



FLEXIM

Technical specification

FLUXUS F831

Ultrasonic flowmeters for liquids for permanent installation in hazardous areas

Features

- Two measuring channels
- Flameproof/explosion proof housing for hazardous areas
- Intrinsic safe process inputs for the integration of external pressure and temperature sensors
- More precise measurement at unfavorable measuring points through integrated disturbance correction
- Bidirectional communication and support of common bus technologies (Profibus PA, Foundation Fieldbus, HART, Modbus, BACnet)
- Certification: ATEX/IECEx zone 1, FM Class I Div. 1+2

Applications

- Chemical industry
- Petrochemical industry
- Oil and gas industry



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Transmitter

Technical data

	FLUXUS F831 (831-AA*, 831-SA*)	FLUXUS F831 (831-AB*, 831-SB*)	FLUXUS F831 (831-ANN, 831-SNN)	FLUXUS F831**-F1N
				
design	831-AA* (aluminum housing): explosion-proof field device or 831-SA* (stainless steel housing): explosion-proof offshore device zone 1 (intrinsic safety: outputs, process interfaces)	831-AB* (aluminum housing): explosion-proof field device or 831-SB* (stainless steel housing): explosion-proof offshore device zone 1 (intrinsic safety: outputs, inputs, process interfaces)	831-ANN (aluminum housing): explosion-proof field device or 831-SNN (stainless steel housing): explosion-proof offshore device zone 1	aluminum housing: explosion-proof field device FM
measurement				
measurement principle	transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content			
flow direction	bidirectional			
synchronized channel averaging	x (2 measuring channels necessary)			
flow velocity	ft/s	measuring range: 0.03 to 82 0.15 % MV ±0.02 ft/s		
repeatability				
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 ±0.02 ft/s includes calibration certificate traceable to NIST		
measurement uncertainty at the measuring point ²		±1 % MV ±0.02 ft/s (see also graphical representation)		
transmitter				
power supply		20 to 32 V DC, U _m = 120 V	• 100 to 230 V/50 to 60 Hz or • 20 to 32 V DC	
power consumption	W	< 4	< 8	
number of measuring channels		1, optional: 2		
damping	s	0 to 100 (adjustable)		
measuring cycle	Hz	100 to 1000 (1 channel)		
response time	s	1 (1 channel), option: 0.02		
housing material		aluminum housing: cast aluminum EN AC 44200 mod, special heavy-duty coating (C5 according to EN ISO 12944) stainless steel housing: stainless steel 316/316L	cast aluminum EN AC 44200 mod, special heavy-duty coating (C5 according to EN ISO 12944)	
degree of protection		IP66	TYPE 4X/IP66	
dimensions	inch	see dimensional drawing		
mounting position		831-A*F (Profibus PA, FF H1), 831-S** : nameplate faces upwards		
weight	lb	aluminum housing: 14.3, stainless steel housing: 34.4		
fixation		wall mounting, 2" pipe mounting		
ambient temperature	°F	aluminum housing: • -40 to +140 • 831-A*F (Profibus PA, FF H1): -40 to +122 (< -4 without operation of the display) stainless steel housing: • -4 to +140 • 831-S**F (Profibus PA, FF H1): -4 to +122	aluminum housing: -40 to +140 (< -4 without operation of the display) stainless steel housing: -4 to +140	-40 to +140 (< -4 without operation of the display)
display		128 x 64 pixels, backlight		
menu language		English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian, Chinese		

¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ outside the explosive atmosphere (housing cover open)

