# Flexim FLUXUS 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 F722**-NNN**-*AL F722**-NNN**-*ST	FLUXUS F722**-A2N**-*AL F722**-A2N**-*ST	FLUXUS F722**-F2N**-*AL F722**-F2N**-*ST				
		- seamu						
design		standard field device	standard field device zone 2	standard field device FM Class I Div. 2				
measurement								
measurement principle			e, ements with high gaseous or solid content					
flow direction		bidirectional						
synchronized		x (2 measuring channels necessary)						
channel averaging flow velocity	ft/s	0.03 to 82						
repeatability	11/5	0.03 to 62  0.15 % MV ±0.02 ft/s						
fluid			0 % gaseous or solid content in volume (tra	ansit time difference principle)				
temperature com-		corresponding to the recommendations in		more unic unicremes principle)				
pensation								
measurement uncer	tainty	(volumetric flow rate)						
measurement uncer-		±0.3 % MV ±0.02 ft/s						
tainty of the measu- ring system <sup>1</sup>		includes calibration certificate traceable to	NIST					
measurement uncer- tainty at the measu- ring point <sup>2</sup>		±1 % MV ±0.02 ft/s						
transmitter								
power supply		• 100 to 230 V/50 to 60 Hz or						
		• 20 to 32 V DC or • 11 to 16 V DC						
power consumption	W	< 15						
number of measuring channels		1, optional: 2 (1 measuring point)	, optional: 2 (1 measuring point)					
damping	s	0 to 100 (adjustable)						
measuring cycle		100 to 1000 (1 channel)						
response time	S	1 (1 channel), option: 0.02	1010					
housing material		aluminum, powder coated or stainless ste	el 316L	Internal to the second of the				
degree of protection	امما		P66 aluminum housing: IP66/NEMA 4X stainless steel housing: IP65					
dimensions	lb	see dimensional drawing aluminum housing: 11.9						
weight Ifixation	ID	stainless steel housing: 11.2 wall mounting, optional: 2" pipe mounting						
ambient temperature	°F	l-40 to +140		aluminum housing: -40 to +131/140				
ambient temperature		(< -4 without operation of the display)		(< -4 without operation of the display) stainless steel housing: -4 to +131/140				
display	Î	128 x 64 pixels, backlight		·				
menu language		English, German, French, Spanish, Dutch	, Russian, Polish, Turkish, Italian, Chinese					
explosion protection	1							
ATEX/IECEx			F700** A00*A F700** A00*O					
marking		-	F722**-A20*A, F722**-A20*S:  C € 0637 🖘   13G     I2D     Ex nA nC ic IIC T4 Gc     Ex tb IIIC T120 °C Db     Ta -40+60 °C	-				
certification		-	IBExU11ATEX1015, IECEx IBE 11.0008	-				
• FM								
marking			_	F722**-F20**2, F722**-F20**3: NI/CI. I,II,III/ Div. 2/GP. A,B,C,D,E,F,G/ T5 F722**-F20**1: NI/CI. I,II,III/Div. 2/GP.				
				APPROVED A,B,C,D,E,F,G/				

<sup>&</sup>lt;sup>1</sup> with aperture calibration of the transducers

 $<sup>^{2}% \</sup>left( -\frac{1}{2}\right) =0$  for transit time difference principle and reference conditions

 $<sup>^{\</sup>rm 3}$  outside the explosive atmosphere (housing cover open)

