

Ultrasonic process monitoring and flow measurement of hydrocarbons

Features

- Exact and highly reliable bidirectional clamp-on flow measurement of operational volumetric flow rate, mass flow rate and density
- Measurement of standard volumetric flow rate according to ASTM and API determination for hydrocarbon processing applications
- Compact, rugged, durable and maintenance-free meter for hazardous area locations
- Certification: ATEX/IECEX zone 1
- Intrinsically safe analog process inputs for the integration of external pressure and temperature sensors at the measuring point
- Bidirectional communication and HART support

Applications



Measurement on process and transport pipelines when processing hydrocarbons in single and multiproduct processes where changes in viscosity and density are affected by process conditions (pressure and temperature):

Leakage detection, fluid detection, interface/batch detection, fluid quality monitoring, check metering



Transmitter

Technical data

FLUXUS H831 (831-AA2)	
	
design	explosion-proof field device zone 1 (intrinsic safety: outputs, inputs, process interfaces)
measurement	
• HPI	
standard volumetric flow rate correction $VCF = CTL \cdot CPL = \rho/\rho_N$	
measurement uncertainty	% ± 1 (crude oil, refined products, liquefied gases, heavy oils) VCF - volume correction factor CTL - correction for the effect of temperature on liquid CPL - correction for the effect of pressure on liquid ρ - operating density ρ_N - normalised density
operating density, normalised density	
repeatability	% ± 1 (with field calibration of sound speed)
• flow	
measurement principle	transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content
flow velocity	m/s 0.01...25
repeatability	0.15 % 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 (see also graphical representation)
transmitter	
power supply	20...32 V DC, $U_m = 120$ V
power consumption	W < 4
number of measuring channels	1, optional: 2
damping	s 0...100 (adjustable)
measuring cycle	Hz 100...1000 (1 channel)
response time	s 1 (1 channel), option: 0.02
housing material	cast aluminum EN AC 44200 mod, special heavy-duty coating (C5 according to EN ISO 12944)
degree of protection	IP66
dimensions	mm see dimensional drawing
weight	kg 6.5
fixation	wall mounting, 2" pipe mounting
ambient temperature	°C -40...+60 (< -20 without operation of the display)
display	128 x 64 pixels, backlight
menu language	English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian
explosion protection	
• ATEX/IECEX	
marking	CE 0637  II(1)2G II(1)2D Ex db eb ia [ia] IIC T6 Gb Ex tb ia [ia] IIC T100 °C Db T_a -40...+60 °C
certification ATEX	IBExU20ATEX1103 X
certification IECEX	IECEX IBE 20.0015X
measuring functions	
physical quantities	<ul style="list-style-type: none"> flow: operating volumetric flow rate, standard volumetric flow rate according to ASTM 1250/TP25/4311, flow velocity, mass flow rate HPI: API gravity, density, normalised density interface detection: slope of the HPI physical quantities fluid detection: according to fluid table
totaliser	volume, mass
calculation functions	average, difference, sum (2 measuring channels necessary)
diagnostic functions	sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times

¹ with aperture calibration of the transducers

² for transit time difference principle and reference conditions

³ outside the explosive atmosphere (housing cover open)

