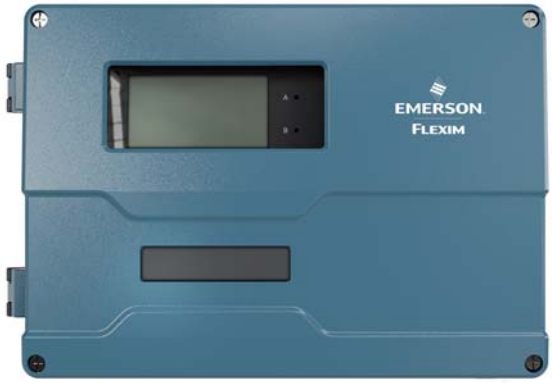
Flexim FLUXUS F731
Ultrasonic Flowmeter



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 F731**-NNN**-*AL F731**-NNN**-*ST	FLUXUS F731**-A2N**-*ST	FLUXUS F731**-F2N**-*ST
				
design		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		
flow direction		bidirectional		
synchronized channel averaging		x (2 measuring channels necessary)		
flow velocity	ft/s	0.03 to 82 (max. value depending on the application)		
repeatability		0.15 % MV ±0.02 ft/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 ±0.02 ft/s includes calibration certificate traceable to NIST		
measurement uncertainty at the measuring point[2]		±1 % MV ±0.02 ft/s		
transmitter				
power supply		• 100 to 240 V ±10 %/50 to 60 Hz or • 11 to 32 V DC		
power consumption	W	< 15		
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, powder coated or stainless steel 316L	stainless steel 316L	
degree of protection		IP66		
dimensions	inch	see dimensional drawing		
weight	lb	aluminum housing: 9.9 stainless steel housing: 12.8	12.8	
fixation		wall mounting, optional: 2" pipe mounting		
ambient temperature	°F	-40 to +140 (< -4 without operation of the display)		
display		240 x 128 pixels, backlight		
menu language		English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian, Chinese		
explosion protection				
• ATEX/IECEx				
certification type		-	731-SNN	-
marking		-	CE 0637 UKCA Ex II3G Ex ec IIC T4 Gc II2D Ex tb IIIC T135 °C Db T_a -40...+59/60 °C	-
certification		-	IBExU24ATEX1014 X, IECEx IBE 23.0024X	-
• FM				
marking		-	-	FM APPROVED c us Cl. I,II,III/Div. 2 / GP. A, B, C, D, F, G / T5 -40 °C ≤ Ta ≤ +60 °C
certification		-	-	FM23US0036, FM23CA0026
measuring functions				
physical quantities		volumetric flow rate, mass flow rate, flow velocity, thermal energy rate (if temperature inputs are installed)		
totalizer		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		

[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 F731**-NNN**-*AL F731**-NNN**-*ST	FLUXUS F731**-A2N**-*ST	FLUXUS F731**-F2N**-*ST
communication interfaces				
service interfaces		measured value transmission, parametrization of the transmitter: • USB[3] • LAN[3]		
process interfaces		max. 1 option: • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1	max. 1 option: • 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, parametrization of the transmitter		
data logger				
loggable 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, current inputs and outputs: max. 4		
• switchable current output				
		configurable according to NAMUR NE 43 All switchable current outputs are jointly switched to active or passive.		
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 ±3 µA		
active output		R_{ext} = 250 to 530 Ω, $U_{opencircuit}$ = 28 V DC		
passive output		U_{ext} = 9 to 30 V DC, depending on R_{ext} (R_{ext} < 458 Ω 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_{ext} = 250 to 530 Ω, $U_{opencircuit}$ = 28 V DC		
• passive output		U_{ext} = 9 to 30 V DC, depending on R_{ext} (R_{ext} = 250 to 458 Ω at 20 V)		
• digital output				
functions		• frequency output • binary output • pulse output		
type		open collector (passive)		
operating parameters		**OC30V** (IEC 60947-5-6) 5 to 30 V, I_{max} = 20 mA, R_{int} = 1020 Ω Low: U < 2 V at I_{loop} = 2 mA (R_{ext} = 11 kΩ at U_{ext} = 24 V) High: U > 15 V (R_{ext} = 11 kΩ at U_{ext} = 24 V) or **OC30V/100mA** 5 to 30 V, I_{max} = 100 mA, R_{int} = 20 Ω Low: U < 2 V at I_{loop} = 2 mA (R_{ext} = 12 kΩ at U_{ext} = 24 V) High: U > 15 V (R_{ext} = 12 kΩ at U_{ext} = 24 V)		**OC30V** (IEC 60947-5-6) 5 to 30 V, I_{max} = 20 mA, R_{int} = 1020 Ω Low: U < 2 V at I_{loop} = 2 mA (R_{ext} = 11 kΩ at U_{ext} = 24 V) High: U > 15 V (R_{ext} = 11 kΩ at U_{ext} = 24 V)
frequency output				
• range	kHz	0.002 to 10		
• damping	s	0 to 999.9 (adjustable)		
• pulse-to-pause ratio		1:1		
binary output				
• binary output as alarm output		limit, change of flow direction or error		
pulse output				
• pulse value	units	0.01 to 1000		
• pulse width	ms	0.05 to 1000		
• pulse rate		max. 10 000 pulses		

