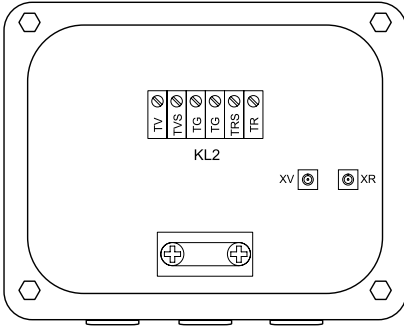
transducer frequency		G, K		M, P	
connection system TS					
transducers technical type		x	l	x	l
*D***8* *D***5*	m	5	≤ 300	4	≤ 300
option LC: *L***8* *L***5*	m	9	≤ 300	9	≤ 300

x - transducer cable length

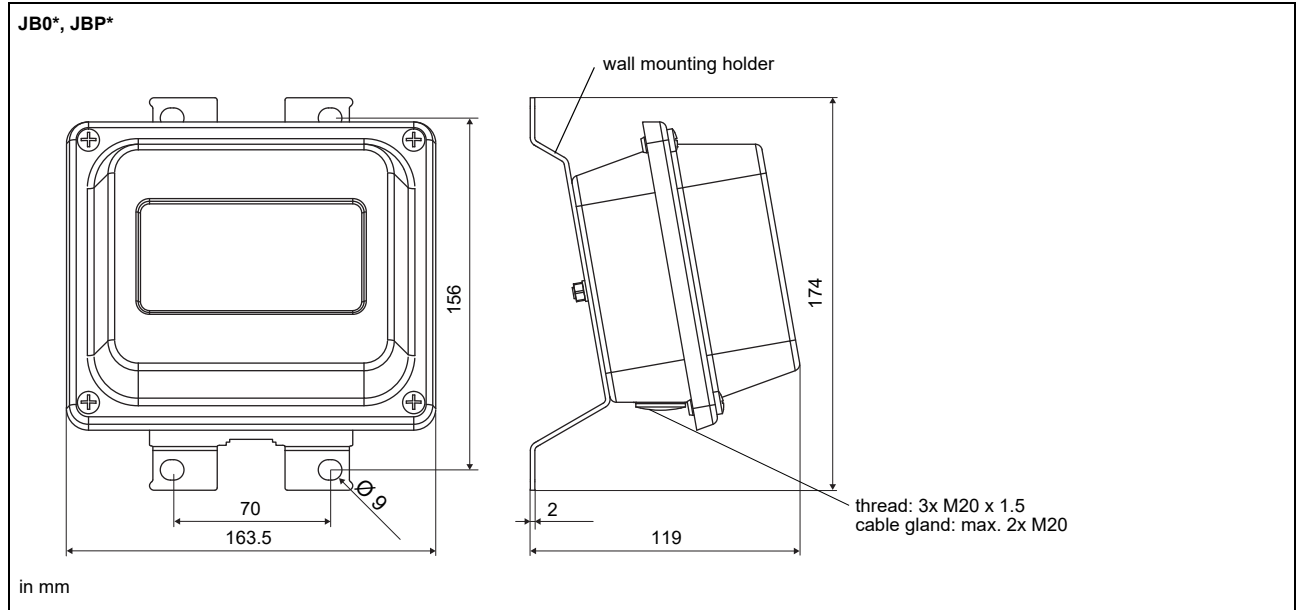
l - max. length of extension cable (depending on application)