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explosion protection				
• ATEX/IECEx				
marking	II2G II2D Ex db eb ia IIC T6 Gb Ex tb ia IIIC T100 °C Db 831-AAN: T_a -40...+60 °C 831-SAN: T_a -20...+60 °C 831-AAF: T_a -40...+50 °C 831-SAF: T_a -20...+50 °C	II(1)2G II(1)2D Ex db eb ia [ia Ga] IIC T6 Gb Ex tb ia [ia Da] IIIC T100 °C Db 831-ABN: T_a -40...+60 °C 831-SBN: T_a -20...+60 °C 831-ABF: T_a -40...+50 °C 831-SBF: T_a -20...+50 °C	II2G II2D Ex db eb IIC T6 Gb Ex tb IIIC T100 °C Db 831-ANN: T_a -40...+60 °C 831-SNN: T_a -20...+60 °C	-
certification	IBExU20ATEX1103 X, IECEx IBE 20.0015X	IBExU20ATEX1103 X, IECEx IBE 20.0015X	IBExU20ATEX1103 X, IECEx IBE 20.0015X	-
• FM				
marking	-	-	-	 Cl. I, II, III, Div. 2, GP A, B, C, D, F, G / T4A Cl. I Div. 1, GP. A, B, C, D / T6 For Group A, conduit seal of connection compartment is required within 18 inches. Cl. II, Div. 1, GP. E, F, G / T6 Cl. III, Div. 1 / T6 $T_a = -40^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ Cl. I, II, III, Div. 2, GP A, B, C, D, F, G / T4A Cl. I Div. 1, GP. B, C, D / T6 Cl. II, Div. 1, GP. E, F, G / T6 Cl. III, Div. 1 / T6 $T_a = -40^{\circ}\text{C}$ to $+60^{\circ}\text{C}$
measuring functions				
physical quantities	volumetric flow rate, mass flow rate, flow velocity			
totalizer	volume, mass			
calculation functions	average, difference, sum (2 measuring channels necessary)			
diagnostic functions	sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times			
communication interfaces				
service interfaces	measured value transmission, parametrization of the transmitter: USB ³			
process interfaces	intrinsic safety, max. 1 option: <ul style="list-style-type: none"> • HART • Profibus PA • FF H1 		max. 1 option: <ul style="list-style-type: none"> • Modbus RTU/RS485 • HART • Profibus PA • FF H1 • BACnet MS/TP 	
intrinsic safety parameters	Profibus PA, FF H1: $U_i = 24 \text{ V}$ $I_i = 174 \text{ mA}$ $P_i = 1044 \text{ mW}$ $L_i = 10 \mu\text{H}$ C_i negligible		-	
accessories				
data transmission kit	USB cable			
software	<ul style="list-style-type: none"> • FluxDiagReader: reading of measured values and parameters, graphical representation • FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrization of the transmitter 			
data logger				
loggable values	all physical quantities, totalized physical quantities and diagnostic values			
capacity	max. 800 000 measured values			

