

## Liquid Ultrasonic Flowmeter for Permanent Installation

For permanent outdoor wall or pipe mounting

### Features

- Accurate and highly reliable bi-directional clamp-on volume and mass flow measurement (optional media temperature and pressure inputs)
- Installation and commissioning without any invasive pipe work or process outages
- Virtually unlimited measurement range, high measurement accuracy even at very low as well as very high flow rates and independent of the flow direction (bi-directional)
- Possibility to measure thermal energy quantities when integrating clamp-on or inline temperature probes
- User oriented configurations guarantee the optimal adaptation of the meter in regard to the individual application
- Automatic loading of calibration data and transducer recognition
- Bidirectional communication and support of common bus technologies (Profibus PA, Foundation Fieldbus, HART, Modbus, BACnet)
- Easy parameterization of the device via connection of PC/laptop (Ethernet, USB) or within the SCADA system, even without external power supply
- Extensive diagnostic functions for the evaluation of the measurement quality and process situation
- Advanced self-diagnosis and possibilities for event based triggering of data recording for the supervision and control of critical processes
- The transmitter is available with an aluminum or stainless steel enclosure (for especially corrosive environments). Both enclosures feature IP66 protection
- Transmitter and transducers for usage in hazardous areas are available
- Transmitter and transducers are separately calibrated (traceable to national standards), guaranteeing a specified measurement accuracy as well as the possibility for later exchange of components
- Transducers for a wide range of inner pipe diameters (6...6500 mm, independent of the pipe wall thickness) and media temperatures (-190...+600 °C) are available
- The measurement is zero point stable, drift free and independent of the pipe material, the internal pressurization and the flowing media
- Highest reliability via HybridTrek mode: automatic switch between transit time measurement principle and NoiseTrek guarantees exact and reliable measurement data even at slurries or liquids with high gaseous entrainments (>10 % of total volume)



FLUXUS F721\*\*-\*A



FLUXUS F721\*\*-\*S



Measurement with transducers mounted by Variofix C

### 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

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## Function

### Measurement Principle

#### Transit Time Difference Principle

In order to measure the flow of a medium in a pipe, ultrasonic signals are used, employing the transit time difference principle. Ultrasonic signals are emitted by a transducer installed on the pipe and received by a second transducer. These signals are emitted alternately in the flow direction and against it.

As the medium in which the signals propagate is flowing, the transit time of the ultrasonic signals in the flow direction is shorter than against the flow direction.

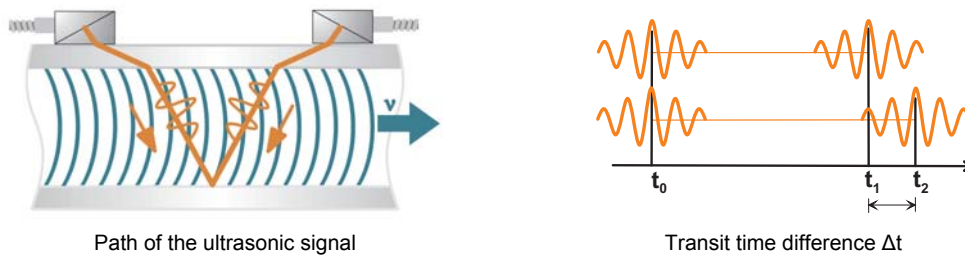
The transit time difference,  $\Delta t$ , is measured and allows the flowmeter to determine the average flow velocity along the propagation path of the ultrasonic signals. A flow profile correction is then performed in order to obtain the area averaged flow velocity, which is proportional to the volumetric flow rate.

Two integrated microprocessors control the entire measuring process. This allows the flowmeter to remove disturbance signals, and to check each received ultrasonic wave for its validity which reduces noise.

#### HybridTrek

If the gaseous or solid content in the medium 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 can switch automatically between transit time and NoiseTrek mode without any changes to the measurement setup.



### Calculation of Volumetric Flow Rate

$$\dot{V} = k_{Re} \cdot A \cdot k_a \cdot \Delta t / (2 \cdot t_{fl})$$

where

- $\dot{V}$  - volumetric flow rate
- $k_{Re}$  - fluid mechanics calibration factor
- $A$  - cross-sectional pipe area
- $k_a$  - acoustical calibration factor
- $\Delta t$  - transit time difference
- $t_{fl}$  - transit time in the medium

### Number of Sound Paths

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

- **reflection arrangement**

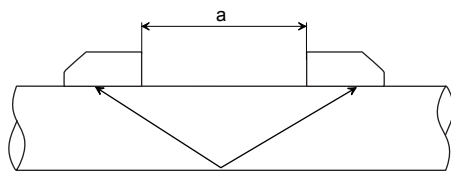
The number of sound paths is even. Both of the transducers are mounted on the same side of the pipe. Correct positioning of the transducers is easier.

- **diagonal arrangement**

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

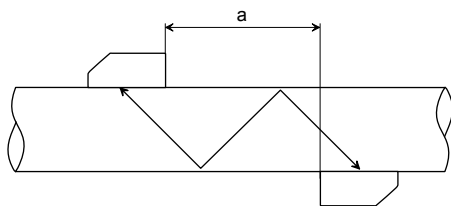
The preferred method of installation depends on the application. While increasing the number of sound paths increases the accuracy of the measurement, signal attenuation increases as well. The optimum number of sound paths for the parameters of the application will be determined automatically by the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

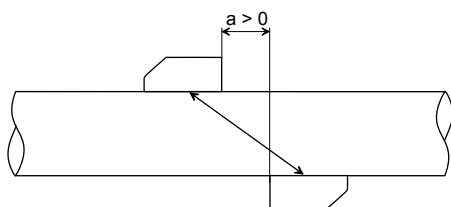


a - transducer distance

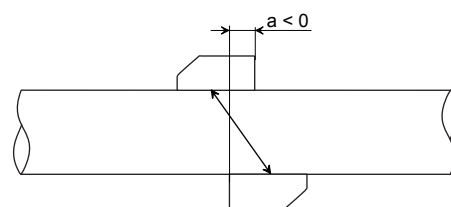
Reflection arrangement, number of sound paths: 2



Diagonal arrangement, number of sound paths: 3





Diagonal arrangement, number of sound paths: 1



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

## Flow Transmitter

### Technical Data

FLUXUS	F721**-NNN*A	F721**-NNN*S F721**-A20*S	
design	standard field device	field device with stainless steel housing	
			
<b>measurement</b>			
measurement principle	transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content		
flow velocity	0.01...25 m/s		
repeatability	0.15 % of reading ±0.01 m/s		
medium	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		
<b>accuracy<sup>1</sup></b>			
with standard calibration	±1.6 % of reading ±0.01 m/s		
with advanced calibration (optional)	±1.2 % of reading ±0.01 m/s		
with field calibration <sup>2</sup>	±0.5 % of reading ±0.01 m/s		
<b>flow transmitter</b>			
power supply	100...230 V/50...60 Hz or 20...32 V DC or 11...16 V DC		
power consumption	< 15 W		
number of flow measuring channels	1, optional: 2		
damping	0...100 s, adjustable		
measuring cycle (1 channel)	100...1000 Hz		
response time	1 s (1 channel), option: 20 ms		
housing material	aluminum, powder coated	stainless steel 316L (1.4404)	
degree of protection according to IEC/EN 60529	IP66	IP66	
dimensions	see dimensional drawing		
weight	5.4 kg	5.1 kg	
fixation	wall mounting, optional: 2" pipe mounting		
ambient temperature	-40...+60 °C (< -20 °C without operation of the display)		
display	128 x 64 dots, backlight		
menu language	English, German, French, Spanish, Russian, Polish		
<b>explosion protection</b>			
<b>A T E X</b>	transmitter	-	F721**-A20*S
	zone	-	2
	marking	-	CE 0637 Ex II3G II2D Ex nA nC ic IIC T4 Gc Ex tb IIIC T 120 °C Db T <sub>a</sub> -40...+60 °C IBExU11ATEX1015 gas: non sparking dust: protection by enclosure
	certification ATEX type of protection	-	

<sup>1</sup> for transit time difference principle, reference conditions and v > 0.15 m/s

