Flexim FLUXUS F721, F722
Ultrasonic Flowmeter

Permanently Installed Ultrasonic Flowmeter for Liquids

Features

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

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

Transmitter

Technical data

		FLUXUS F721**-NNN**-*A F721**-NNN**-*S	FLUXUS F721**-A2N**-*A F721**-A2N**-*S	FLUXUS F721**-F2N**-*A F721**-F2N**-*S	FLUXUS F722**-NNN**-*A F722**-NNN**-*S	FLUXUS F722**-A2N**-*A F722**-A2N**-*S	FLUXUS F722**-F2N**-*A F722**-F2N**-*S
							
design		standard field device	standard field device zone 2	standard field device FM Class I Div. 2	standard field device	standard field device zone 2	standard field device FM Class I Div. 2
measurement							
measurement principle		transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content					
synchronised channel averaging		-			x (2 measuring channels necessary)		
flow velocity	m/s	0.01...25					
repeatability		0.15 % MV ±0.005 m/s					
fluid		all acoustically conductive liquids with < 10 % gaseous or solid content in volume (transit time difference principle)					
temperature compensation		corresponding to the recommendations in ANSI/ASME MFC-5.1-2011					
measurement uncertainty (volumetric flow rate)							
measurement uncertainty of the measuring system[1]		±0.3 % MV ±0.005 m/s					
measurement uncertainty at the measuring point[2]		±1 % MV ±0.005 m/s					
transmitter							
power supply		• 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			1, optional: 2 (1 measuring point)		
damping	s	0...100 (adjustable)					
measuring cycle	Hz	100...1000 (1 channel)					
response time	s	1 (1 channel), option: 0.02					
housing material		aluminum, powder coated or stainless steel 316L (1.4404)					
degree of protection		IP66		aluminum housing: IP66/NEMA 4X stainless steel housing: IP65	IP66		aluminum housing: IP66/NEMA 4X stainless steel housing: IP65
dimensions	mm	see dimensional drawing					
weight	kg	aluminum housing: 5.4 stainless steel housing: 5.1					
fixation		wall mounting, optional: 2" pipe mounting					
ambient temperature	°C	-40…+60 (< -20 without operation of the display)		aluminum housing: -40...+55/60 (< -20 without operation of the display) stainless steel housing: -20...+55/60	-40…+60 (< -20 without operation of the display)		aluminum housing: -40...+55/60 (< -20 without operation of the display) stainless steel housing: -20...+55/60
display		128 x 64 pixels, backlight					
menu language		English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian					
explosion protection							
• ATEX/IECEx							
marking		-	F721**-A20*A, F721**-A20*S: CE 0637 Ex II3G II2D Ex nA nC ic IIC T4 Gc Ex tb IIIC T120 °C Db T_a -40...+60 °C	-	-	F722**-A20*A, F722**-A20*S: CE 0637 Ex II3G II2D Ex nA nC ic IIC T4 Gc Ex tb IIIC T120 °C Db T_a -40...+60 °C	-
certification		-	IBExU11ATEX1015, IECEx IBE 11.0008	-	-	IBExU11ATEX1015, IECEx IBE 11.0008	-