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 F831 (831-AA*, 831-SA*)	FLUXUS F831 (831-AB*, 831-SB*)	FLUXUS F831 (831-ANN, 831-SNN)	FLUXUS F831**-F1N
outputs					
The outputs are galvanically isolated from the transmitter.					
• switchable current output					
number				configurable according to NAMUR NE43 All switchable current outputs are jointly switched to active or passive.	
range	mA	-	-	max. 3	
uncertainty		-	-	4 to 20 (alarm current: 3.2 to 3.99, 20.01 to 24, hardware fault current: 3.2)	
active output		-	-	0.04 % of output value $\pm 3 \mu\text{A}$	
passive output		-	-	$R_{\text{ext}} = 250$ to 530Ω , $U_{\text{opencircuit}} = 28 \text{ V DC}$ $U_{\text{ext}} = 9$ to 30 V DC , depending on R_{ext} ($R_{\text{ext}} < 458 \Omega$ at 20 V)	
current output in HART mode		-	-	option	
• range	mA	-	-	4 to 20 (alarm current: 3.5 to 3.99, 20.01 to 22, hardware fault current: 3.2)	
• active output		-	-	$R_{\text{ext}} = 250$ to 530Ω , $U_{\text{opencircuit}} = 28 \text{ V DC}$	
• passive output		-	-	$U_{\text{ext}} = 9$ to 30 V DC , depending on R_{ext} ($R_{\text{ext}} = 250$ to 458Ω at 20 V)	
• current output					
range	mA	4 to 20 (alarm current: 3.2 to 3.99, 20.01 to 24, hardware fault current: 3.2)	-	-	
uncertainty		0.04 % of output value $\pm 3 \mu\text{A}$	-	-	
passive output		$U_{\text{ext}} \leq 29 \text{ V DC}$, depending on R_{ext} ($R_{\text{ext}} < 458 \Omega$ at 20 V)	-	-	
current output in HART mode		option	-	-	
• range	mA	4 to 20 (alarm current: 3.5 to 3.99, 20.01 to 22, hardware fault current: 3.2)	-	-	
• passive output		$U_{\text{ext}} = 9$ to 29 V DC , depending on R_{ext} ($R_{\text{ext}} = 250$ to 458Ω at 20 V)	-	-	
intrinsic safety parameters		$U_i = 29 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 0.725 \text{ W}$ $C_i = 1 \text{ nF}$ $L_i = 50 \text{ nH}$	-	-	
• digital output					
functions		• frequency output • binary output • pulse output	-	• frequency output • binary output • pulse output	
type		open collector (passive)	-	open collector (passive)	
operating parameters		8.2 V/30 mA (NAMUR)	-	8.2 V/30 mA (NAMUR)	
max. values		8 mA at 29 V DC	-	8 mA at 29 V DC	
frequency output					
• range	kHz	2 to 10	-	2 to 10	
• damping	s	0 to 999.9	-	0 to 999.9	
• pulse-to-pause ratio		1:1	-	1:1	
binary output					
• binary output as alarm output		limit, change of flow direction or error	-	limit, change of flow direction or error	
pulse output					
• pulse value	units	0.01 to 1000	-	0.01 to 1000	
• pulse width	ms	0.05 to 1000	-	0.05 to 1000	
• pulse rate		max. 10 000 pulses	-	max. 10 000 pulses	
intrinsic safety parameters		$U_i = 29 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 0.725 \text{ W}$ $C_i = 1 \text{ nF}$ $L_i = 50 \text{ nH}$	-	-	

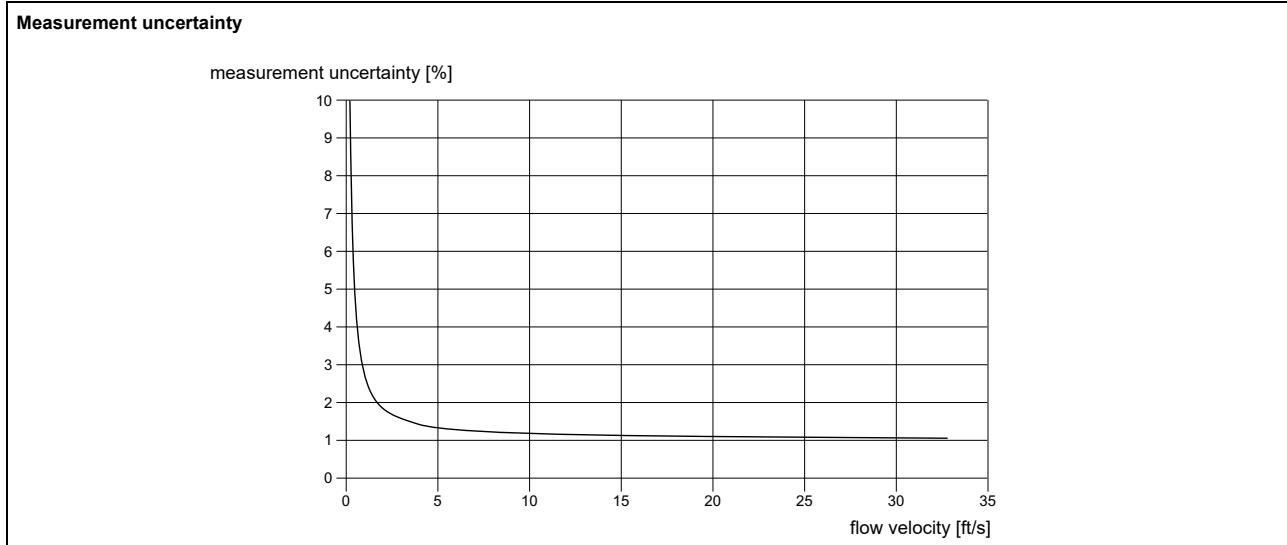
¹ with aperture calibration of the transducers² for transit time difference principle and reference conditions³ outside the explosive atmosphere (housing cover open)