reasuring functions  volumetric flow rate, mass flow rate, flow velocity,  the control of temperature inputs are installed to the communication functions and control of the control of th		1		1					
measuring functions  Priyacial quantities  Columeter flow rate, mass flow rate, flow velocity, themal energy rate (if temperature inputs are installed)  Volume, mass, optional: thermal energy values of temperature inputs are installed)  Volume, mass, optional: thermal energy values (if temperature inputs are installed)  Volume, mass, optional: thermal energy values of temperature inputs are installed)  Volume, mass, optional: thermal energy values (if temperature inputs are installed)  Volume, mass, optional: thermal energy values (if the value transmission, parametrization of the transmitter:  Values (in the value transmission, parametrization of the transmitter:  Values (in the value transmission, parametrization of the transmitter:  Values (in the value transmission o				FLUXUS					
included in the company of the compa									
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thermal energy rate (if temperature inputs are installed) volume, mass, optional: thermal energy autroport functions ignoration function ignoration ignoration function ignoration i			volumetric flow rate, mass flow rate, flow v	velocity					
colatizer   colatizer   colame, mass, optional: thermal energy   consuments activated functions   sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times   communication interfaces   service interfaces   service interfaces   reading   colatizer   colatiz	priysical quartities								
accusation functions   alwayse, difference, sum (2 measuring channels necessary)   service interfaces   vision interfaces   v	totalizer								
Security	calculation functions			annels necessary)					
service interfaces   measured value transmission, parametrization of the transmitter:   USB3					transit times				
LSB    LAN				,					
process interfaces   LANS   max. 1 option:   RS485 (ASCII sender)   max. 1 option:   PF H1   modibus TCP   Profibus PA   FF H1   modibus TCP   Profibus PA   FF H1   modibus TCP   paccessories   FluxDiag/Reader: reading of measured values and parameters, graphical representation, report generation, parametrization of the transmit attal logger   FluxDiag/Reader: reading of measured values and parameters, graphical representation, report generation, parametrization of the transmit regard of the province of the provi	service interfaces		measured value transmission, parametriza	ation of the transmitter:					
max. 1 option:    RSAS (ASCII sender)									
max. 1 option:    RSAS (ASCII sender)			• I AN <sup>3</sup>						
RS485 (ASCII sender)   Mobus RTU   BACnet MS/TP   HART   Profibus PA   FF H   Mobus TCP   BACnet MS/TP   HART   Profibus PA   FF H   Mobus TCP   BACnet IP	process interfaces								
Modbus RTU	F		•						
BACNET MSTP HART Profibus PA FF H1 Modous TCP BACNET IVENCING (popular): reading of measured values and parameters, graphical representation FluxDiag (optional): reading of measurement data, graphical representation, parametrization of the transmit ter    Value   International   Inter			,						
HART   Profibus PA   FF H1   Nodous TCP   BAchet IP									
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FF H1   Modbus TCP   BAChes IIP									
Left at tarsmission kit of the common short of									
accessories  Idata transmission kit software   FluxDlagReader: reading of measured values and parameters, graphical representation   FluxDlag Reader: reading of measured values and parameters, graphical representation, report generation, parametrization of the transmit fer									
Line									
USB cable   FluxDiagReader: reading of measured values and parameters, graphical representation   FluxDiag (optional): reading of measured values and parameters, graphical representation, parametrization of the transmit for   FluxDiag (optional): reading of measured values and parameters, graphical representation, parametrization of the transmit for   FluxDiag (optional): reading of measured values   PluxDiag (optional): reading of measured values and diagnostic values   PluxDiag (optional): reading of measured values   PluxDiag (optiona		L	BACnet IP						