Junction box

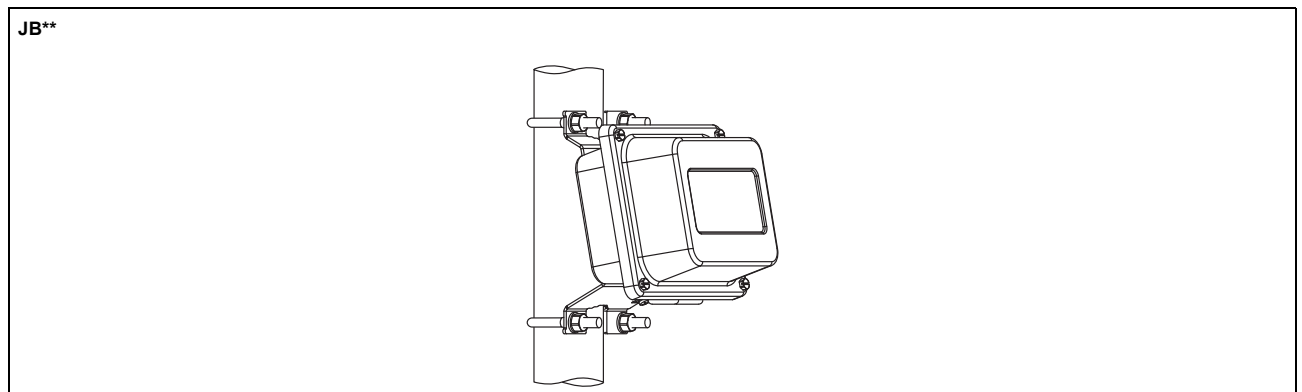
Technical data

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		IP67																													
ambient temperature																															
min.	°C	-40																													
max.	°C	+80																													
explosion protection																															
• ATEX/IECEX																															
marking		CE 0637 Ex II2G II2D Ex eb mb IIC T6...T4 Gb Ex tb IIIC T100 °C Db Ta -40...+70/80 °C																													
certification ATEX		IBExU06ATEX1161																													
certification IECEX		IECEX IBE 08.0006																													
type of protection		gas: increased safety decoupled network: encapsulation dust: protection by enclosure																													
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>Connection</p>  </div> <div style="width: 60%;"> <p>Transducers</p> <table border="1"> <thead> <tr> <th>terminal strip</th> <th>terminal</th> <th>connection</th> <th>transducer</th> </tr> </thead> <tbody> <tr> <td rowspan="4">KL1</td> <td>V</td> <td>signal</td> <td>↑</td> </tr> <tr> <td>VS</td> <td>internal shield</td> <td></td> </tr> <tr> <td>RS</td> <td>internal shield</td> <td>⤴</td> </tr> <tr> <td>R</td> <td>signal</td> <td></td> </tr> </tbody> </table> <p>Extension cable</p> <table border="1"> <thead> <tr> <th>terminal strip</th> <th>terminal</th> <th>connection</th> </tr> </thead> <tbody> <tr> <td rowspan="4">KL2</td> <td>TV</td> <td>signal</td> </tr> <tr> <td>TVS</td> <td>internal shield</td> </tr> <tr> <td>TRS</td> <td>internal shield</td> </tr> <tr> <td>TR</td> <td>signal</td> </tr> </tbody> </table> </div> </div>			terminal strip	terminal	connection	transducer	KL1	V	signal	↑	VS	internal shield		RS	internal shield	⤴	R	signal		terminal strip	terminal	connection	KL2	TV	signal	TVS	internal shield	TRS	internal shield	TR	signal
terminal strip	terminal	connection	transducer																												
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JB02, JB03																															
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explosion protection																															
• ATEX																															
junction box		JB02																													
marking		CE Ex II3G Ex nA IIC (T6)...T4 Gc II3D Ex tc IIIC T 100 °C Dc Ta -40...+(70)80 °C																													
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>Connection</p>  </div> <div style="width: 60%;"> <p>Transducers</p> <table border="1"> <thead> <tr> <th>terminal</th> <th>connection</th> <th>transducer</th> </tr> </thead> <tbody> <tr> <td>XV</td> <td>SMB connector</td> <td>↑</td> </tr> <tr> <td>XR</td> <td>SMB connector</td> <td>⤴</td> </tr> </tbody> </table> <p>Extension cable</p> <table border="1"> <thead> <tr> <th>terminal strip</th> <th>terminal</th> <th>connection</th> </tr> </thead> <tbody> <tr> <td rowspan="4">KL2</td> <td>TV</td> <td>signal</td> </tr> <tr> <td>TVS</td> <td>internal shield</td> </tr> <tr> <td>TRS</td> <td>internal shield</td> </tr> <tr> <td>TR</td> <td>signal</td> </tr> </tbody> </table> </div> </div>			terminal	connection	transducer	XV	SMB connector	↑	XR	SMB connector	⤴	terminal strip	terminal	connection	KL2	TV	signal	TVS	internal shield	TRS	internal shield	TR	signal								
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terminal strip	terminal	connection																													
KL2	TV	signal																													
	TVS	internal shield																													
	TRS	internal shield																													
	TR	signal																													