	FLUXUS F831 (831-AA*, 831-SA*)	FLUXUS F831 (831-AB*, 831-SB*)	FLUXUS F831 (831-ANN, 831-SNN)	FLUXUS F831**-F1N
inputs				
	not short-circuit proof The inputs are not galvanically isolated from the transmitter.		The inputs are galvanically isolated from the transmitter.	
• temperature input				
number	-	max. 1	max. 1	
type	-	Pt100/Pt1000	Pt100/Pt1000	
connection	-	4-wire	4-wire	
range	°F	-238 to +1040	-238 to +1040	
resolution	K	0.01	0.01	
accuracy		±0.01 % MV ±0.03 K at 64 to 82 °F ±0.01 % MV ±0.03 K ±0.0005 %/K at <64 °F/>82 °F	±0.01 % MV ±0.03 K at 64 to 82 °F ±0.01 % MV ±0.03 K ±0.0005 %/K at <64 °F/>82 °F	
cable resistance	Ω	max. 1000	max. 1000	
intrinsic safety parameters		U _o = 9.2 V I _o = 25 mA P _o = 0.057 W C _o = 4283 nF L _o = 57 mH	-	
• switchable current input				
	All switchable current inputs are jointly switched to active or passive.			
number	-	max. 2		
accuracy	-	±0.1 % MV ±0.01 mA at 64 to 82 °F ±0.1 % MV ±0.01 mA ±0.005 %/K at <64 °F/>82 °F		
resolution	μA	0.1		
active input	-	R _{int} = 75 Ω, I _{max} ≤ 30 mA U _{opencircuit} = 28 V (open circuit) U _{min} = 21.4 V at 20 mA		
• range	mA	0 to 20		
passive input	-	U _{ext} = 24 V, R _{int} = 35 Ω, I _{max} ≤ 24 mA		
• range	mA	0 to 20		
• current input				
number	-	max. 1	-	
accuracy	-	±0.1 % MV ±0.01 mA at 64 to 82 °F ±0.1 % MV ±0.01 mA ±0.005 %/K at <64 °F/>82 °F	-	
resolution	μA	0.1	-	
active input	-	U _{int} < 20 V, R _{int} ≤ 385 Ω, I _{max} ≤ 40 mA U _{min} = 19.6 V - R _{int} · I	-	
• range	mA	0 to 20	-	
intrinsic safety parameters		U _o = 29.2 V I _o = 88 mA P _o = 0.64 W C _o = 73 nF L _o = 4.1 mH	-	