[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

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

		FLUXUS F721-NNN**-*A F721**-NNN**-*S**	**FLUXUS F721**-A2N**-*A F721**-A2N**-*S**	**FLUXUS F721**-F2N**-*A F721**-F2N**-*S**	**FLUXUS F722**-NNN**-*A F722**-NNN**-*S**	**FLUXUS F722**-A2N**-*A F722**-A2N**-*S**	**FLUXUS F722**-F2N**-*A F722**-F2N**-*S**
• FM							
marking		-	-	F721**-F20**2, F721**-F20**3: NI/Cl. I,II,III/ Div. 2/GP. A,B,C,D,E, F,G/ T5 F721**-F20**1: NI/Cl. I,II,III/ Div. 2/GP. A,B,C,D,E, F,G/ T4A	-	-	F722**-F20**2, F722**-F20**3: NI/Cl. I,II,III/ Div. 2/GP. A,B,C,D,E, F,G/ T5 F722**-F20**1: NI/Cl. I,II,III/ Div. 2/GP. A,B,C,D,E, F,G/ T4A
measuring functions							
physical quantities		volumetric flow rate, mass flow rate, flow velocity, thermal energy rate (if temperature inputs are installed)					
totaliser		volume, mass, optional: thermal energy					
calculation functions		average, difference, sum (2 measuring channels necessary)					
diagnostic functions		sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times					
communication interfaces							
service interfaces		measured value transmission, parametrisation of the transmitter: • USB[3] • LAN[3]					
process interfaces		max. 1 option: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • M-Bus • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • M-Bus • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • RS485 (ASCII sender) • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP
accessories							
data transmission kit		USB cable					
software		• FluxDiagReader: reading of measured values and parameters, graphical representation • FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrisation of the transmitter					
data logger							
loggable values		all physical quantities, totalised physical quantities and diagnostic values					
capacity		max. 800 000 measured values					
outputs							
		The outputs are galvanically isolated from the transmitter.					
number		on request					
• switchable current output							
		All switchable current outputs are jointly switched to active or passive.					
range	mA	4...20 (3.2...22)					
accuracy		0.04 % MV ±3 µA					
active output		R_{ext} < 250 Ω					
passive output		U_{ext} = 8...30 V, depending on R_{ext} (R_{ext} < 1 kΩ at 30 V)					
• HART							
range	mA	4...20					
accuracy		0.1 % MV ±15 µA					
active output		U_{int} = 24 V, R_{ext} < 500 Ω					
passive output		U_{ext} = 10...24 V DC, depending on R_{ext} (R_{ext} < 1 kΩ at 24 V)					
• voltage output							
range	V	0...1 or 0...10					
accuracy		0...1 V: 0.1 % MV ±1 mV 0...10 V: 0.1 % MV ±10 mV					
internal resistance		R_{int} = 500 Ω					
• frequency output							
range	kHz	0...5					
optorelay		24 V/4 mA, R_{int} = 66.5 Ω					

[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

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

		FLUXUS F721**-NNN**-*A F721**-NNN**-*S	FLUXUS F721**-A2N**-*A F721**-A2N**-*S	FLUXUS F721**-F2N**-*A F721**-F2N**-*S	FLUXUS F722**-NNN**-*A F722**-NNN**-*S	FLUXUS F722**-A2N**-*A F722**-A2N**-*S	FLUXUS F722**-F2N**-*A F722**-F2N**-*S
• digital output							
functions		• frequency output • binary output • pulse output					
number		3					
operating parameters		5...30 V/< 100 mA					
frequency output							
• range	kHz	0...5					
binary output							
• binary output as alarm output		limit, change of flow direction or error					
pulse output							
• functions		mainly for totalising					
• pulse value	units	0.01...1000					
• pulse width	ms	0.05...1000					
inputs							
		The inputs are galvanically isolated from the transmitter.					
number		max. 4, on request					
• temperature input							
type		Pt100/Pt1000					
connection		4-wire					
range	°C	-150…+560					
resolution	K	0.01					
accuracy		±0.01 % MV ±0.03 K					
• current input							
accuracy		0.1 % MV ±10 µA					
active input		U_{int} = 24 V, R_{int} = 50 Ω, P_{int} < 0.5 W, not short-circuit proof					
• range	mA	0...20					
passive input		R_{int} = 50 Ω, P_{int} < 0.3 W					
• range	mA	-20...+20					
• voltage input							
range	V	0...1					
accuracy		0.1 % MV ±1 mV					
internal resistance		R_{int} = 1 MΩ					
• binary input							
switching signal		5...30 V, 1 mA		5...26 V, 1 mA	5...30 V, 1 mA		5...26 V, 1 mA
functions		• reset of the measured values • reset of the totalisers • stop of the totalisers • activation of the measuring mode for highly dynamic flows					