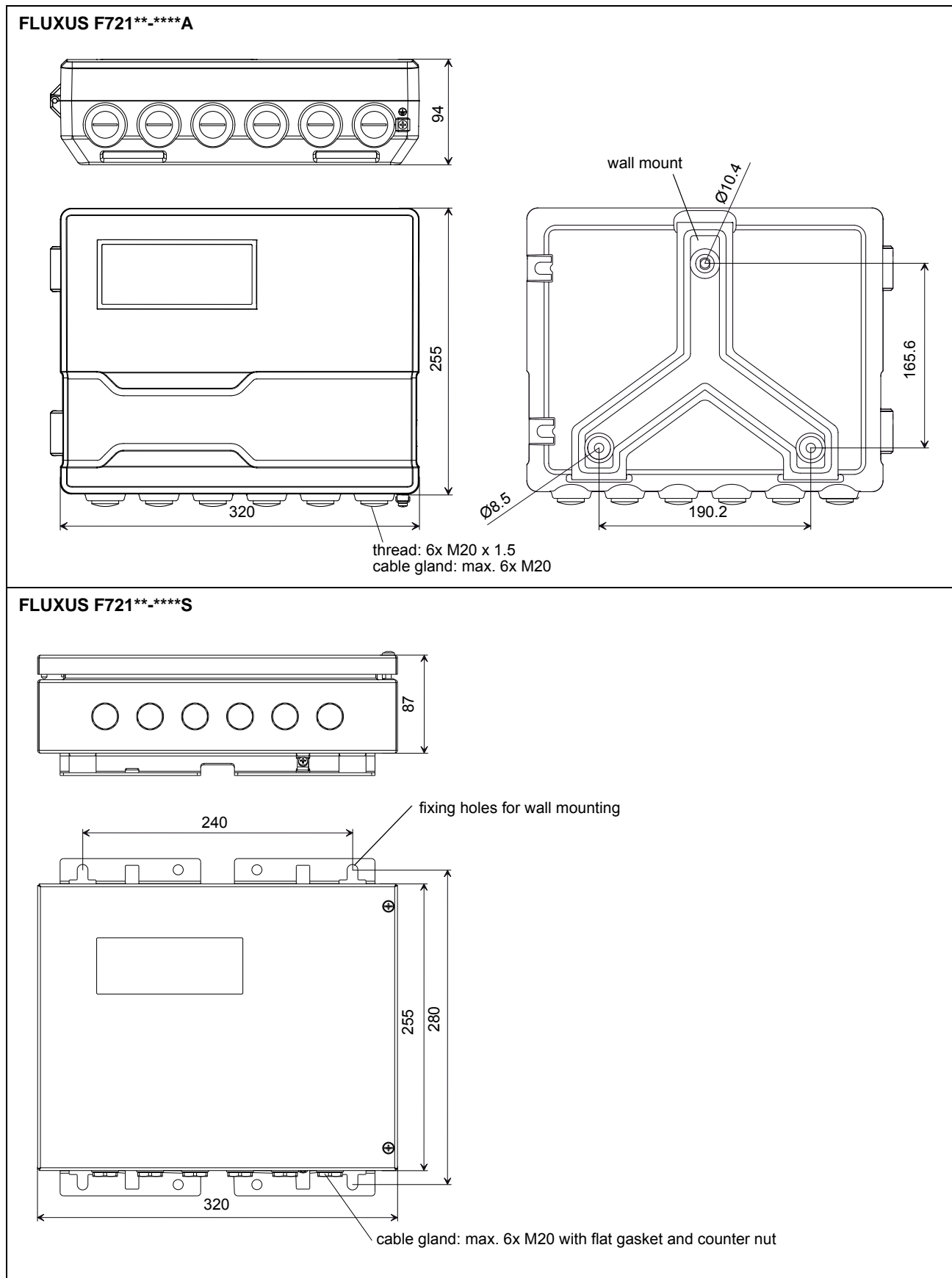
<sup>2</sup> reference uncertainty < 0.2 %

FLUXUS	F721**-NNN*A	F721**-NNN*S F721**-A20*S
<b>measuring functions</b>		
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	
<b>data logger</b>		
loggable values	all physical quantities, totalized values and diagnostic values	
capacity	max. 800 000 measured values	
<b>communication (optional)</b>		
process integration	measured value transmission, configuration and parametrization (transmitter): Modbus TCP or HART or FF H1 or Profibus PA or measured value transmission: RS485 (emitter) or Modbus RTU or BACnet MS/TP or BACnet IP	
diagnosis <sup>3</sup>	measured value transmission, configuration and parametrization (transmitter): USB, Ethernet	
<b>serial data kit (optional)</b>		
software	FluxDiag: online diagnostics and report generation (min. Windows 7)	
cable	USB cable <sup>3</sup>	
<b>outputs (optional)</b>		
	The outputs are galvanically isolated from the transmitter.	
number	on request	
<b>switchable current output (nonEx)</b>		
	All switchable current outputs are switched to active or passive mode at the same time.	
- range	4...20 mA (3.2...22 mA)	
- accuracy	0.04 % of reading $\pm 3 \mu\text{A}$	
- active output	$R_{\text{ext}} < 350 \Omega$	
- passive output	$U_{\text{ext}} = 8...30 \text{ V}$ , depending on $R_{\text{ext}}$ , $R_{\text{ext}} < 1 \text{ k}\Omega$	
<b>current output</b>		
current output	0/4...20 mA	
- range	0/4...20 mA	
- accuracy	0.1 % of reading $\pm 15 \mu\text{A}$	
- active output	$R_{\text{ext}} < 500 \Omega$	
- passive output	$U_{\text{ext}} = 4...24 \text{ V}$ , depending on $R_{\text{ext}}$ , $R_{\text{ext}} < 1 \text{ k}\Omega$	
current output I1 in HART mode	4...20 mA	
- range	4...20 mA	
- active output	$U_{\text{int}} = 24 \text{ V}$	
- passive output	$U_{\text{ext}} = 10...24 \text{ V}$	
<b>voltage output</b>		
range	0...1 V or 0...10 V	
accuracy	0...1 V: 0.1 % of reading $\pm 1 \text{ mV}$ 0...10 V: 0.1 % of reading $\pm 10 \text{ mV}$	
internal resistance	$R_{\text{int}} = 500 \Omega$	
<b>frequency output</b>		
range	0...5 kHz	
open collector	24 V/4 mA, $R_{\text{int}} = 66.5 \Omega$	
<b>binary output</b>		
Reed relay	48 V/100 mA, $R_{\text{int}} = 22 \Omega$	
optorelay	26 V/100 mA	
binary output as alarm output - functions	limit, change of flow direction or error	
binary output as pulse output - pulse value - pulse width	0.01...1000 units optorelay: 1...1000 ms Reed relay: 80...1000 ms	

<sup>3</sup> outside of explosive atmosphere (housing cover open)

FLUXUS	F721**-NNN*A	F721**-NNN*S F721**-A20*S
<b>inputs (optional)</b>		
	The inputs are galvanically isolated from the transmitter.	
number	max. 4, on request	
<b>temperature input</b>		
type	Pt100/Pt1000	
connection	4-wire	
range	-150...+560 °C	
resolution	0.01 K	
accuracy	±0.01 % of reading ±0.03 K	
<b>current input</b>		
accuracy	0.1 % of reading ±10 µA	
active input	U <sub>int</sub> = 24 V, R <sub>int</sub> = 50 Ω, P <sub>int</sub> < 0.5 W, not short-circuit proof	
- range	0...20 mA	
passive input	R <sub>int</sub> = 50 Ω, P <sub>int</sub> < 0.3 W	
- range	-20...+20 mA	
<b>voltage input</b>		
range	0...1 V	
accuracy	0.1 % of reading ±1 mV	
internal resistance	R <sub>int</sub> = 1 MΩ	
<b>binary input</b>		
switching signal	5...30 V, 1 mA FM class I, Div. 2: 5...26 V, 1 mA	
functions	<ul style="list-style-type: none"> <li>- resetting the measured values</li> <li>- resetting the totalizers</li> <li>- stopping the totalizers</li> <li>- activation of the measuring mode for highly dynamic flows</li> </ul>	

Dimensions

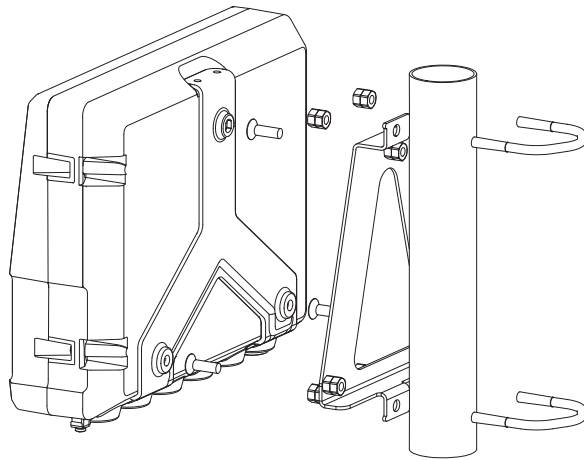


in mm

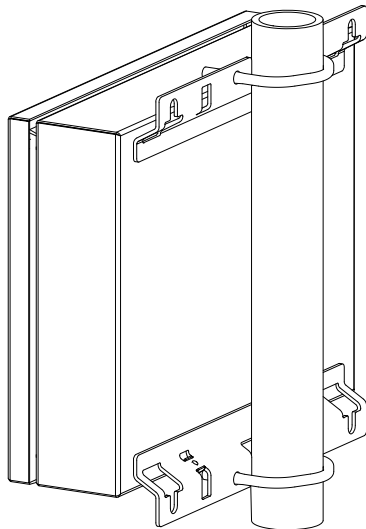


## 2 " Pipe Mounting Kit (optional)

FLUXUS F721\*\*\_\*\*\*\*A

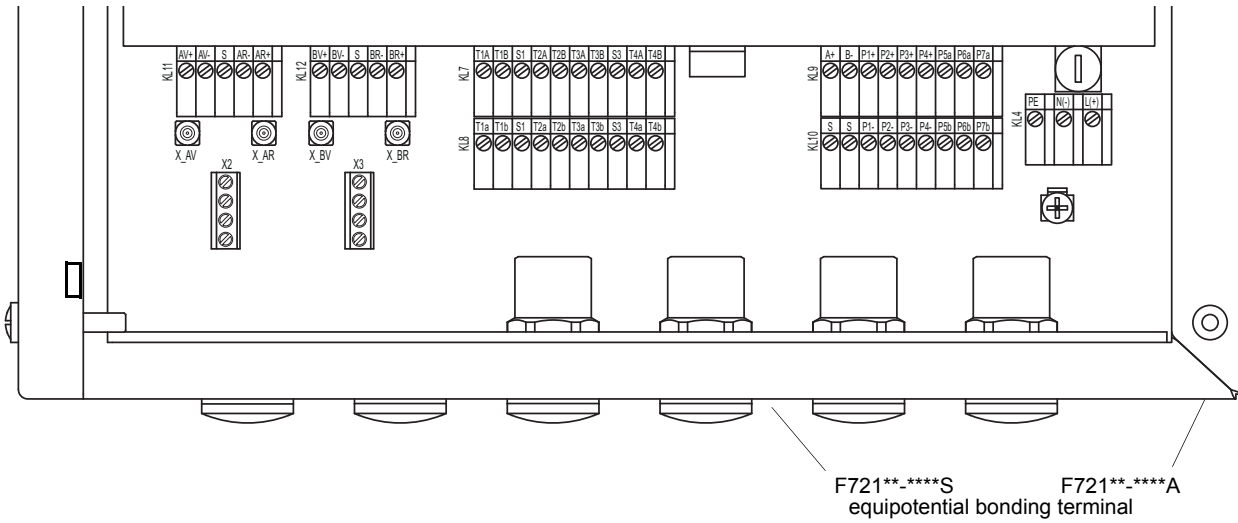


FLUXUS F721\*\*\_\*\*\*\*S



## Terminal Assignment

### FLUXUS F721



#### power supply

terminal strip KL4

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

#### transducers

terminal strip KL11, KL12

extension cable (transducers ****8*, ****LI*, ****52) transducer cable (transducers ****8*, ****LI*)			
measuring channel A		measuring channel B	
terminal	connection	terminal	connection
AV+	signal	BV+	signal
AV-	shield	BV-	shield
AR-	shield	BR-	shield
AR+	signal	BR+	signal