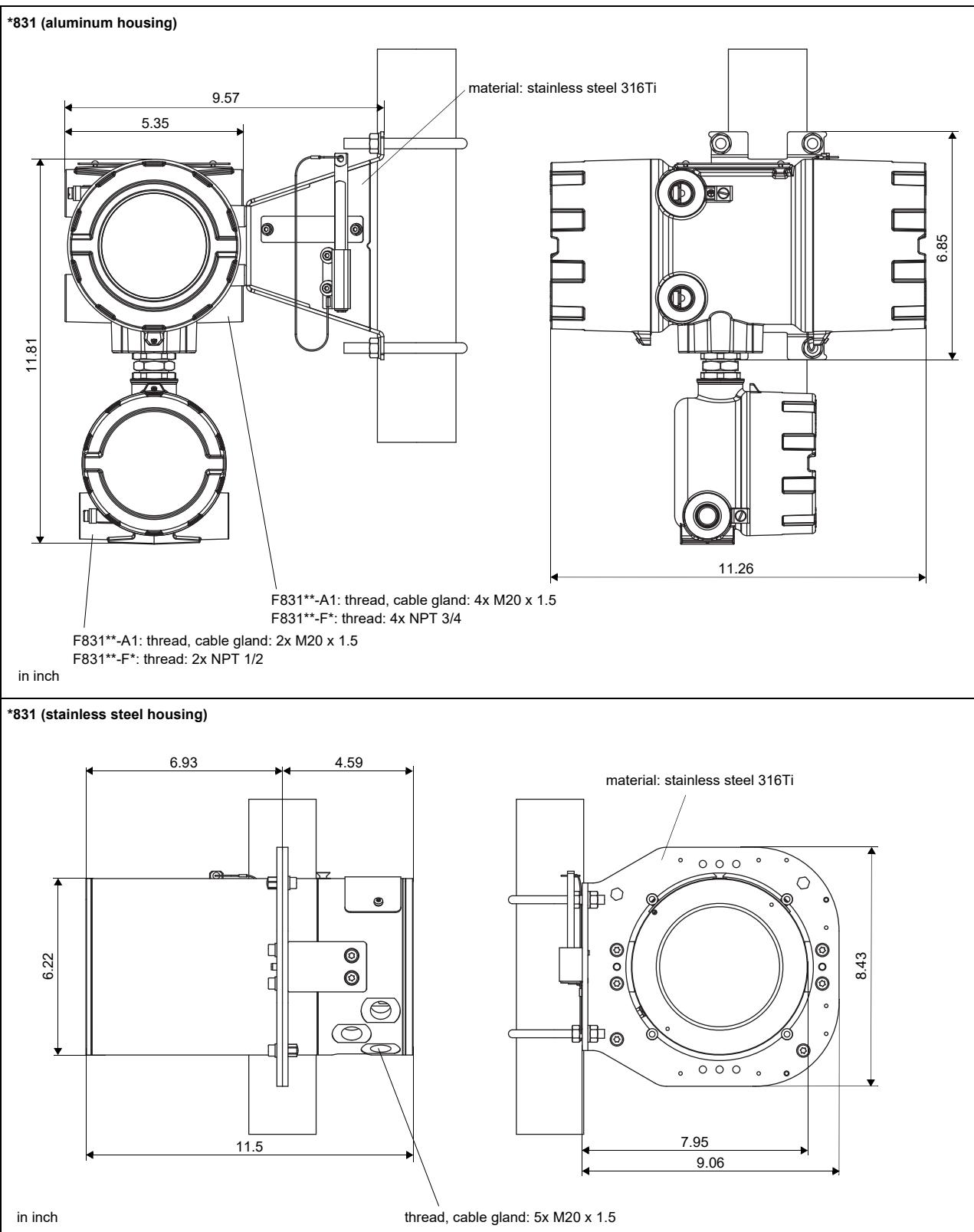
¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ outside the explosive atmosphere (housing cover open)

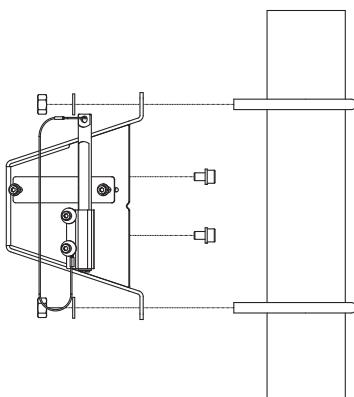


Dimensions

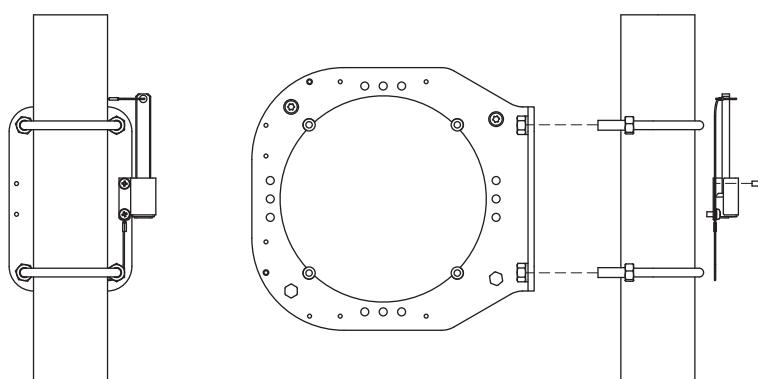


Wall and 2" pipe mounting kit

*831 (aluminum housing)