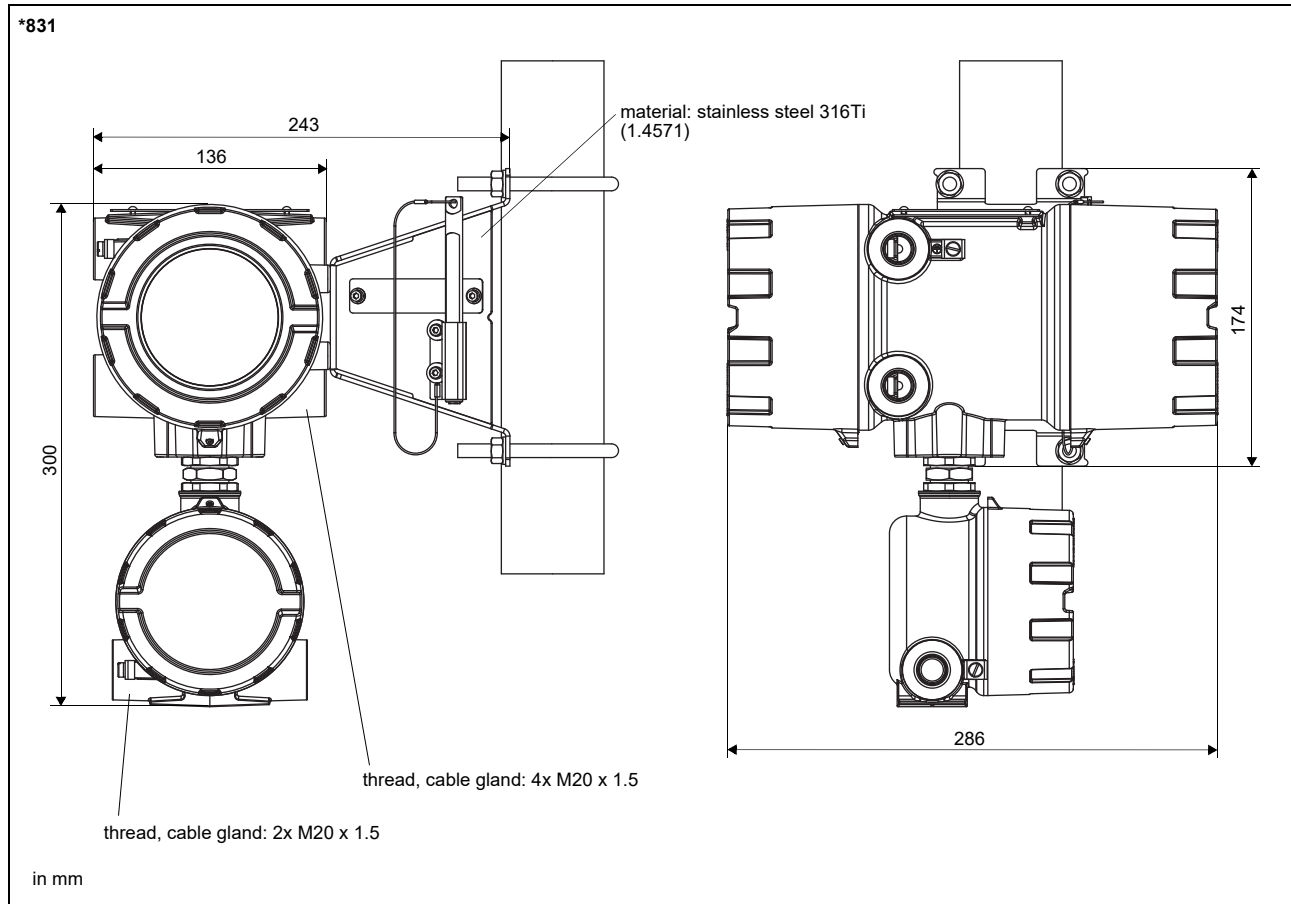
FLUXUS H831 (831-AA2)	
communication interfaces	
service interfaces	measured value transmission, parametrisation of the transmitter: USB ³
process interfaces	HART (intrinsic safety, optional)
accessories	
data transmission kit	USB cable
software	<ul style="list-style-type: none"> FluxDiagReader: reading of measured values and parameters, graphical representation FluxDiag (optional): reading of measurement data, graphical representation, report generation, 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.	
• current output	
configurable according to NAMUR NE43	
number	max. 2
range	mA 4...20 (3.2...24)
accuracy	0.04 % MV ±3 µA
passive output	$U_{ext} \leq 29 \text{ V DC}$, depending on R_{ext} ($R_{ext} < 830 \Omega$ at 29 V)
current output in HART mode	option
<ul style="list-style-type: none"> range passive output 	mA 4...20 (3.5...22) $U_{ext} = 9...29 \text{ V DC}$
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	<ul style="list-style-type: none"> frequency output binary output pulse output
number	max. 2
operating parameters	$U_{ext} = (8.2 \pm 0.1) \text{ V DC}$
frequency output	
<ul style="list-style-type: none"> range 	kHz 0...10
binary output	
<ul style="list-style-type: none"> binary output as alarm output 	limit, change of flow direction or error
pulse output	
<ul style="list-style-type: none"> pulse value pulse width 	units 0.01...1 000 ms 0.05...1 000
intrinsic safety parameters	$U_i = 29 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 0.725 \text{ W}$ $C_i = 1 \text{ nF}$ $L_i = 50 \text{ nH}$
inputs	
not short-circuit proof	
The inputs are not galvanically isolated from the transmitter.	
• temperature input	
number	max. 1
type	Pt100/Pt1000
connection	4-wire
range	°C -150...+560
resolution	K 0.01
accuracy	±0.01 % MV ±0.03 K
intrinsic safety parameters	$U_o = 9.2 \text{ V}$ $I_o = 25 \text{ mA}$ $P_o = 0.057 \text{ W}$ $C_o = 4283 \text{ nF}$ $L_o = 57 \text{ mH}$
• current input	
number	max. 1
accuracy	±0.1 % MV ±0.01 mA
active input	$U_{int} < 20 \text{ V}$, $R_{int} = 360 \Omega$
<ul style="list-style-type: none"> range 	mA 0...20
intrinsic safety parameters	$U_o = 29.2 \text{ V}$ $I_o = 88 \text{ mA}$ $P_o = 0.64 \text{ W}$ $C_o = 73 \text{ nF}$ $L_o = 4.1 \text{ mH}$