transducer cable (transducers ****52)		
measuring channel A	measuring channel B	
terminal		connection
X_AV	X_BV	SMB connector
X_AR	X_BR	SMB connector

#### outputs<sup>1</sup>

terminal strip KL9, KL10

terminal	connection
P1+...P4+, P1-...P4-	current output, voltage output, frequency output, binary output (Reed relay)
P5a...P7a, P5b...P7b	binary output (optorelay)

#### RS485, Modbus RTU, BACnet MS/TP, Profibus, FF (optional)

terminal strip KL9, KL10

terminal	connection
A+	signal +
B-	signal -
S	shield

#### analog inputs<sup>1</sup>

terminal strip KL7, KL8

terminal	temperature probe		passive current source connection of an active input	active current source connection of a passive input
	direct connection	connection with extension cable		
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<sup>1</sup>

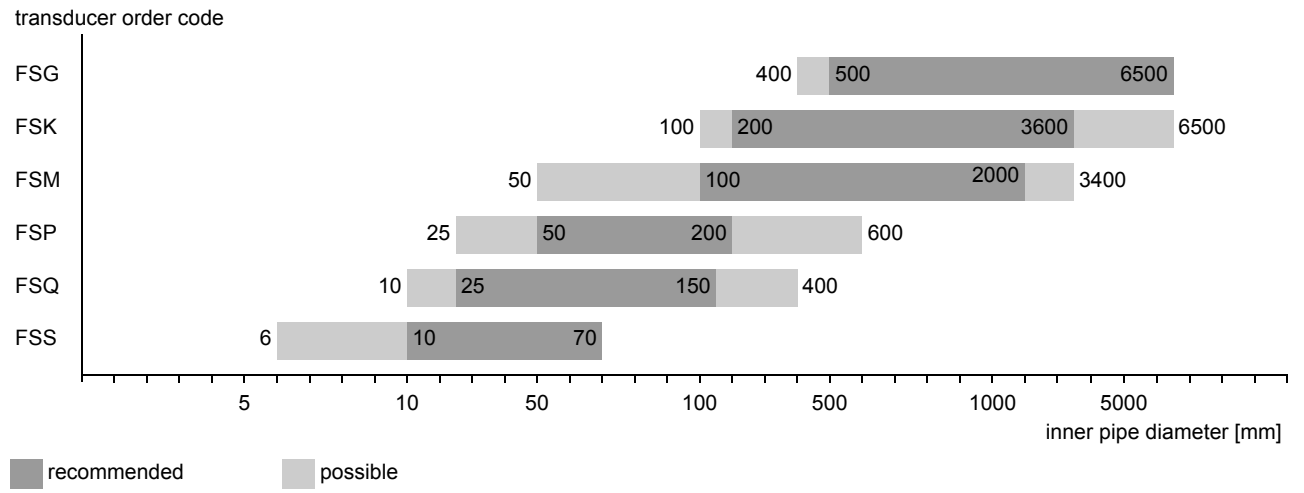
terminal strip KL9, KL10

terminal
P1+...P2+, P1-...P2-

<sup>1</sup> The number, type and terminal assignment of the outputs and inputs will be customized.

## Transducers

### Transducer Selection

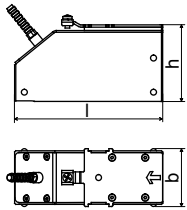
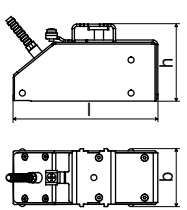


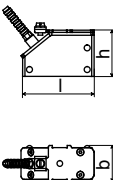
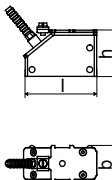
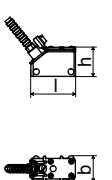
### Transducer Order Code

1, 2	3	4	5, 6	7, 8	9...11	12, 13	no. of character			
transducer	transducer frequency	-	ambient temperature	explosion protection	connection system	-	extension cable	/	option	description
FS									set of ultrasonic flow transducers for liquids measurement, shear wave	
	G									0.2 MHz
	K									0.5 MHz
	M									1 MHz
	P									2 MHz
	Q									4 MHz
	S									8 MHz
			N							normal temperature range
			E							extended temperature range (shear wave transducers with transducer frequency M, P, Q)
				A1						ATEX zone 1/IECEx zone 1
				A2						ATEX zone 2
				F2						FM Class I Div. 2
				NN						not explosion proof
					TS					direct connection or connection via junction box
							XXX			cable length in m, for max. length of extension cable see page 25 0 m: without junction box > 0 m: with junction box JB01 (zone 1), JB02 (ATEX zone 2, FM), JB03 (not explosion proof), JBP2 (transducers IP68, ATEX zone 2), JBP3 (transducers IP68, not explosion proof)
									LC	long transducer cable (only FSG, FSK)
									IP68	degree of protection IP68 with connection system TS
									OS	housing with stainless steel 316 (with connection system TS)
example										
FS	M	-	N	A1	TS	-	030			shear wave transducer 1 MHz, normal temperature range, ATEX zone 1/IECEx zone 1, connection system TS with junction box JB01 and extension cable 30 m
		-				-		/		

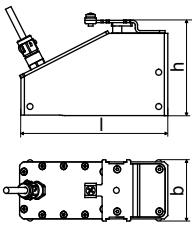
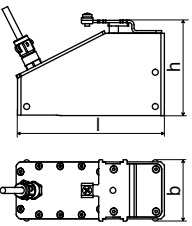
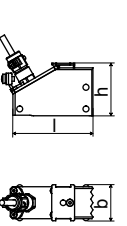
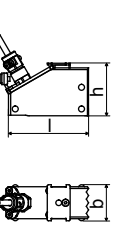




## Technical Data

### Shear Wave Transducers (zone 1)

technical type		CDG1N81	CDK1N81
order code		<b>FSG-NA1TS</b> <b>FSG-NA1TS/OS</b>	<b>FSK-NA1TS</b> <b>FSK-NA1TS/OS</b>
transducer frequency	MHz	0.2	0.5
<b>inner pipe diameter d</b>			
min. extended	mm	400	100
min. recommended	mm	500	200
max. recommended	mm	6500	3600
max. extended	mm	6500	6500
<b>pipe wall thickness</b>			
min.	mm	-	-
max.	mm	-	-
<b>material</b>			
housing		PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)
contact surface		PEEK	PEEK
degree of protection according to IEC/EN 60529		IP65	IP65
<b>transducer cable</b>			
type		1699	1699
length	m	5	5
<b>dimensions</b>			
length l	mm	129.5	126.5
width b	mm	51	51
height h	mm	67	67.5
dimensional drawing			
<b>ambient temperature</b>			
min.	°C	-40	-40
max.	°C	+130	+130
temperature compensation		x	x
<b>explosion protection</b>			
ATEX / IECEx	category zone	gas: 2G 1	dust: 2D 21
	<b>explosion protection temperature (pipe surface)</b>		
	min.	°C	-55
	max.	°C	+180
	marking	CE 0637 (E) II2G II2D Ex e q IIC T6...T3 Gb Ex tb IIIC TX Db	
	certification ATEX	IBExU07ATEX1168 X	
	certification IECEx	IECEx IBE 08.0007X	
	type of protection	gas: increased safety, powder filling dust: protection by enclosure	
	transducer mounting fixture necessary	x	