*831 (stainless steel housing)



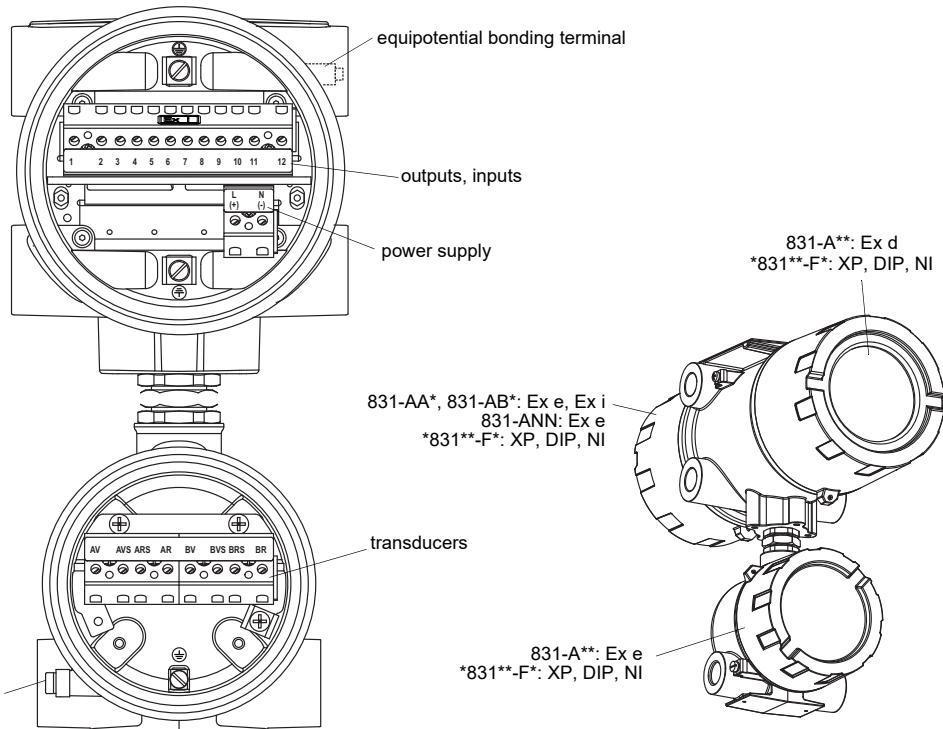
Storage

- 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:
 - aluminum housing: -40...+140 °F
 - stainless steel housing: -4...+140 °F

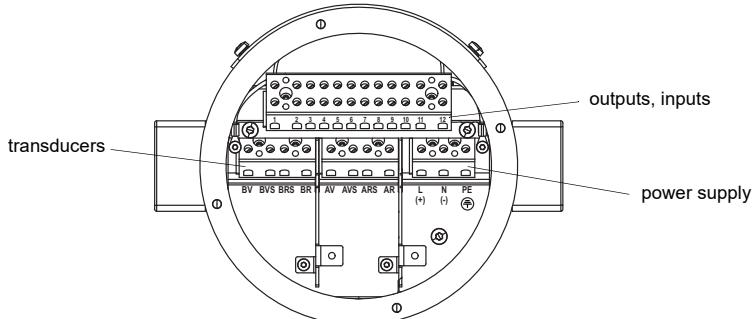
Terminal assignment

*831 (aluminum housing)

upper housing,
back view
831-AA*, 831-AB*: Ex e, Ex i
831-ANN: Ex e
*831**-F*: XP, DIP, NI



*831 (stainless steel housing)



power supply¹

AC		DC	
terminal	connection	terminal	connection
L	outer conductor	(+)	+
N	neutral conductor	(-)	-
	protective conductor		protective conductor