FluxDiag/Reader, reading of measured values and parameters, graphical representation   FluxDiag (optional); reading of measurement data, graphical representation, report generation, parametrization of the transmitter   optional property   optional	accessories								
FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrization of the transmit fer organization values apacity max. 800 000 measured values are galvanically isolated from the transmitter.	data transmission kit								
data logger oggable values   all physical quantities, totalized 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 output  arange   mA   4 to 20 (3.2 to 22)  accuracy   0.04 % MV ± 3 μA  active output   R <sub>ext</sub> < 250 Ω  passive output   U <sub>ext</sub> = 8 to 30 V, depending on R <sub>ext</sub> (R <sub>ext</sub> < 1 kΩ at 30 V)  + HART  arange   mA   4 to 20   4 to 20   2 to 20    accuracy   0.1 % MV ±15 μA  accuracy   0.1 % MV ±10 to 24 V DC, depending on R <sub>ext</sub> (R <sub>ext</sub> < 1 kΩ at 24 V)  - voltage output  arange   V   0 to 1 or 0 to 10  accuracy   0 to 1 V · 0.1 % MV ±1 mV  to 1 to 1 V · 0.1 % MV ±10 mV  number   a signal to 1 to 1 V · 0.1 % MV ±10 mV  number   5 to 30 V/< 100 mA  frequency output   binary o	software		<ul> <li>FluxDiagReader: reading of measured v</li> </ul>	alues and parameters, graphical represe	ntation				
data logger cogable values  all physical quantities, totalized physical quantities and diagnostic values  capacity max. 800 000 measured values    The outputs are galvanically isolated from the transmitter.   In the output of the properties of			<ul> <li>FluxDiag (optional): reading of measure</li> </ul>	ment data, graphical representation, repo	rt generation, parametrization of the transmit-				
Sepacity   all physical quantities, totalized physical quantities and diagnostic values			ter						
max. 800 000 measured values									
The outputs are galvanically isolated from the transmitter.  number on request  ange mA 4 to 20 (3.2 to 22)  accuracy 0.04 % MV ±3 µA  active output Rex < 250 Ω  passive output Uext = 8 to 30 V, depending on Rext (Rext < 1 kΩ at 30 V)  **HART**  Tange mA 4 to 20  accuracy 0.1 % MV ±15 µA  accuracy 0.1 % MV ±10 µA  accuracy 0.1 % V.0.1 % MV ±10 µA  accuracy 0.1 % MV ±10 µA  accura				uantities and diagnostic values					
The outputs are galvanically isolated from the transmitter.  on request  All switchable current output  All switchable current outputs are jointly switched to active or passive.  arange mA 4 to 20 (3.2 to 22)  accuracy 0.04 % MV ± 3 μA  active output Rext < 250 Ω  passive output Upxt = 1 to 30 V, depending on Rext (Rext < 1 kΩ at 30 V)  HART  range mA 4 to 20  0.1 % MV ±15 μA  active output Upxt = 24 V, Rext < 500 Ω  passive output Upxt = 10 to 24 V DC, depending on Rext (Rext < 1 kΩ at 24 V)  rollage output range V 0 to 1 or 0 to 10  accuracy 0 to 1 V · 0.1 % MV ±1 mV  0 to 10 V · 0.1 % MV ±10 mV  internal resistance Ring = 500 Ω  poperating parameters  forequency output  • binary output as alarm output  binary output as alarm output  • pulse value units  • Ool to 1000  mainly for totalizing  • pulse value  • pulse			max. 800 000 measured values						
In request   In	outputs								
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All switchable current outputs are jointly switched to active or passive.   All switchable current outputs are jointly switched to active or passive.   A to 20 (3.2 to 22)   active output   R <sub>ext</sub> < 250 Ω     passive output   V <sub>ext</sub> = 8 to 30 V, depending on R <sub>ext</sub> (R <sub>ext</sub> < 1 kΩ at 30 V)   HART     A to 20									
range mA 4 to 20 (3.2 to 22)	switchable current								
Couracy   Country   Cou	*****			witched to active or passive.					
Rext   250 Ω   Rext   250 Ω   Rext   250 Ω   Rext   Rext   21 kΩ at 30 V			,						
PART   Farm	_								
MART   mange	· · · · · · · · · · · · · · · · · · ·			< 1 kO at 30 V/					
range mA 4 to 20 accuracy	<u> </u>		O <sub>ext</sub> - 6 to 50 V, depending on K <sub>ext</sub> (K <sub>ext</sub>	< 1 KQ at 50 V)					
0.1 % MV ±15 μA		mΛ	4 to 20						
V   10 to 10 v 2 to 10 to 10									
Description	*								