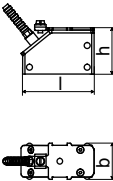
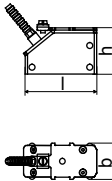
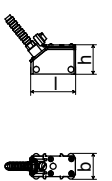
technical type		CDM2N81	CDP2N81	CDQ2N81
order code		<b>FSM-NA1TS</b> <b>FSM-NA1TS/OS</b>	<b>FSP-NA1TS</b> <b>FSP-NA1TS/OS</b>	<b>FSQ-NA1TS</b> <b>FSQ-NA1TS/OS</b>
transducer frequency	MHz	1	2	4
<b>inner pipe diameter d</b>				
min. extended	mm	50	25	10
min. recommended	mm	100	50	25
max. recommended	mm	2000	200	150
max. extended	mm	3400	600	400
<b>pipe wall thickness</b>				
min.	mm	-	-	-
max.	mm	-	-	-
<b>material</b>				
housing		PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)
contact surface		PEEK	PEEK	PEEK
degree of protection according to IEC/EN 60529		IP65	IP65	IP65
<b>transducer cable</b>				
type		1699	1699	1699
length	m	4	4	3
<b>dimensions</b>				
length l	mm	64	64	40
width b	mm	32	32	22
height h	mm	40.5	40.5	25.5
dimensional drawing				
<b>ambient temperature</b>				
min.	°C	-40	-40	-40
max.	°C	+130	+130	+130
temperature compensation		x	x	x
<b>explosion protection</b>				
category		gas: 2G dust: 2D	gas: 2G dust: 2D	gas: 2G dust: 2D
zone		1 21	1 21	1 21
<b>explosion protection temperature (pipe surface)</b>				
min.	°C	-55	-55	-55
max.	°C	+180	+180	+180
ATEX / IECEx	marking	CE 0637 Ex e q IIC T6...T3 Gb Ex tb IIIC TX Db	CE 0637 Ex e q IIC T6...T3 Gb Ex tb IIIC TX Db	CE 0637 Ex e q IIC T6...T3 Gb Ex tb IIIC TX Db
	certification ATEX	IBExU07ATEX1168 X	IBExU07ATEX1168 X	IBExU07ATEX1168 X
	certification IECEx	IECEX IBE 08.0007X	IECEX IBE 08.0007X	IECEX IBE 08.0007X
	type of protection	gas: increased safety, powder filling dust: protection by enclosure	gas: increased safety, powder filling dust: protection by enclosure	gas: increased safety, powder filling dust: protection by enclosure
	transducer mounting fixture necessary	x	x	x

**Shear Wave Transducers (zone 1, IP68)**

technical type		CDG1L1	CDK1L1	CDM2L1	CDP2L1
order code		<b>FSG-NA1TS/IP68</b>	<b>FSK-NA1TS/IP68</b>	<b>FSM-NA1TS/IP68</b>	<b>FSP-NA1TS/IP68</b>
transducer frequency	MHz	0.2	0.5	1	2
<b>inner pipe diameter d</b>					
min. extended	mm	400	100	50	25
min. recommended	mm	500	200	100	50
max. recommended	mm	6500	3600	2000	200
max. extended	mm	6500	6500	3400	600
<b>pipe wall thickness</b>					
min.	mm	-	-	-	-
max.	mm	-	-	-	-
<b>material</b>					
housing		PEEK with stainless steel cap 316Ti (1.4571)	PEEK with stainless steel cap 316Ti (1.4571)	PEEK with stainless steel cap 316Ti (1.4571)	PEEK with stainless steel cap 316Ti (1.4571)
contact surface		PEEK	PEEK	PEEK	PEEK
degree of protection according to IEC/EN 60529		IP68 <sup>1</sup>	IP68 <sup>1</sup>	IP68 <sup>1</sup>	IP68 <sup>1</sup>
<b>transducer cable</b>					
type		2550	2550	2550	2550
length	m	12	12	12	12
<b>dimensions</b>					
length l	mm	130	130	72	72
width b	mm	54	54	32	32
height h	mm	83.5	83.5	46	46
dimensional drawing					
<b>ambient temperature</b>					
min.	°C	-40	-40	-40	-40
max.	°C	+100	+100	+100	+100
temperature compensation		x	x	x	x
<b>explosion protection</b>					
category		gas: 2G dust: 2D	gas: 2G dust: 2D	gas: 2G dust: 2D	gas: 2G dust: 2D
zone		1 21	1 21	1 21	1 21
<b>explosion protection temperature (pipe surface)</b>					
min.	°C	-55	-55	-55	-55
max.	°C	+180	+180	+180	+180
marking		CE 0637  II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db	CE 0637  II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db	CE 0637  II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db	CE 0637  II2G II2D Ex q IIC T6...T3 Gb Ex tb IIIC TX Db
certification ATEX		IBExU07ATEX1168 X	IBExU07ATEX1168 X	IBExU07ATEX1168 X	IBExU07ATEX1168 X
certification IECEx		IECEX IBE 08.0007X	IECEX IBE 08.0007X	IECEX IBE 08.0007X	IECEX IBE 08.0007X
type of protection		gas: powder filling dust: protection by enclosure	gas: powder filling dust: protection by enclosure	gas: powder filling dust: protection by enclosure	gas: powder filling dust: protection by enclosure
transducer mounting fixture necessary		x	x	x	x

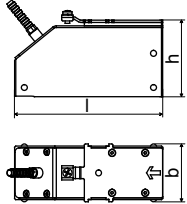
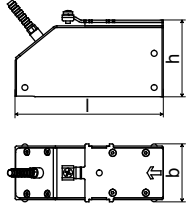
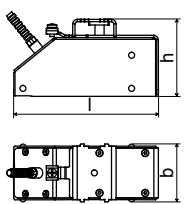
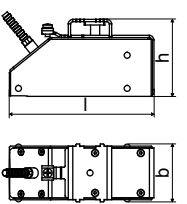
<sup>1</sup> test conditions: 3 months/2 bar (20 m)/20 °C

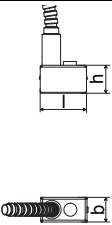

**Shear Wave Transducers (zone 1, extended temperature range)**

technical type		CDM2E85	CDP2E85	CDQ2E85	
order code		<b>FSM-EA1TS</b> <b>FSM-EA1TS/OS</b>	<b>FSP-EA1TS</b> <b>FSP-EA1TS/OS</b>	<b>FSQ-EA1TS</b> <b>FSQ-EA1TS/OS</b>	
transducer frequency	MHz	1	2	4	
<b>inner pipe diameter d</b>					
min. extended	mm	50	25	10	
min. recommended	mm	100	50	25	
max. recommended	mm	2000	200	150	
max. extended	mm	3400	600	400	
<b>pipe wall thickness</b>					
min.	mm	-	-	-	
max.	mm	-	-	-	
<b>material</b>					
housing		PI with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PI with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PI with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	
contact surface		PI	PI	PI	
degree of protection according to IEC/EN 60529		IP56	IP56	IP56	
<b>transducer cable</b>					
type		6111	6111	6111	
length	m	4	4	3	
<b>dimensions</b>					
length l	mm	64	64	40	
width b	mm	32	32	22	
height h	mm	40.5	40.5	25.5	
dimensional drawing					
<b>ambient temperature</b>					
min.	°C	-30	-30	-30	
max.	°C	+200	+200	+200	
temperature compensation		x	x	x	
<b>explosion protection</b>					
ATEX / IECEx	category zone	gas: 2G dust: 3D 1 22	gas: 2G dust: 3D 1 22	gas: 2G dust: 3D 1 22	
	<b>explosion protection temperature (pipe surface)</b>				
	min.	°C	-45	-45	-45
	max.	°C	+225	+225	+225
	marking		CE 0637 (Ex) II2G II2D Ex e q IIC T6...T2 Gb Ex tb IIIA TX Db	CE 0637 (Ex) II2G II2D Ex e q IIC T6...T2 Gb Ex tb IIIA TX Db	CE 0637 (Ex) II2G II2D Ex e q IIC T6...T2 Gb Ex tb IIIA TX Db
	certification ATEX		IBExU07ATEX1168 X	IBExU07ATEX1168 X	IBExU07ATEX1168 X
	certification IECEx		IECEx IBE 08.0007X	IECEx IBE 08.0007X	IECEx IBE 08.0007X
	type of protection		gas: increased safety, powder filling dust: protection by enclosure	gas: increased safety, powder filling dust: protection by enclosure	gas: increased safety, powder filling dust: protection by enclosure
transducer mounting fixture necessary		x	x	x	

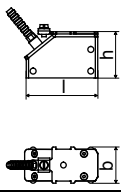
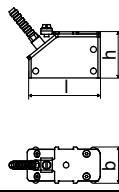
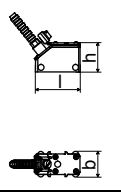


**Shear Wave Transducers (ATEX zone 2, FM or not explosion proof)**

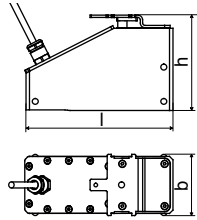
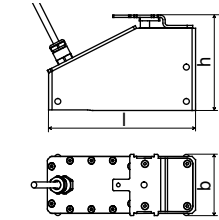
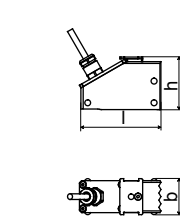
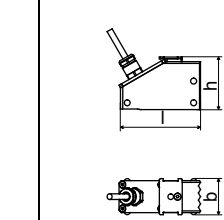