¹ cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

transducers, extension cable

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

outputs, inputs^{1, 2}		
terminal	connection	
depending on configuration	current output, digital output, current input	
3, 4, 5, 6	temperature input	
11+, 12-	passive current output/HART	
11-, 12+	active current output/HART	
11, 12	Modbus RTU, FF H1, Profibus PA, BACnet MS/TP	
temperature probe		
terminal	direct connection	connection with extension cable
3	red	red
4	white	black
5	red	green
6	white	white
USB	type C Hi-Speed USB 2.0 Device	service (FluxDiag/FluxDiagReader)

¹ cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

² The number, type and terminal assignment are customized.

Transducers

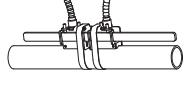
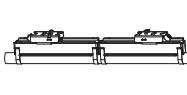
Overview

Shear wave transducers

	technical type					
	G	K	M	P	Q	S
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	
FM Class I Div. 1 normal temperature range	CDG1N62 CLG1N62	CDK1N62 CLK1N62	CDM1N62 CLM1N62	CDP1N62 CLP1N62	CDQ1N62 CLQ1N62	
FM Class I Div. 2 normal temperature range	CDG1N52 CLG1N52	CDK1N52 CLK1N52	CDM2N52 CLM2N52	CDP2N52 CLP2N52	CDQ2N52 CLQ2N52	CDS2N52
FM Class I Div. 2 extended temperature range			CDM2E52 CLM2E52	CDP2E52 CLP2E52	CDQ2E52 CLQ2E52	
inner pipe diameter d						
min. extended	inch	15.7	3.9	2	0.98	0.39
min. recommended	inch	19.7	7.9	3.9	2	0.98
max. recommended	inch	157.5	78.7	39.4	15.7	5.9
max. extended	inch	255.9	94.5	47.2	18.9	9.4
pipe wall thickness						
min.	inch	0.43	0.2	0.1	0.05	0.02
						0.01

for further data see Technical specification TS_F8xx-transducersVx-xXX_Lus

Transducer mounting fixture

PermaRail	PermaFix	transducer box WI for WavelInjector with chains
		
transducer frequency S		
PermaFix with bolt mounting plates	transducer box WI for WavelInjector with threaded rods	outer pipe diameter: 1.4 to 15 inch
		

for further data see Technical specification TS_F8xx-transducersVx-xXX_Lus

Coupling materials for transducers

	normal temperature range	extended temperature range	WavelInjector
	< 212 °F	< 338 °F	< 536 °F
< 24 h	coupling compound type N or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type E or H or coupling pad type VT
long time measurement	coupling pad type VT	coupling pad type VT	coupling pad type VT

for further data see Technical specification TS_F8xx-transducersVx-xXX_Lus

Connection systems

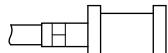
connection system T1		
connection with extension cable	direct connection	transducers technical type
<p>JB01</p>	<p>direct connection</p>	*****8*
<p>JB01</p>	<p>direct connection</p>	*****L1*
<p>terminal board for junction box (junction box by customer)</p>	<p>transmitter</p>	*****62

connection system TS		
connection with extension cable	direct connection	transducers technical type
<p>JB04</p>	<p>direct connection</p>	*****52

for further data see Technical specification TS_F8xx-transducersVx-xXX_Lus

Temperature probes

PT12N (item number: 770415-6)	PT12N (item number: 770415-7)
<ul style="list-style-type: none">• Pt100• clamp-on• -49 to +446 °F• ATEX zone 0/1 (intrinsic safety)• for 831-*B*	<ul style="list-style-type: none">• Pt100• clamp-on• -49 to +482 °F• ATEX zone 1• for 831-*NN



see Technical specification TS_PTVx-xXX

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 uncertainty	% 0.2
pipe wall thickness uncertainty	% 1
circularity tolerance	0.08 % of inner pipe diameter
SCNR	dB > 48
SNR	dB > 12