range V 0 to 1 or 0 to 10 accuracy 0 to 1 V : 0.1 % MV ±1 mV 0 to 10 V : 0.1 % MV ±10 mV 0 to 10 V : 0.1 % MV ±10 mV 0 to 10 V : 0.1 % MV ±10 mV 0 to 10 to 10 V : 0.1 % MV ±10 mV 0 to 10 to 10 V : 0.1 % MV ±10 mV 0 to 10 to 10 V : 0.1 % MV ±10 mV 0 to 10 MV 0 to 10 MV 0 to 10 MV 0 to 10 V : 0.1 % MV ±10 mV 0 to 10 MV 0 to 10 MV 0 to 10 MV 0 to 10 V : 0.1 % MV ±10 mV 0 to 10 MV 0 to 1	· · · · · · · · · · · · · · · · · · ·			R < 1 kO at 24 V/					
range V 0 to 1 or 0 to 10 accuracy 0 to 1 V: 0.1 % MV ±1 mV 0 to 10 V: 0.1 % MV ±10 mV  Internal resistance R <sub>int</sub> = 500 Ω  • digital output  functions • frequency output • binary output • pulse output • range kHz 0 to 5  • binary output as alarm output • functions • functions  mainly for totalizing • pulse width ms 0.05 to 1000			ext = 10 to 24 V DO, depending on Next (	Text T K12 at 24 V)					
accuracy 0 to 1 V: 0.1 % MV ±1 mV 0 to 10 V: 0.1 % MV ±10 mV  Internal resistance R <sub>int</sub> = 500 Ω  • digital output  functions • frequency output • binary output • pulse output  • pulse output  • requency output  • range kHz 0 to 5  binary output as alarm output  • binary output as alarm output  • functions mainly for totalizing  • pulse value • pulse width ms 0.05 to 1000		V	0 to 1 or 0 to 10						
0 to 10 V: 0.1 % MV ±10 mV     Internal resistance   R <sub>int</sub> = 500 Ω     Int		1							
Internal resistance  Indigital output  functions  Indigital output	,								
functions  • frequency output • binary output • pulse output  • range binary output • binary output • to 30 V/< 100 mA   * frequency output • range binary output • binary out	internal resistance								
functions  • frequency output • binary output • pulse output  range • frequency output • range • binary output as alarm output • functions • pulse output • functions • pulse value • pulse width • ms • 0.05 to 1000									
binary output pulse output  to perating parameters  frequency output to range binary output binary output binary output binary output to binar	functions		frequency output						
pulse output  pulse output  pulse output  pulse output  frequency output  binary output salarm output  functions  pulse value  pulse width  pulse width  pulse width  pulse output  pulse width  pulse width  pulse width  pulse output  pulse width									
number 3 perating parameters 5 to 30 V/< 100 mA  frequency output range kHz 0 to 5 binary output binary output shalarm output functions mainly for totalizing pulse value units pulse width ms 0.05 to 1000									
perating parameters  5 to 30 V/< 100 mA  frequency output Frange KHZ 0 to 5  binary output as alarm output  pulse output frunctions mainly for totalizing pulse value units pulse width ms  5 to 30 V/< 100 mA  binary output limit, change of flow direction or error  and in the following for totalizing 0.01 to 1000 0.05 to 1000	number		•						
frequency output range kHz 0 to 5  binary output as alarm output pulse output frunctions mainly for totalizing pulse value units 0.01 to 1000 pulse width ms 0.05 to 1000	operating parame-								
range kHz 0 to 5  binary output binary output as alarm output pulse output functions mainly for totalizing pulse value units pulse width ms 0.05 to 1000	ters								
binary output  binary output  binary output as alarm output  pulse output  functions mainly for totalizing  pulse value units  pulse width ms  limit, change of flow direction or error  mainly for totalizing  0.01 to 1000	frequency output	İ							
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binary output as alarm output pulse output functions mainly for totalizing pulse value units pulse width ms limit, change of flow direction or error  limit, change of flow direction or error  error  mainly for totalizing 0.01 to 1000 0.05 to 1000	binary output								
pulse output functions mainly for totalizing pulse value units 0.01 to 1000 pulse width ms 0.05 to 1000	<ul> <li>binary output as</li> </ul>		limit, change of flow direction or error						
functions mainly for totalizing pulse value units 0.01 to 1000 pulse width ms 0.05 to 1000									
pulse value units 0.01 to 1000 ms 0.05 to 1000	pulse output								
pulse width ms 0.05 to 1000			, · · · · · · · · · · · · · · · · · · ·						
	· ·								
with aperture calibration of the transducers			0.05 to 1000						