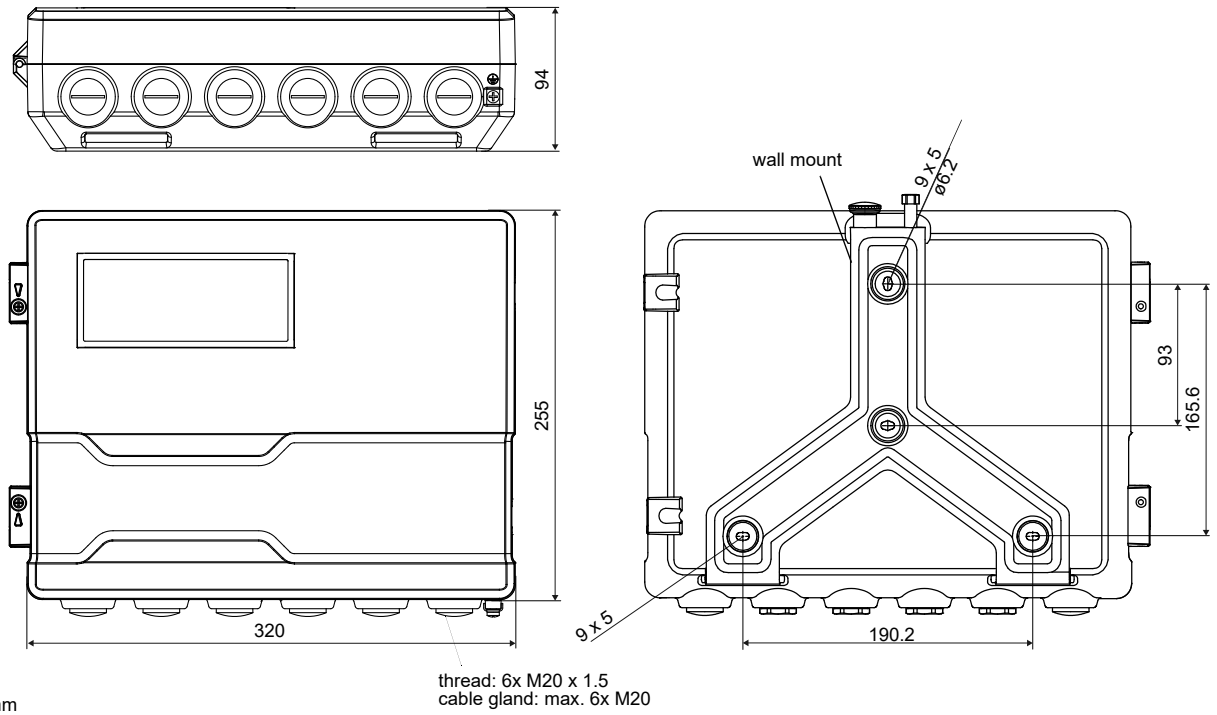
[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