Dimensions



2" pipe mounting kit



Transducer heating system (optional)

Continuous operation

fluid temperature < -40 °C: transducer heating system required

Cycle operation

operating time in cycle operation > 12 h: transducer heating system required

operating time in cycle operation < 12 h and rest period ≥ 2x operating time: see table below

fluid temperature °C	ambient temperature °C					
	-30	-20	-10	0	+10	+20
-200	x	x	x	x	x	x
-190	x	x	x	x	x	x
-180	x	x	x	x	x	
-170	x	x	x	x	x	
-160	x	x	x	x		
-150	x	x	x	x		
-140	x	x	x	x		
-130	x	x	x			
-120	x	x	x			
-110	x	x				
-100	x	x				
-90	x	x				
-80	x					
-70	x					

x - transducer heating system required

Technical data

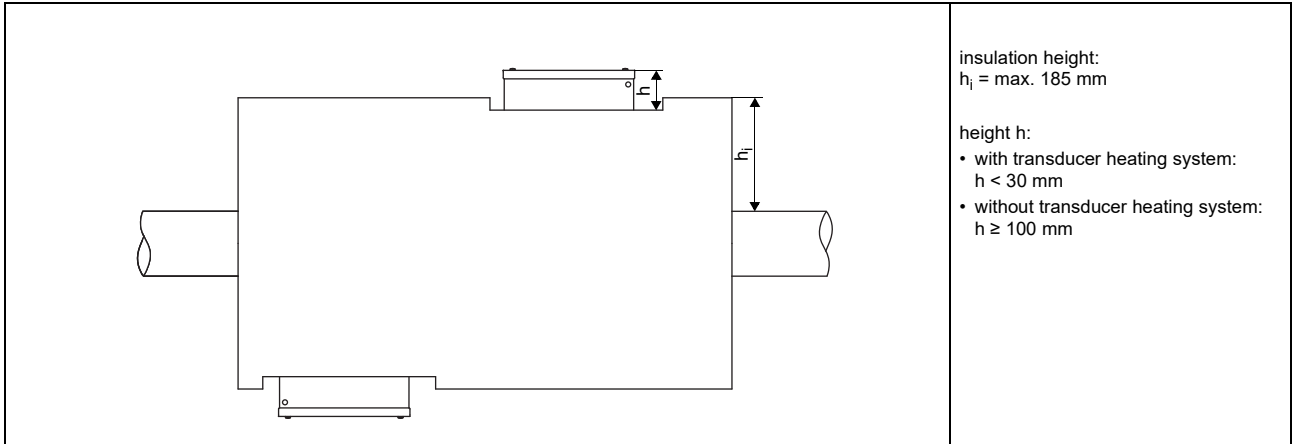
type	BARTEC PSB	
order code	ACC-PE-F***-CY1 (1 measuring channel)	ACC-PE-F***-CY2 (2 measuring channels)
power supply ¹	208...254 V AC	
consisting of		
heating element	2x PSB 33, 07-5801-2335 power consumption: 2x 44 W	4x PSB 33, 07-5801-2335 power consumption: 4x 44 W
connection system	2x PLEXO TCS 27-59P1-1010	4x PLEXO TCS 27-59P1-1010
junction box PSB	1x 07-5103-2201/2090	1x 07-5103-2201/2090
explosion protection	ATEX, IECEx, TR TS	

¹ on request: 120 V AC

Cable junction box PSB - heating element

type	H05SS-F	
length	m	10
max. length	m	on request
weight	kg/ m	0.11
ambient temperature	°C	-60...+180
installation temperature	°C	-20...+50
bend radius	7.5 D	
cable jacket		
material	rubber	
outer diameter	mm	8...10.4
colour	black	
shield	-	

Insulation



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