<sup>&</sup>lt;sup>1</sup> with aperture calibration of the transducers

<sup>&</sup>lt;sup>2</sup> for transit time difference principle and reference conditions

 $<sup>^{\</sup>rm 3}$  outside the explosive atmosphere (housing cover open)

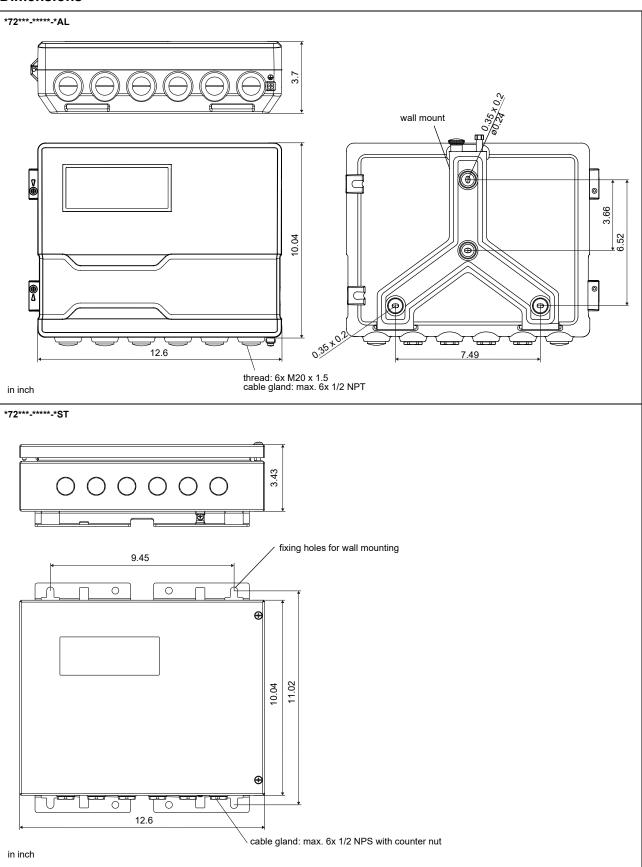
		F722**-NNN**-*AL	FLUXUS F722**-A2N**-*AL F722**-A2N**-*ST	FLUXUS F722**-F2N**-*AL F722**-F2N**-*ST			
nputs							
		The inputs are galvanically isolated from the	he transmitter.				
number		max. 4, on request					
<ul> <li>temperature input</li> </ul>							
type		Pt100/Pt1000					
connection		4-wire					
range	°F	-238 to +1040					
resolution	K	0.01					
accuracy	Ì	±0.01 % MV ±0.03 K					
<ul> <li>current input</li> </ul>							
accuracy		0.1 % MV ±10 μA	1 % MV ±10 μA				
active input	Ì	$U_{int}$ = 24 V, $R_{int}$ = 50 $\Omega$ , $P_{int}$ < 0.5 W, not s	$J_{\text{int}} = 24 \text{ V}, R_{\text{int}} = 50 \Omega, P_{\text{int}} < 0.5 \text{ W}, \text{ not short-circuit proof}$				
<ul> <li>range</li> </ul>	mΑ	0 to 20					
passive input	Ì	$R_{int} = 50 \Omega$ , $P_{int} < 0.3 W$					
<ul> <li>range</li> </ul>	mΑ	20 to +20					
<ul> <li>voltage input</li> </ul>							
range	V	0 to 1					
accuracy	Ì	0.1 % MV ±1 mV					
internal resistance	Ì	$R_{int} = 1 M\Omega$					
<ul> <li>binary input</li> </ul>							
switching signal		5 to 30 V, 1 mA		5 to 26 V, 1 mA			
functions		reset of the measured values					
		reset of the totalizers					
		stop of the totalizers					
		activation of the measuring mode for hig	hly dynamic flows				