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

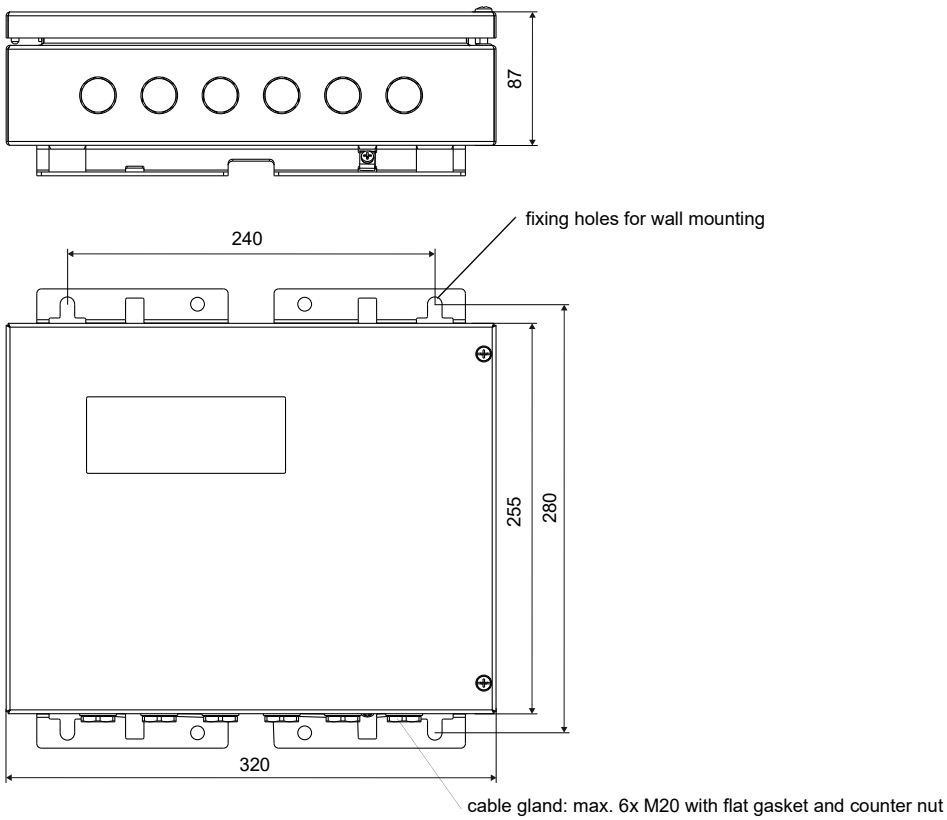
Dimensions

72-*****-*A**



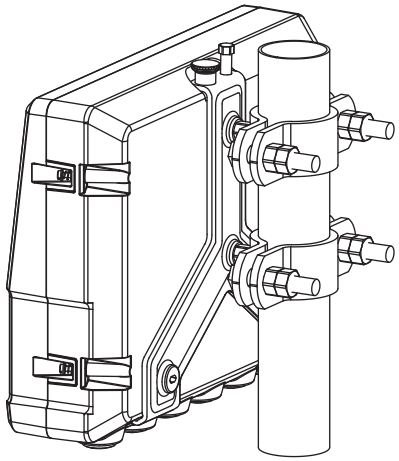
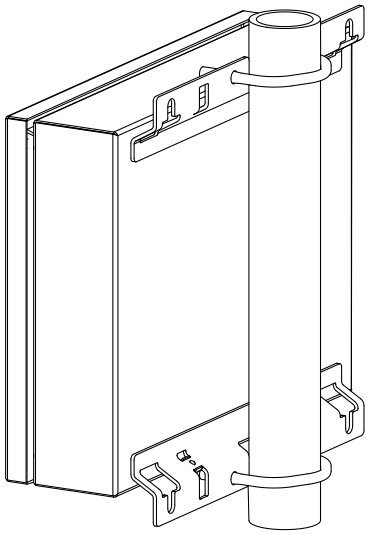
in mm

72-*****-*S**



in mm

2" pipe mounting kit

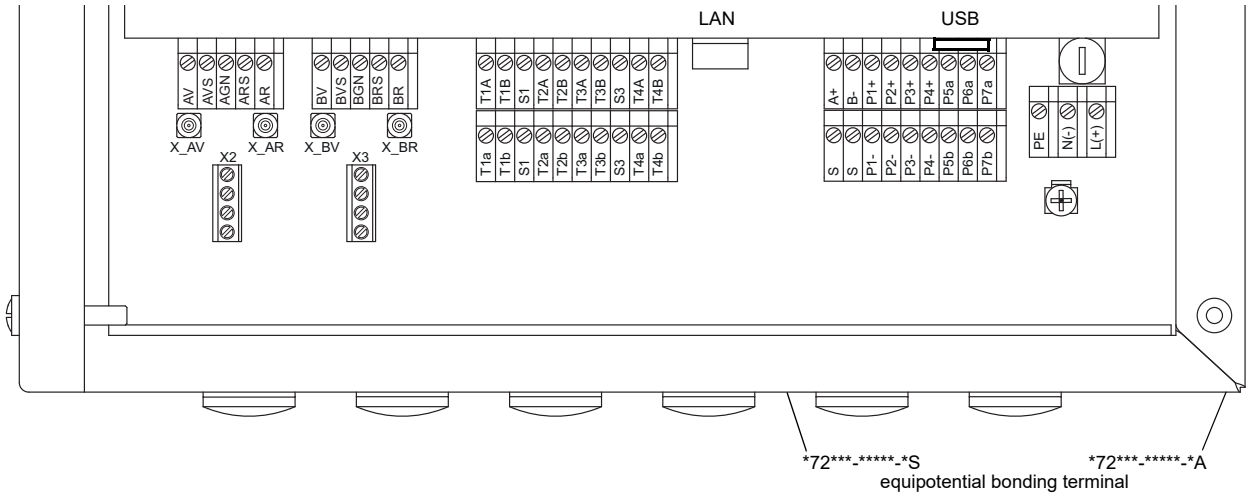
72-*****-*A** 	item number: 721037-4
72-*****-*S** 	item number: 721110-4

Storage

- do not store outdoors
- store within the original package
- store in a dry and dust-free place
- protect against sunlight
- keep all openings closed
- storing temperature: -20...+60 °C