¹ with aperture calibration of the transducers

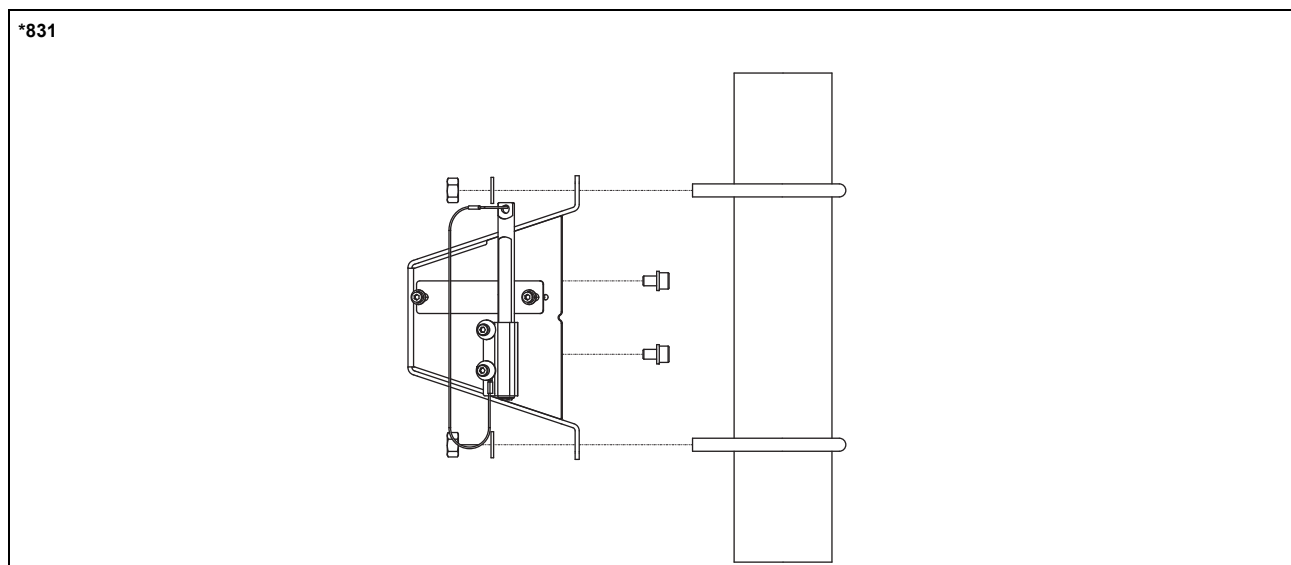
² for transit time difference principle and reference conditions

³ outside the explosive atmosphere (housing cover open)