technical type		CDG1N52	CLG1N52	CDK1N52	CLK1N52
order code		FSG-NA2TS FSG-NA2TS/OS FSG-NF2TS FSG-NF2TS/OS FSG-NNNTS FSG-NNNTS/OS	FSG-NA2TS/LC FSG-NA2TS/LC/OS FSG-NF2TS/LC FSG-NF2TS/LC/OS FSG-NNNTS/LC FSG-NNNTS/LC/OS	FSK-NA2TS FSK-NA2TS/OS FSK-NF2TS FSK-NF2TS/OS FSK-NNNTS FSK-NNNTS/OS	FSK-NA2TS/LC FSK-NA2TS/LC/OS FSK-NF2TS/LC FSK-NF2TS/LC/OS FSK-NNNTS/LC FSK-NNNTS/LC/OS
transducer frequency	MHz	0.2	0.2	0.5	0.5
<b>inner pipe diameter d</b>					
min. extended	mm	400	400	100	100
min. recommended	mm	500	500	200	200
max. recommended	mm	6500	6500	3600	3600
max. extended	mm	6500	6500	6500	6500
<b>pipe wall thickness</b>					
min.	mm	-	-	-	-
max.	mm	-	-	-	-
<b>material</b>					
housing		PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)
contact surface		PEEK	PEEK	PEEK	PEEK
degree of protection according to IEC/EN 60529		IP67	IP67	IP67	IP67
<b>transducer cable</b>					
type	m	1699	1699	1699	1699
length	m	5	9	5	9
<b>dimensions</b>					
length l	mm	129.5	129.5	126.5	126.5
width b	mm	51	51	51	51
height h	mm	67	67	67.5	67.5
dimensional drawing					
<b>ambient temperature</b>					
min.	°C	-40	-40	-40	-40
max.	°C	+130	+130	+130	+130
temperature compensation		x	x	x	x
<b>explosion protection</b>					
order code		FSG-NA2TS FSG-NA2TS/OS	FSG-NA2TS/LC FSG-NA2TS/LC/OS	FSK-NA2TS FSK-NA2TS/OS	FSK-NA2TS/LC FSK-NA2TS/LC/OS
category		gas: 3G dust: 3D	gas: 3G dust: 3D	gas: 3G dust: 3D	gas: 3G dust: 3D
zone		2 22	2 22	2 22	2 22
<b>explosion protection temperature (pipe surface)</b>					
min.	°C	-55	-55	-55	-55
max.	°C	+190	+190	+190	+190
ATEX	marking	CE Ex II3G Ex nA IIC T6...T3 Gc Ta -55...+190 °C II3D Ex tc IIIC TX Dc	CE Ex II3G Ex nA IIC T6...T3 Gc Ta -55...+190 °C II3D Ex tc IIIC TX Dc	CE Ex II3G Ex nA IIC T6...T3 Gc Ta -55...+190 °C II3D Ex tc IIIC TX Dc	CE Ex II3G Ex nA IIC T6...T3 Gc Ta -55...+190 °C II3D Ex tc IIIC TX Dc
	certification	-	-	-	-
	type of protection	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure
	transducer mounting fixture necessary	x	x	x	x
order code		FSG-NF2TS FSG-NF2TS/OS	FSG-NF2TS/LC FSG-NF2TS/LC/OS	FSK-NF2TS FSK-NF2TS/OS	FSK-NF2TS/LC FSK-NF2TS/LC/OS
<b>explosion protection temperature</b>					
min.	°C	-40	-40	-40	-40
max.	°C	+125	+125	+125	+125
FM	marking	NI/Cl. I,II,III/Div. 2 / APPROVED GP A,B,C,D,E,F,G/Temp. Codes dwg 3860	NI/Cl. I,II,III/Div. 2 / APPROVED GP A,B,C,D,E,F,G/Temp. Codes dwg 3860	NI/Cl. I,II,III/Div. 2 / APPROVED GP A,B,C,D,E,F,G/Temp. Codes dwg 3860	NI/Cl. I,II,III/Div. 2 / APPROVED GP A,B,C,D,E,F,G/Temp. Codes dwg 3860
	type of protection	non incendive	non incendive	non incendive	non incendive

technical type	CDS1N52	
order code	<b>FSS-NF2TS</b> <b>FSS-NNNTS</b>	
transducer frequency	MHz	8
<b>inner pipe diameter d</b>		
min. extended	mm	6
min. recommended	mm	10
max. recommended	mm	70
max. extended	mm	70
<b>pipe wall thickness</b>		
min.	mm	-
max.	mm	-
<b>material</b>		
housing	stainless steel 304 (1.4301)	
contact surface	PEI	
degree of protection according to IEC/EN 60529	IP65	
<b>transducer cable</b>		
type	1699	
length	m	2
<b>dimensions</b>		
length l	mm	25
width b	mm	13
height h	mm	17
dimensional drawing		
<b>ambient temperature</b>		
min.	°C	-30
max.	°C	+130
temperature compensation	x	
<b>explosion protection</b>		
order code	FSS-NF2TS	
<b>F M</b>	<b>explosion protection temperature</b>	
	min.	°C -40
	max.	°C +125
marking	 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860	

**Shear Wave Transducers (ATEX zone 2, FM or not explosion proof)**

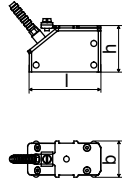
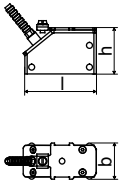
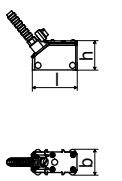



technical type		CDM2N52	CDP2N52	CDQ2N52
order code		FSM-NA2TS FSM-NA2TS/OS FSM-NF2TS FSM-NF2TS/OS FSM-NNNTS FSM-NNNTS/OS	FSP-NA2TS FSP-NA2TS/OS FSP-NF2TS FSP-NF2TS/OS FSP-NNNTS FSP-NNNTS/OS	FSQ-NA2TS FSQ-NA2TS/OS FSQ-NF2TS FSQ-NF2TS/OS FSQ-NNNTS FSQ-NNNTS/OS
transducer frequency	MHz	1	2	4
<b>inner pipe diameter d</b>				
min. extended	mm	50	25	10
min. recommended	mm	100	50	25
max. recommended	mm	2000	200	150
max. extended	mm	3400	600	400
<b>pipe wall thickness</b>				
min.	mm	-	-	-
max.	mm	-	-	-
<b>material</b>				
housing		PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PEEK with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)
contact surface		PEEK	PEEK	PEEK
degree of protection according to IEC/EN 60529		IP67	IP67	IP67
<b>transducer cable</b>				
type		1699	1699	1699
length	m	4	4	3
<b>dimensions</b>				
length l	mm	64	64	40
width b	mm	32	32	22
height h	mm	40.5	40.5	25.5
dimensional drawing				
<b>ambient temperature</b>				
min.	°C	-40	-40	-40
max.	°C	+130	+130	+130
temperature compensation		x	x	x
<b>explosion protection</b>				
order code		FSM-NA2TS FSM-NA2TS/OS	FSP-NA2TS FSP-NA2TS/OS	FSQ-NA2TS FSQ-NA2TS/OS
category zone		gas: 3G dust: 3D 2 22	gas: 3G dust: 3D 2 22	gas: 3G dust: 3D 2 22
<b>explosion protection temperature (pipe surface)</b>				
min.	°C	-55	-55	-55
max.	°C	+190	+190	+190
<b>ATEX</b>	marking	CE (Ex) II3G Ex nA IIC T6...T3 Gc Ta -55...+190 °C II3D Ex tc IIIC TX Dc	CE (Ex) II3G Ex nA IIC T6...T3 Gc Ta -55...+190 °C II3D Ex tc IIIC TX Dc	CE (Ex) II3G Ex nA IIC T6...T3 Gc Ta -55...+190 °C II3D Ex tc IIIC TX Dc
	certification	-	-	-
	type of protection	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure
	transducer mounting fixture necessary	x	x	x
	order code		FSM-NF2TS FSM-NF2TS/OS	FSP-NF2TS FSP-NF2TS/OS
<b>explosion protection temperature</b>				
min.	°C	-55	-55	-55
max.	°C	+190	+190	+190
<b>FM</b>	marking	NI/Cl. I,II,III/Div. 2 / APPROVED GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860	NI/Cl. I,II,III/Div. 2 / APPROVED GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860	NI/Cl. I,II,III/Div. 2 / APPROVED GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860
	type of protection	non incendive	non incendive	non incendive

**Shear Wave Transducers (ATEX zone 2 or not explosion proof, IP68)**

technical type		CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8
order code		<b>FSG-NA2TS/IP68</b> <b>FSG-NNNTS/IP68</b>	<b>FSK-NA2TS/IP68</b> <b>FSK-NNNTS/IP68</b>	<b>FSM-NA2TS/IP68</b> <b>FSM-NNNTS/IP68</b>	<b>FSP-NA2TS/IP68</b> <b>FSP-NNNTS/IP68</b>
transducer frequency	MHz	0.2	0.5	1	2
<b>inner pipe diameter d</b>					
min. extended	mm	400	100	50	25
min. recommended	mm	500	200	100	50
max. recommended	mm	6500	3600	2000	200
max. extended	mm	6500	6500	3400	600
<b>pipe wall thickness</b>					
min.	mm	-	-	-	-
max.	mm	-	-	-	-
<b>material</b>					
housing		PEEK with stainless steel cap 316Ti (1.4571)	PEEK with stainless steel cap 316Ti (1.4571)	PEEK with stainless steel cap 316Ti (1.4571)	PEEK with stainless steel cap 316Ti (1.4571)
contact surface		PEEK	PEEK	PEEK	PEEK
degree of protection according to IEC/EN 60529		IP68 <sup>1</sup>	IP68 <sup>1</sup>	IP68 <sup>1</sup>	IP68 <sup>1</sup>
<b>transducer cable</b>					
type		2550	2550	2550	2550
length	m	12	12	12	12
<b>dimensions</b>					
length l	mm	130	130	72	72
width b	mm	54	54	32	32
height h	mm	83.5	83.5	46	46
dimensional drawing					
<b>ambient temperature</b>					
min.	°C	-40	-40	-40	-40
max.	°C	+100	+100	+100	+100
temperature compensation		x	x	x	x
<b>explosion protection</b>					
order code		FSG-NA2TS/IP68	FSK-NA2TS/IP68	FSM-NA2TS/IP68	FSP-NA2TS/IP68
category		gas: 3G dust: 3D	gas: 3G dust: 3D	gas: 3G dust: 3D	gas: 3G dust: 3D
zone		2 22	2 22	2 22	2 22
<b>explosion protection temperature (pipe surface)</b>					
min.	°C	-40	-40	-40	-40
max.	°C	+90	+90	+90	+90
<b>ATEX</b>	marking	<b>CE</b>  II3G Ex nA IIC T6...T5 Gc Ta -40...+90 °C II3D Ex tc IIIC TX Dc	<b>CE</b>  II3G Ex nA IIC T6...T5 Gc Ta -40...+90 °C II3D Ex tc IIIC TX Dc	<b>CE</b>  II3G Ex nA IIC T6...T5 Gc Ta -40...+90 °C II3D Ex tc IIIC TX Dc	<b>CE</b>  II3G Ex nA IIC T6...T5 Gc Ta -40...+90 °C II3D Ex tc IIIC TX Dc
	certification	-	-	-	-
	type of protection	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure
	transducer mounting fixture necessary	x	x	x	x