Terminal assignment

72



power supply[1]		
terminal	**connection (AC)**	**connection (DC)**
PE	protective conductor	protective conductor
N(-)	neutral conductor	-
L(+)	outer conductor	+

transducers

transducer cable (transducers *****8*, ****LI*), extension cable					transducer cable (transducers *****52)		
measuring channel A		**measuring channel B**			**measuring channel A**	**measuring channel B**	
terminal	**connection**	**terminal**	**connection**	**transducer**	**terminal**		**connection**
AV	signal	BV	signal		X_AV	X_BV	SMB connector
AVS	shield	BVS	shield				
ARS	shield	BRS	shield		X_AR	X_BR	SMB connector
AR	signal	BR	signal				

outputs[1, 2]

terminal	**connection**
P1+...P4+ P1-...P4-	current output, voltage output, frequency output, HART (P1)
P5a...P7a P5b...P7b	digital output

terminal	**connection**	**communication interface**
A+	signal +	• RS485[1] • Modbus RTU[1] • BACnet MS/TP[1] • M-Bus[1] • Profibus PA[1] • FF H1[1]
B-	signal -	
S	shield	
USB	type B Hi-Speed USB 2.0 Device	• service (FluxDiag/ FluxDiagReader)
LAN	RJ45 10/100 Mbps Ethernet	• service (FluxDiag/ FluxDiagReader) • BACnet IP • Modbus TCP

analog inputs[1, 2]

	temperature probe		**passive sensor**	**active sensor**
terminal	**direct connection**	**connection with extension cable**	**connection**	**connection**
T1a...T4a	red	red	not connected	not connected
T1A...T4A	red/blue	grey	-	+
T1b...T4b	white/blue	blue	+	not connected
T1B...T4B	white	white	not connected	-
S1, S3	shield	shield	not connected	not connected

binary inputs[1, 2]

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

[1] cable (by customer):
- e.g. flexible wires, with insulated wire ferrules, wire cross-section: 0.25...2.5 mm^2
- outer diameter of the cable (*72***-*****-*S with ferrite nut): max. 7.6 mm

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

Transducers

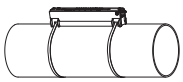
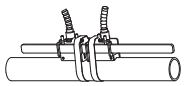
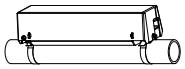
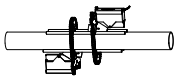
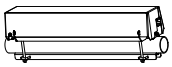
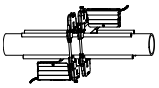
Overview

Shear wave transducers

			technical type					
			G	**K**	**M**	**P**	**Q**	**S**
zone 2 - FM Class I Div. 2 - nonEx normal temperature range			CDG1N52 CLG1N52	CDK1N52 CLK1N52	CDM2N52 CLM2N52	CDP2N52 CLP2N52	CDQ2N52 CLQ2N52	CDS2N52
zone 2 - nonEx IP68			CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8		
zone 2 - FM Class I Div. 2 - nonEx extended temperature range			CDG1E52 CLG1E52	CDK1E52 CLK1E52	CDM2E52 CLM2E52	CDP2E52 CLP2E52	CDQ2E52 CLQ2E52	
zone 1 normal temperature range			CDG1N81 CLG1N81	CDK1N81 CLK1N81	CDM2N81 CLM2N81	CDP2N81 CLP2N81	CDQ2N81 CLQ2N81	
zone 1 IP68			CDG1LI1	CDK1LI1	CDM2LI1	CDP2LI1		
zone 1 extended temperature range			CDG1E83 CLG1E83	CDK1E83 CLK1E83	CDM2E85 CLM2E85	CDP2E85 CLP2E85	CDQ2E85 CLQ2E85	
inner pipe diameter d								
min. extended	mm		400	100	50	25	10	6
min. recommended	mm		500	200	100	50	25	10
max. recommended	mm		4000	2000	1000	400	150	70
max. extended	mm		6500	2400	1200	480	240	70
pipe wall thickness								
min.	mm		11	5	2.5	1.2	0.6	0.3

for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

Transducer mounting fixture

Variofix L		**Variofix C**	**transducer box WI for WaveInjector with chains**
	 transducer frequency S		
		Variofix C with bolt mounting plates	**transducer box WI for WaveInjector with threaded rods**
		 outer pipe diameter: **VCM**: max. 46 mm **VCQ**: max. 36 mm	 outer pipe diameter: 35...380 mm