Dimensions



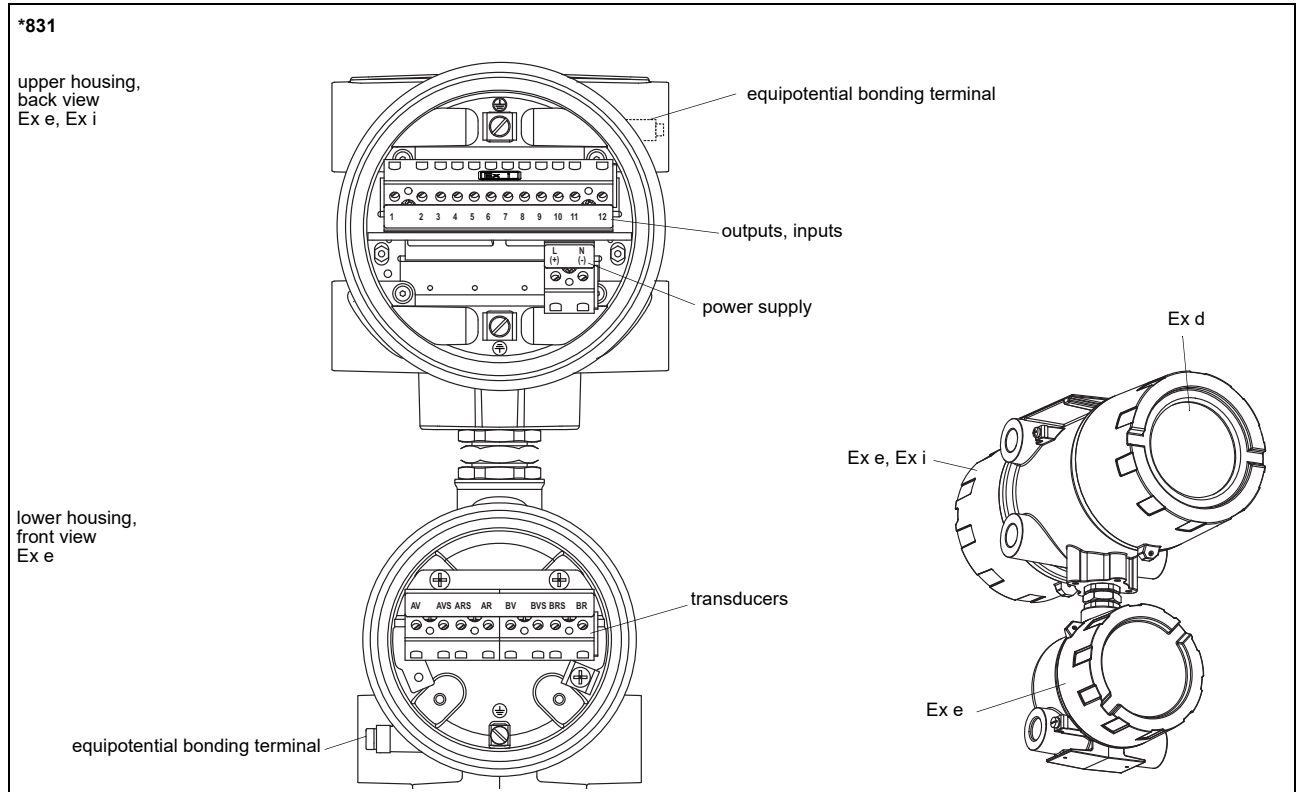
2" pipe mounting kit



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: -40...+60 °C

Terminal assignment



power supply ¹				
DC				
terminal		connection		
(+)		+		
(-)		-		
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		
dependent on configuration		passive current output, digital output, current input		
3, 4, 5, 6		temperature input		
11+, 12-		passive current output/HART		
temperature probe				
terminal		direct connection	connection with extension cable	
3		red	red	
4		red	blue	
5		white	grey	
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: 0.25...2.5 mm²

² The number, type and terminal assignment are customised.

Transducers


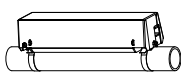
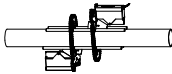
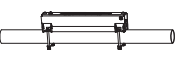
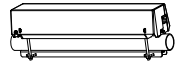
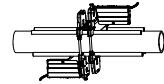
Overview

Shear wave transducers

		technical type				
		G	K	M	P	Q
zone 1 normal temperature range		CDG1N81 CLG1N81	CDK1N81 CLK1N81	CDM2N81 CLM2N81	CDP2N81 CLP2N81	CDQ2N81 CLQ2N81
zone 1 IP68		CDG1L11	CDK1L11	CDM2L11	CDP2L11	
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
min. recommended	mm	500	200	100	50	25
max. recommended	mm	4000	2000	1000	400	150
max. extended	mm	6500	2400	1200	480	240
pipe wall thickness						
min.	mm	11	5	2.5	1.2	0.6

for further data see Technical specification TS_F8xx-transducersVx-xxx_Leu

Transducer mounting fixture

Variofix L	Variofix C	transducer box WI for Wavelnjector with chains
		
Variofix L with bolt mounting plates	Variofix C with bolt mounting plates	transducer box WI for Wavelnjector with threaded rods
		
outer pipe diameter: max. 48 mm	outer pipe diameter: VCM: max. 46 mm VCC: max. 36 mm	outer pipe diameter: 35...380 mm

for further data see Technical specification TS_F8xx-transducersVx-xxx_Leu

Coupling materials for transducers

	normal temperature range		extended temperature range			Wavelnjector	
	< 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 measurement	coupling foil type VT	coupling foil type VT	coupling foil type VT	coupling foil type VT			

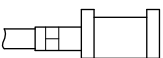
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Connection systems

connection system T1		
connection with extension cable	direct connection	transducers technical type
<p>JB01</p>		<p>****g*</p>
<p>JB01</p>		<p>****L*</p>

for further data see Technical specification TS_F8xx-transducersVx-xxx_Leu

Temperature probes

PT12N (order code: ACC-PE-xxxx-/T332)
<ul style="list-style-type: none">• clamp-on• ATEX zone 0 (intrinsic safety)
-45...+230 °C


see Technical specification TS_PTVx-xxx_Leu