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

**Shear Wave Transducers (extended temperature range, ATEX zone 2, FM or not explosion proof)**

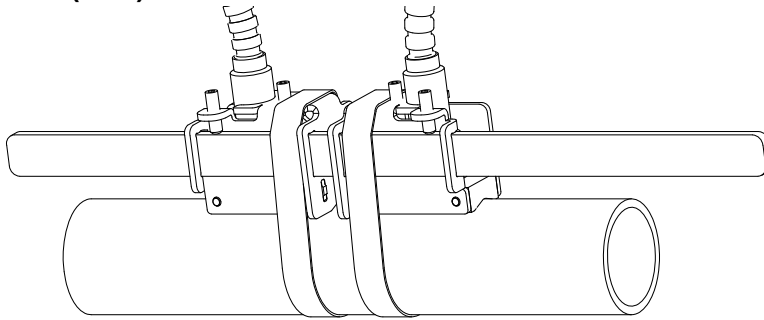
technical type		CDM2E52	CDP2E52	CDQ2E52
order code		FSM-EA2TS FSM-EA2TS/OS FSM-EF2TS FSM-EF2TS/OS FSM-ENNTS FSM-ENNTS/OS	FSP-EA2TS FSP-EA2TS/OS FSP-EF2TS FSP-EF2TS/OS FSP-ENNTS FSP-ENNTS/OS	FSQ-EA2TS FSQ-EA2TS/OS FSQ-EF2TS FSQ-EF2TS/OS FSQ-ENNTS FSQ-ENNTS/OS
transducer frequency	MHz	1	2	4
<b>inner pipe diameter d</b>				
min. extended	mm	50	25	10
min. recommended	mm	100	50	25
max. recommended	mm	2000	200	150
max. extended	mm	3400	600	400
<b>pipe wall thickness</b>				
min.	mm	-	-	-
max.	mm	-	-	-
<b>material</b>				
housing		PI with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PI with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)	PI with stainless steel cap 304 (1.4301), option OS: 316L (1.4404)
contact surface		PI	PI	PI
degree of protection according to IEC/EN 60529		IP56	IP56	IP56
<b>transducer cable</b>				
type		6111	6111	6111
length	m	4	4	3
<b>dimensions</b>				
length l	mm	64	64	40
width b	mm	32	32	22
height h	mm	40.5	40.5	25.5
dimensional drawing				
<b>ambient temperature</b>				
min.	°C	-30	-30	-30
max.	°C	+200	+200	+200
temperature compensation		x	x	x
<b>explosion protection</b>				
order code		FSM-EA2TS FSM-EA2TS/OS	FSP-EA2TS FSP-EA2TS/OS	FSQ-EA2TS FSQ-EA2TS/OS
category zone		gas: 3G dust: 3D 2 22	gas: 3G dust: 3D 2 22	gas: 3G dust: 3D 2 22
<b>explosion protection temperature (pipe surface)</b>				
min.	°C	-45	-45	-45
max.	°C	+235	+235	+235
A T E X	marking	CE (Ex) II3G Ex nA IIC T6...T2 Gc Ta -45...+235 °C II3D Ex tc IIIB TX Dc	CE (Ex) II3G Ex nA IIC T6...T2 Gc Ta -45...+235 °C II3D Ex tc IIIB TX Dc	CE (Ex) II3G Ex nA IIC T6...T2 Gc Ta -45...+235 °C II3D Ex tc IIIB TX Dc
	certification	-	-	-
	type of protection	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure	gas: non sparking dust: protection by enclosure
	transducer mounting fixture necessary	x	x	x
order code		FSM-EF2TS FSM-EF2TS/OS	FSP-EF2TS FSP-EF2TS/OS	FSQ-EF2TS FSQ-EF2TS/OS
<b>explosion protection temperature</b>				
min.	°C	-45	-45	-45
max.	°C	+235	+235	+235
F M	marking	 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860	 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860	 NI/Cl. I,II,III/Div. 2 / GP A,B,C,D,E,F,G/ Temp. Codes dwg 3860
	type of protection	non incendive	non incendive	non incendive

## Transducer Mounting Fixture

### Order Code

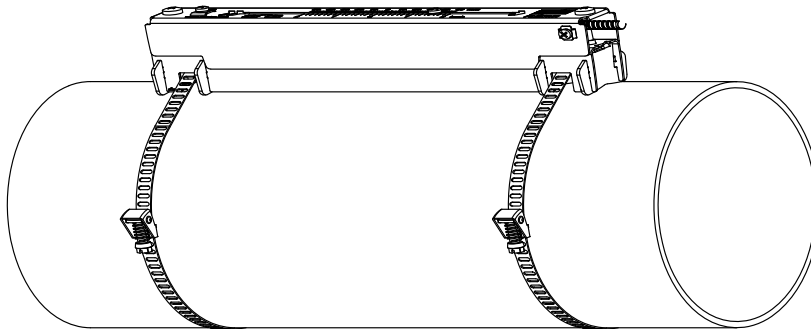
1, 2	3	4	5	6	7...9	10, 11	no. of character			
transducer mounting fixture	transducer	-	measurement arrangement	size	-	fixation	outer pipe diameter	/	option	
VL										Variofix L
VC										Variofix C
WI										transducer box for WaveInjector
	K									transducers with transducer frequency G, K
	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
						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	degree of protection IP68
									OS	housing with stainless steel 316
									Z	special design
example										
VL	M	-	D	S	-	S	200			Variofix L and tension straps for transducers with transducer frequency M, P
		-			-			/		

**Variofix L (VLS)**



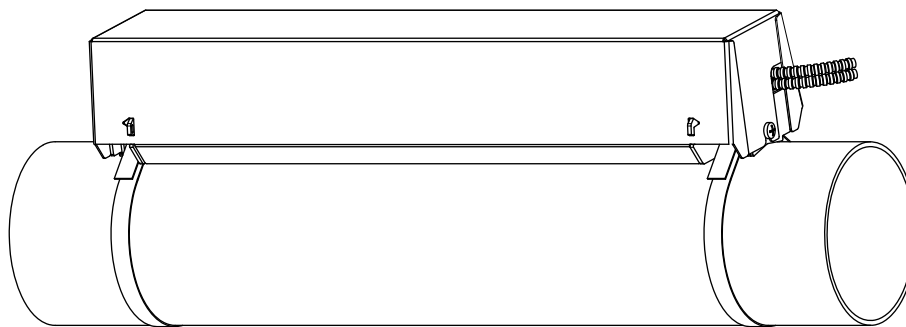
transducers:  
CDS1N52  
material: stainless steel 304  
(1.4301), 303 (1.4305)

**Variofix L (VLK, VLM, VLQ)**



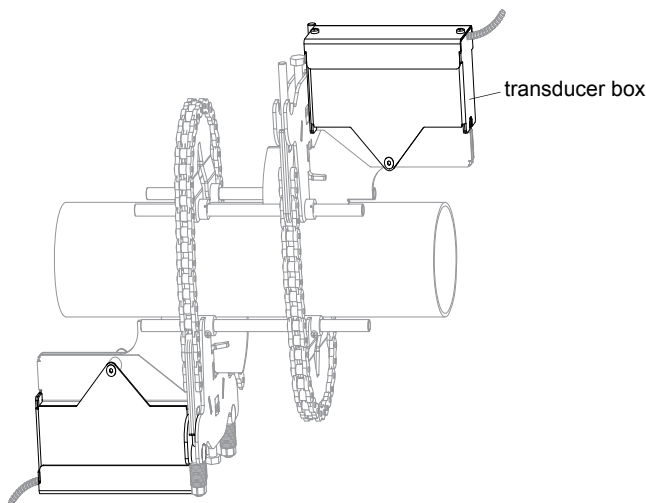
material: stainless steel 304  
(1.4301), 301 (1.4310), 410  
(1.4006)  
option OS: 316 (1.4571), 316L  
(1.4404), 17-7PH (1.4568)  
inner length:  
**VLK:** 348 mm,  
option IP68: 368 mm  
**VLM:** 234 mm  
**VLQ:** 176 mm  
dimensions:  
**VLK:** 423 x 90 x 93 mm,  
option IP68: 443 x 94 x 105 mm  
**VLM:** 309 x 57 x 63 mm  
**VLQ:** 247 x 43 x 47 mm

**Variofix C (VC)**



material: stainless steel 304  
(1.4301), 301 (1.4310)  
option OS: 316 (1.4571)  
inner length:  
**VCK-\*L:** 500 mm  
**VCK-\*S:** 350 mm  
**VCM:** 400 mm  
**VCQ:** 250 mm  
dimensions:  
**VCK-\*L:** 560 x 122 x 102 mm,  
option IP68: 560 x 126 x 120 mm  
**VCK-\*S:** 410 x 122 x 102 mm,  
option IP68: 410 x 126 x 120 mm  
**VCM:** 460 x 96 x 80 mm  
**VCQ:** 310 x 85 x 62 mm