[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 F731**-NNN**-*AL F731**-NNN**-*ST	FLUXUS F731**-A2N**-*ST	FLUXUS F731**-F2N**-*ST
inputs				
		The inputs are galvanically isolated from the transmitter.		
number		on request, current inputs and outputs: max. 4		
• **temperature input**				
type		Pt100/Pt1000		
connection		4-wire		
range	°F	-238 to +1040		
resolution	K	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		
cable resistance	Ω	max. 1000		
• **switchable current input**				
		All switchable current inputs are jointly switched to active or passive.		
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 • range	 mA	R_{int} = 75 Ω, I_{max} ≤ 30 mA $U_{opencircuit}$ = 28 V (open circuit) U_{min} = 21.4 V at 20 mA 0 to 20		
passive input • range	 mA	U_{ext} = 24 V, R_{int} = 35 Ω, I_{max} ≤ 24 mA 0 to 20		

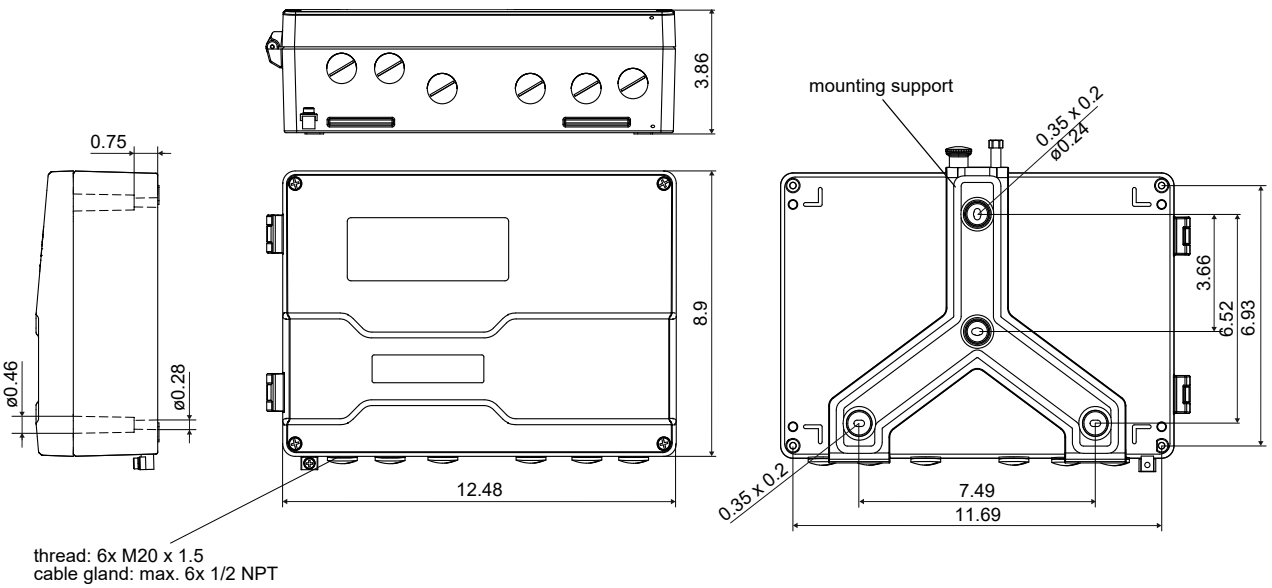
[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