<sup>&</sup>lt;sup>1</sup> with aperture calibration of the transducers

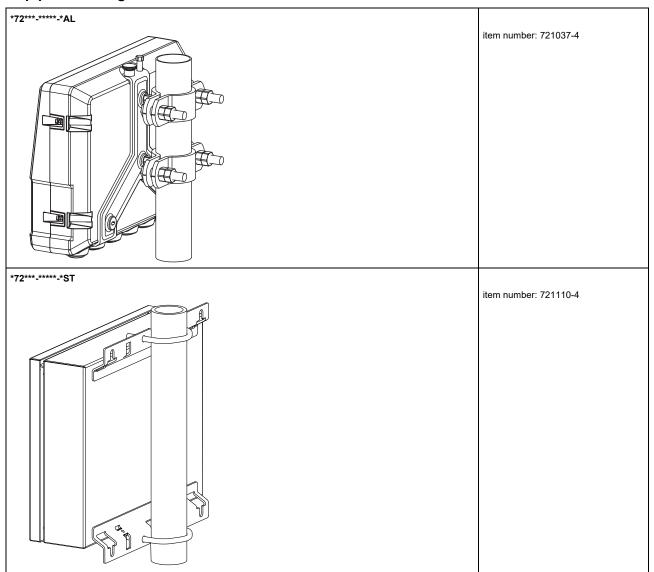
 $<sup>\</sup>overset{\cdot}{}_{2}$  for transit time difference principle and reference conditions

 $<sup>^{\</sup>rm 3}$  outside the explosive atmosphere (housing cover open)

## **Dimensions**



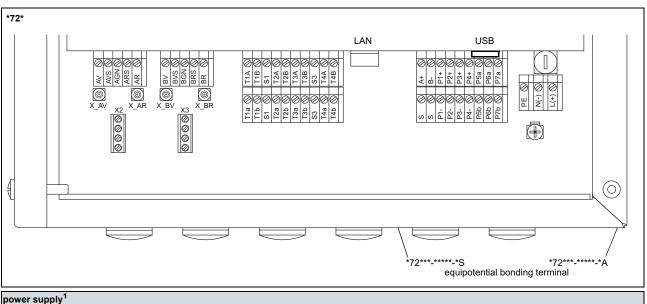
# 2" pipe mounting kit



## 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: -4...+140 °F

## **Terminal assignment**



	equipotential bonding terminal									
power supply	1									
terminal			connection (AC)	connection (DC)						
PE			protective conductor	protective conductor protective conductor						
N(-)			neutral conductor	utral conductor -						
L(+)			outer conductor		+					
transducers										
transducer cab	ole (transducers ****Ll	*), extension ca	able		transd	lucer cable (t	ransducers	*****52)		
measuring ch	annel A	measuring	channel B		meas nel A	uring chan-	measuring nel B	g chan-		
terminal	connection	terminal	connection	transducer	termi	nal	1		connection	
AV	signal	BV	signal	1	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 <sup>1, 2</sup>										
terminal connection				terminal	connection		1	communication inter- face		
P1+ to P4+			tput, frequency output	requency output, A+		signal +		• RS		
P1- to P4-	HART (P1	TART (PT)		B-		signal -		_	dbus RTU <sup>1</sup> Cnet MS/TP <sup>1</sup>	
								• Profibus PA <sup>1</sup>		
P5a to P7a P5b to P7b	digital out	out		S	S		Ishield		H1 <sup>1</sup>	
				USB		Hi-Speed USB 2.0 Device  RJ45 10/100 Mbps Ethernet  Hi-Speed USB 2.0 Flu: ser Flu: Flu: Flu: Flu: Flu: Flu: Flu: Flu:			vice (FluxDiag/ xDiagReader)	
				LAN				vice (FluxDiag/ xDiagReader) Cnet IP		
				1		Modbus TCP				
analog inputs										
		ture probe			passive se			ive sens		
terminal		onnection	cable	ith extension					connection	
T1a to T4a red			red/white		not connect		oted not		not connected	
T1A to T4A	red/blue		gray/black		-	+		+		
T1b to T4b	white/blu	ie	blue/red		+	not c		not connected		
T1B to T4B	white		white/green		not connect		-			
,			not connect	ot connected not connected			ed			
binary inputs	1, 2									

P1+ to P2+, P1- to P2cable (by customer):

terminal

<sup>-</sup> e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24 - outer diameter of the cable (\*72\*\*\*-\*\*\*\*-\*S with ferrite nut): max. 0.3 inch

 $<sup>^{2}\,\</sup>mathrm{The}$  number, type and terminal assignment are customized.