**transducer box WI for Wavelnjector**



see Technical Specification  
TSWavelnjectorVx-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	< 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 A and coupling foil type VT	coupling foil type B and coupling foil type VT
long time measurement	coupling foil type VT <sup>1</sup>	coupling foil type VT <sup>2</sup>	coupling foil type VT <sup>1</sup>	coupling foil type VT <sup>2</sup>	coupling foil type A and coupling foil type VT	coupling foil type B and coupling foil type VT

<sup>1</sup> < 5 years

<sup>2</sup> < 6 months

## Technical Data

type	order code	ambient temperature °C	material	remark
coupling compound type N	990739-1	-30...+130	mineral grease paste	
coupling compound type E	990739-2	-30...+200	silicone paste	
coupling compound type H	990739-3	-30...+250	fluoropolymer paste	
coupling foil type A	990739-7	max. 280	lead	
coupling foil type B	990739-8	> 280...400	silver	
coupling foil type VT	990739-0	-10...+200	fluoroelastomer	for transducers with transducer frequency G, H, K
	990739-6			for shear wave transducers with transducer frequency M, P
	990739-14			for shear wave transducers IP68 and Lambwave transducers with transducer frequency M, P
	990739-5			for transducers with transducer frequency Q



### Connection Systems

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

transducer frequency (3d character of transducer order code)		G, H, K		M, P		Q		S		
		x	l	x	l	x	l	x	l	
T S	cable length	m	5	≤ 300	4	≤ 300	3	≤ 90	2	≤ 40
	cable length (option LC)	m	9	≤ 300	-	-	-	-	-	-
	cable length (option IP68)	m	12	≤ 300	12	≤ 300	-	-	-	-

x - transducer cable length  
l - max. length of extension cable

## Transducer Cable

### Technical Data

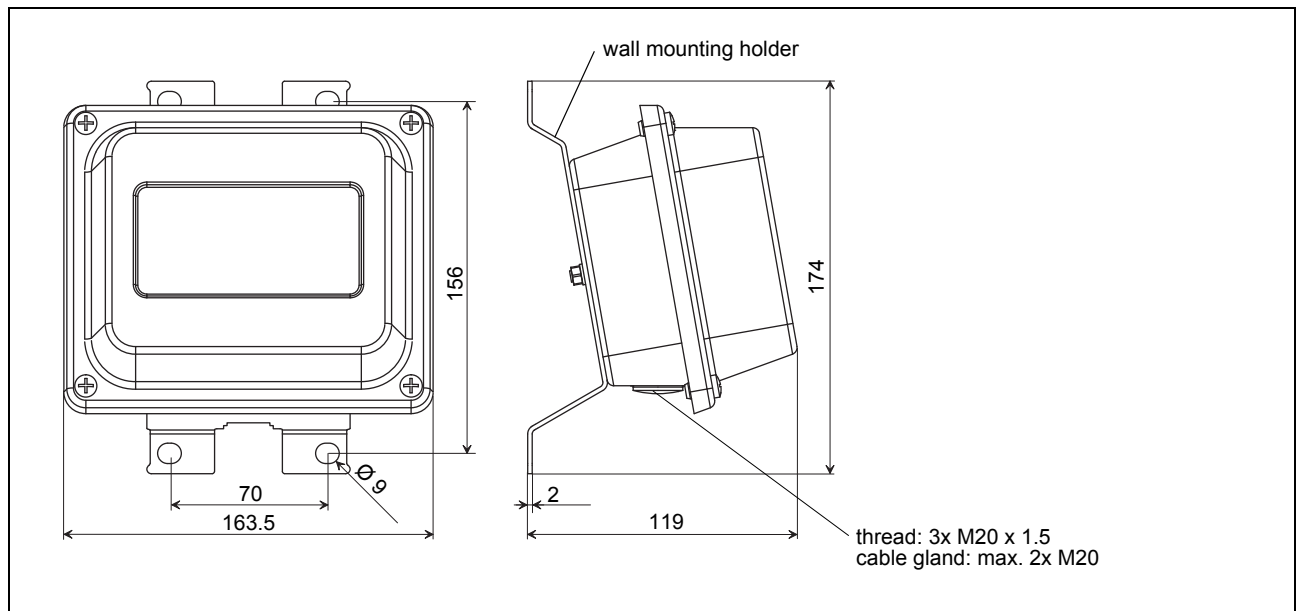
		transducer cable			extension cable	
type		1699	2550 (option IP68)	6111	2615	5245
standard length	m	see table above				
max. length	m	-				
ambient temperature	°C	-55...+200	-40...+100	-100...+225	-40...+70	-30...+70
properties			longitudinal water tight		halogen free fire propagation test according to 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
<b>cable jacket</b>						
material		PTFE	PUR	PFA	PUR	PUR
outer diameter	mm	2.9	5.2 ±0.2	2.7	12	12
thickness	mm	0.3	0.9	0.5	2	2
colour		brown	grey	white	black	black
shield		x	x	x	x	x
<b>sheath</b>						
material		stainless steel 304 (1.4301) option OS: 316L (1.4404)	-	stainless steel 304 (1.4301) option OS: 316L (1.4404)	-	steel wire braid with copolymer sheath
outer diameter	mm	8	-	8	-	15.6

## Junction Box

### Technical Data

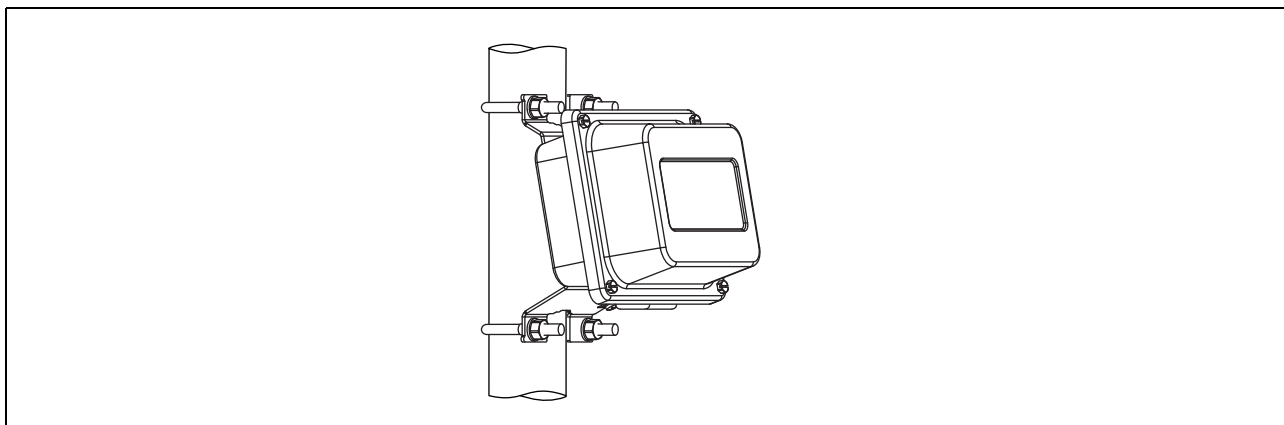
technical type		JB01S4E3M	JB02	JB03	JBP2	JBP3
dimensions		see dimensional drawing	see dimensional drawing	see dimensional drawing	see dimensional drawing	see dimensional drawing
fixation		wall mounting, optional: 2 " pipe mounting	wall mounting, optional: 2 " pipe mounting	wall mounting, optional: 2 " pipe mounting	wall mounting, optional: 2 " pipe mounting	wall mounting, optional: 2 " pipe mounting
<b>material</b>						
housing		stainless steel 316L (1.4404)	stainless steel 316L (1.4404)	stainless steel 316L (1.4404)	stainless steel 316L (1.4404)	stainless steel 316L (1.4404)
gasket		silicone	silicone	silicone	silicone	silicone
degree of protection according to IEC/ EN 60529		IP67	IP67	IP67	IP67	IP67
<b>ambient temperature</b>						
min.	°C	-40	-40	-40	-40	-40
max.	°C	+80	+80	+80	+80	+80
<b>explosion protection</b>						
ATEX / IECEx	zone	1	2	-	2	-
	marking	CE 0637 II2G II2D Ex e mb IIC (T6)...T4 Gb Ex tb IIIC T 100 °C Db Ta -40...+(70)80 °C	CE II3G Ex nA IIC (T6)...T4 Gc II3D Ex tc IIIC T 100 °C Dc Ta -40...+(70)80 °C	-	CE II3G Ex nA IIC (T6)...T4 Gc II3D Ex tc IIIC T 100 °C Dc 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	gas: non sparking dust: protection by enclosure	-	gas: non sparking dust: protection by enclosure	-

### Dimensions



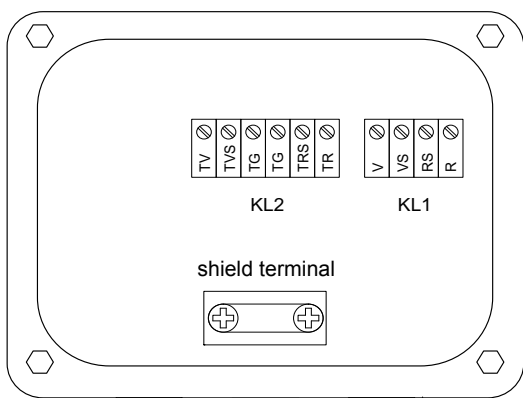
in mm

## 2 " Pipe Mounting Kit (optional)



### Terminal Assignment

#### JB01



equipotential bonding terminal  
(at wall mounting holder)