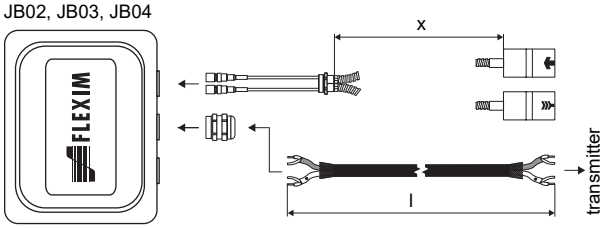
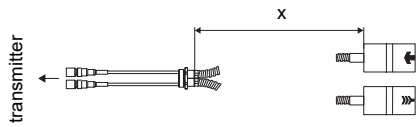
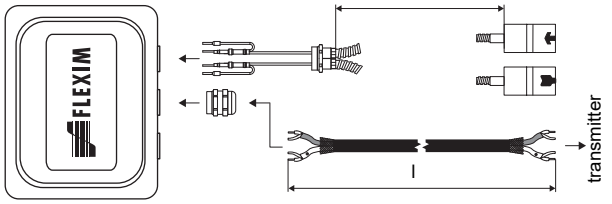
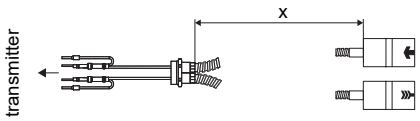
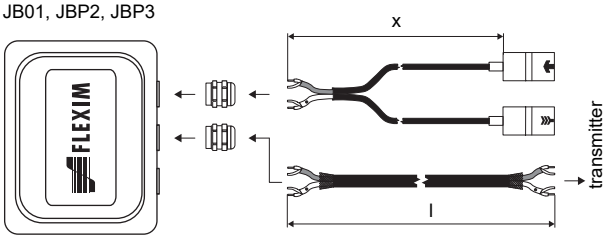
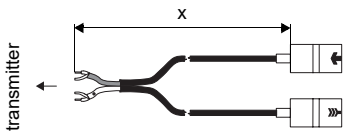
for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

Coupling materials for transducers

	normal temperature range		**extended temperature range**			**WaveInjector**	
	< 100 °C	< 170 °C	< 150 °C	< 200 °C	200...240 °C	< 280 °C	280...630 °C
< 24 h	coupling compound type N or coupling foil type VT	coupling compound type E or coupling foil type VT	coupling compound type E or coupling foil type VT	coupling compound type E or H or coupling foil type VT	coupling foil type TF	coupling foil type A and coupling foil type VT	coupling foil type B and coupling foil type VT
long time measure-ment	coupling foil type VT	coupling foil type VT	coupling foil type VT	coupling foil type VT			

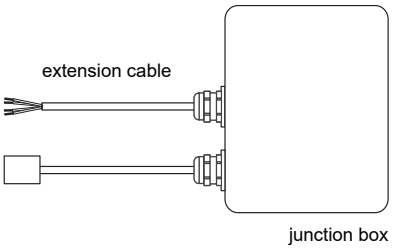
for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

Connection systems

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

for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

Temperature probes

<table>
<tr><th colspan="2">PT12N</th><th>PT12F</th></tr>
<tr><td>item number:
• 770415-1
• 770414-2 (matched)</td><td>item number:
• 770415-1A2
• 770414-1A2 (matched)</td><td>item number:
• 770415-2</td></tr>
<tr><td>• Pt100
• clamp-on
• -30...+250 °C</td><td>• Pt100
• clamp-on
• -30...+250 °C
• ATEX</td><td>• Pt100
• clamp-on
• -45...+250 °C
• response time: 8 s</td></tr>
<tr><td colspan="3">direct connection
  </td></tr>
<tr><td colspan="3">connection with extension cable
 
</td></tr>
</table>

see Technical specification TS_PTVx-xXX_Leu

Annex

Reference conditions

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

measurement principle		transit time difference correlation principle
all uncertainties	%	95
fluid temperature		25 °C ±5 K
ambient temperature		25 °C ±5 K
warm-up time	min	10
flow profile at the measuring point		fully developed, rotationally symmetric
installation		installation according to specifications using the recommended transducers
Reynolds number		> 10 000
pipe diameter uncertainty	%	0.2
pipe wall thickness uncertainty	%	1
circularity tolerance		0.08 % of inner pipe diameter
SCNR	dB	> 48
SNR	dB	> 12

For more information: **Emerson.com**

FLEXIM

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