#### **Transducers**

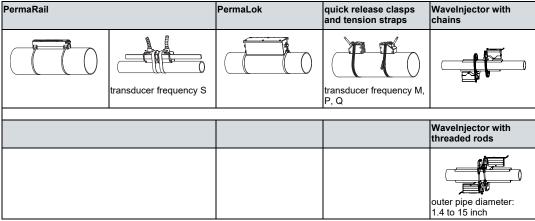
#### Overview

#### Shear wave transducers

		technical typ	ре				
		G	K	М	Р	Q	s
zone 2 - FM Class I I normal temperature		CDG1N52 CLG1N52	CDK1N52 CLK1N52	CDM2N52 CLM2N52	CDP2N52 CLP2N52	CDQ2N52 CLQ2N52	CDS2N52
zone 2 - nonEx IP68		CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8		
zone 2 - FM Class I I extended temperatu		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 temperatu	ıre range	CDG1E83 CLG1E83	CDK1E83 CLK1E83	CDM2E85 CLM2E85	CDP2E85 CLP2E85	CDQ2E85 CLQ2E85	
inner pipe diameter	d						
min. extended	inch	15.7	3.9	2	0.98	0.39	0.24
min. recommended	inch	19.7	7.9	3.9	2	0.98	0.39
max. recommended	inch	157.5	78.7	39.4	15.7	5.9	2.8
max. extended	inch	255.9	94.5	47.2	18.9	9.4	2.8
pipe wall thickness	•			•		•	
min.	inch	0.43	0.2	0.1	0.05	0.02	0.01

for further data see Technical specification TS\_F7xx-transducersVx-xXX\_Lus

## Transducer mounting fixture



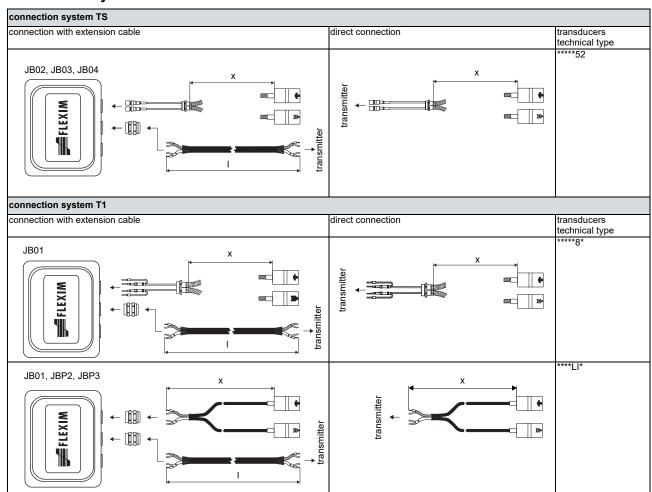
for further data see Technical specification TS\_F7xx-transducersVx-xXX\_Lus

## **Coupling materials for transducers**

	normal temperature range		extended temperature range			WaveInjector	
	< 212 °F	< 338 °F	< 302 °F	< 392 °F	392 to 464 °F	< 536 °F	536 to 1166 °F
	pound type N or coupling pad	pound type E or coupling pad	pound type E or coupling pad		type TF	and coupling pad	coupling pad type B and coupling pad type VT
-			1 01	coupling pad type VT			

for further data see Technical specification TS\_F7xx-transducersVx-xXX\_Lus

## **Connection systems**



for further data see Technical specification TS\_F7xx-transducersVx-xXX\_Lus

# **Temperature probes**

PT13N	PT13F	A2179
• Pt1000	• Pt1000	• Pt1000
clamp-on	• clamp-on	• inline
• -40 to +392 °F	response time: 8 s	• -58 to +500 °F
	-49 to +482 °F	
direct connection		
extension cable junction box		

## **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		77 °F ±9 °F
ambient temperature		77 °F ±9 °F
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 uncer- tainty	%	0.2
pipe wall thickness uncertainty	%	1
circularity tolerance		0.08 % of inner pipe diameter
SCNR	dB	> 48
SNR	dB	> 12

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