#### transducers

terminal strip KL1

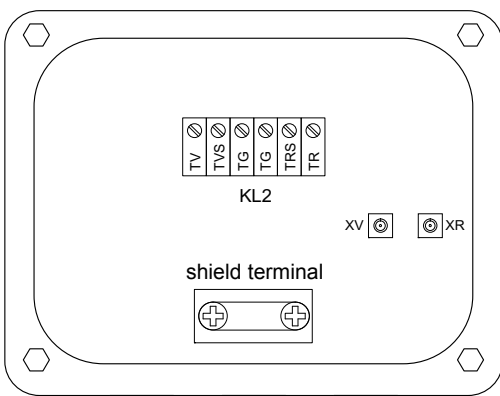
terminal	connection
V	transducer ↑, signal
VS	transducer ↑, internal shield
RS	transducer ↗, internal shield
R	transducer ↗, signal
cable gland	external shield

#### extension cable

terminal strip KL2

terminal	connection
TV	signal
TVS	internal shield
TRS	internal shield
TR	signal
shield terminal	external shield

#### JB02, JB03



equipotential bonding terminal  
(at wall mounting holder)

#### transducers

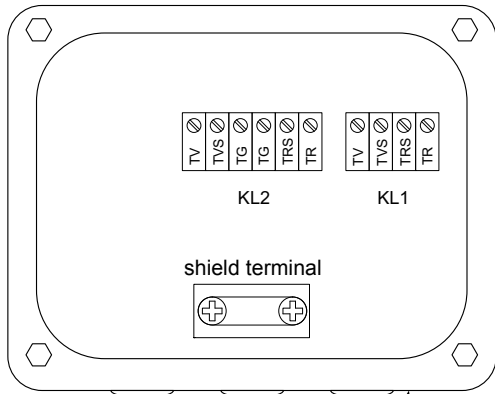
terminal	connection
XV	transducer ↑, SMB connector
XR	transducer ↗, SMB connector
cable gland	external shield

#### extension cable

terminal strip KL2

terminal	connection
TV	signal
TVS	internal shield
TRS	internal shield
TR	signal
shield terminal	external shield

**JBP2, JBP3**



equipotential bonding terminal  
(at wall mounting holder)

**transducers**

terminal strip KL1

terminal	connection
TV	transducer ↑, signal
TVS	transducer ↑, internal shield
TRS	transducer ↕, internal shield
TR	transducer ↕, signal
cable gland	external shield

**extension cable**

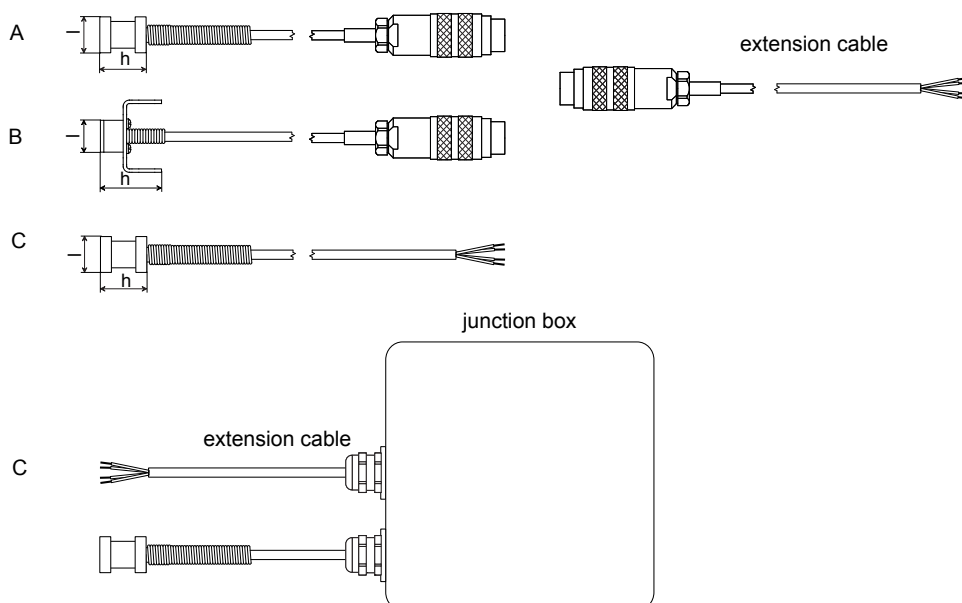
terminal strip KL2

terminal	connection
TV	signal
TVS	internal shield
TRS	internal shield
TR	signal
shield terminal	external shield

## Clamp-on Temperature Probe (optional)

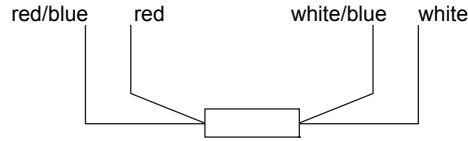
### Technical Data

technical type		<b>PT12N</b>	<b>PT12N</b>	<b>PT12N</b>	<b>PT12N</b>	<b>PT12F</b>	<b>PT12F</b>
order code		<b>670415-1</b> <b>770415-1</b>	<b>670414-1</b> <b>770414-1</b>	<b>770415-1A2</b>	<b>770414-1A2</b>	<b>670415-2</b>	<b>670414-2</b>
design				ATEX zone 2		short response time	
type		Pt100	2x Pt100 matched according to EN 1434-1	Pt100	2x Pt100 matched according to EN 1434-1	Pt100	2x Pt100 matched according to EN 1434-1
connection		4-wire		4-wire		4-wire	
measuring range	°C	-30...+250		-30...+250		-50...+250	
accuracy T		$\pm(0.15\text{ °C} + 2 \cdot 10^{-3} \cdot  T\text{ [°C]} )$ class A		$\pm(0.15\text{ °C} + 2 \cdot 10^{-3} \cdot  T\text{ [°C]} )$ class A		$\pm(0.15\text{ °C} + 2 \cdot 10^{-3} \cdot  T\text{ [°C]} )$ class A	
accuracy ΔT		-	≤ 0.1 K (3 K < ΔT < 6 K), more corre- sponding to EN 1434-1	-	≤ 0.1 K (3 K < ΔT < 6 K), more corre- sponding to EN 1434-1	-	≤ 0.1 K (3 K < ΔT < 6 K), more corre- sponding to EN 1434-1
response time	s	50		50		8	
housing		aluminum		aluminum		PEEK, stainless steel 304 (1.4301), copper	
degree of protection according to IEC/ EN 60529		IP66		IP66		IP66	
weight (without connector)	kg	0.25	0.5	0.25	0.5	0.32	0.64
fixation		clamp-on		clamp-on		clamp-on	
<b>accessories</b>							
thermal conductivity paste 200 °C		670415-1: x 770415-1: -	670414-1: x 770414-1: -	-		x	
thermal conductivity foil 250 °C		x	x	x		x	
plastic protection plate, insulation foam		-	-	-		x	
<b>dimensions</b>							
length l	mm	15		15		14	
width b	mm	15		15		30	
height h	mm	20		20		27	
dimensional drawing		670415-1: A 770415-1: C	670414-1: A 770414-1: C	C		B	
<b>explosion protection</b>							
zone		-		2		-	
<b>explosion protection temperature</b>							
min.	°C	-		-30		-	
max.	°C	-		+250		-	
marking		-		II3G Ex nA IIC T6...T2 Gc Ta -30...+250 °C		-	



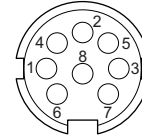
## Connection

### Temperature Probe



### Connector

pin	cable of temperature probe	extension cable
1	white/blue	blue
2	red/blue	grey
3, 4, 5	not connected	
6	red	red
7	white	white
8	not connected	



### Cable

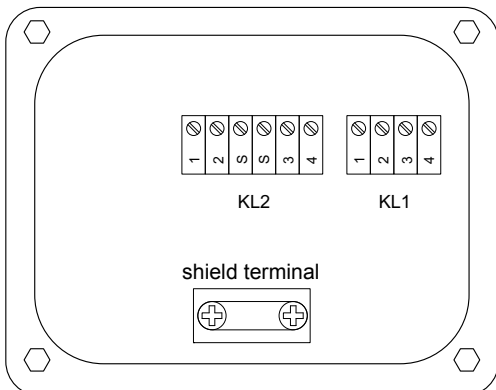
		cable of temperature probe	extension cable
type		4 x 0.25 mm <sup>2</sup> black or white	LIYCY 8 x 0.14 mm <sup>2</sup> grey
standard length	m	3	5/10/25
max. length	m	-	200
cable jacket		PTFE	PVC

### Junction Box

technical type		JBT2	JBT3
dimensions		see dimensional drawing	see dimensional drawing
fixation		wall mounting optional: 2 " pipe mounting	wall mounting optional: 2 " pipe mounting
<b>material</b>			
housing		stainless steel 316L (1.4404)	stainless steel 316L (1.4404)
gasket		silicone	silicone
degree of protection according to IEC/ EN 60529		IP67	IP67
cable gland		max. 2x M12	max. 2x M12
<b>ambient temperature</b>			
min.	°C	-40	-40
max.	°C	+80	+80
<b>explosion protection</b>			
ATEX	zone marking	2 CE (Ex) II3G Ex nA IIC (T6)...T4 Gc II3D Ex tc IIIC T 100 °C Dc Ta -40...+(70)80 °C	-
	certification	-	-
	type of protection	gas: non sparking, dust: protection by enclosure	-

### Terminal Assignment

#### JBT2, JBT3



equipotential bonding terminal  
(at wall mounting holder)

#### temperature probe

terminal strip KL1

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

#### extension cable

terminal strip KL2

terminal	connection
1	red
2	grey
3	white
4	blue





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