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

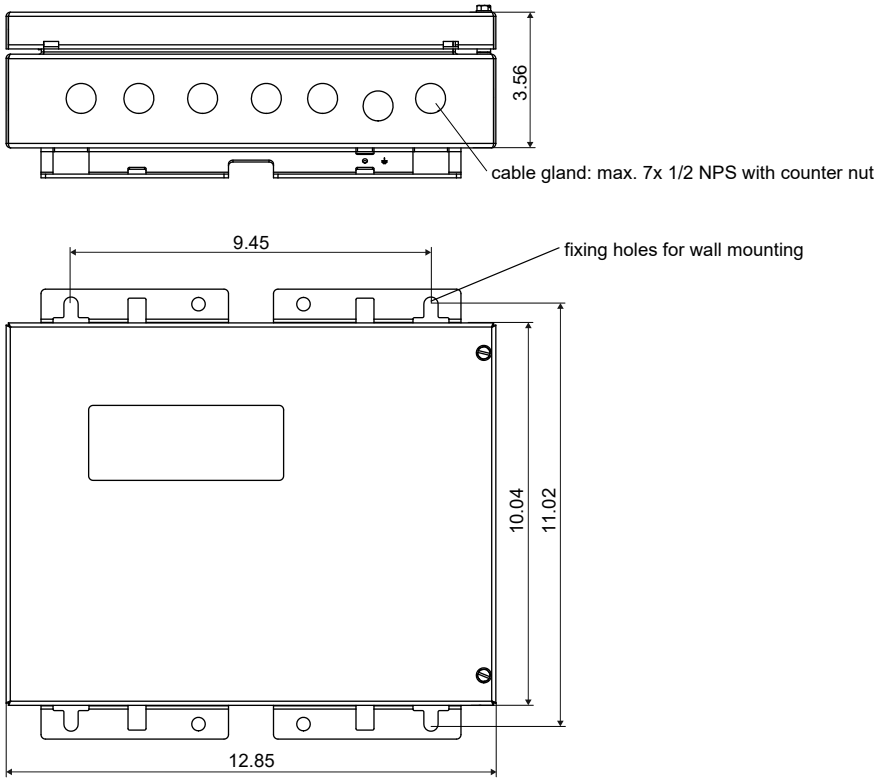
Dimensions

731**-**-*AL**



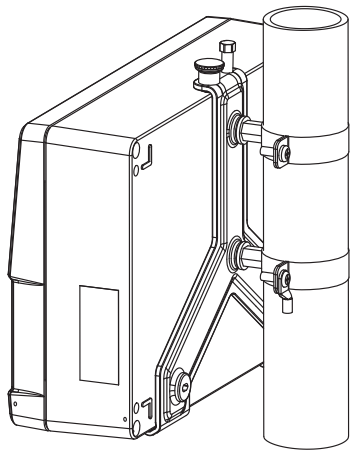
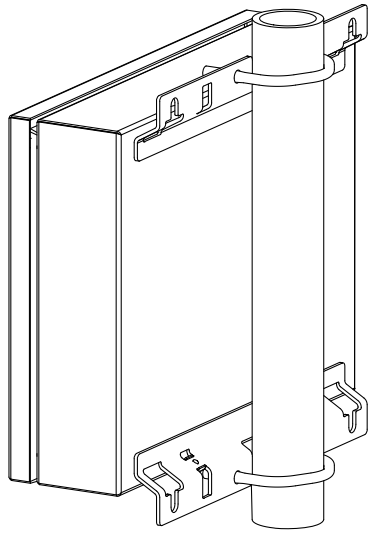
in inch

731**-**-*ST**



in inch

2" pipe mounting kit

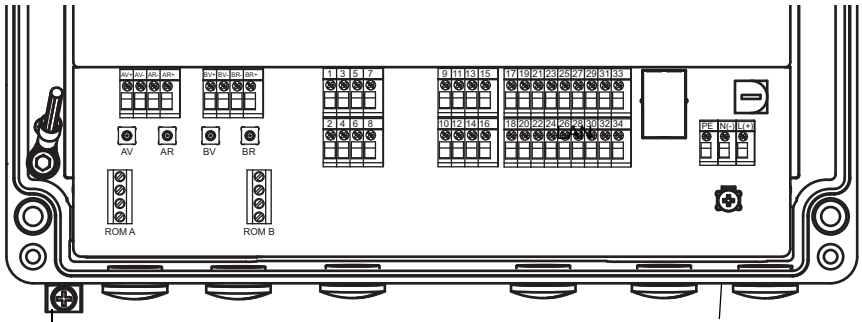
731**-**-*AL** 	item number: 731037-1
731**-**-*ST** 	item number: 721110-4

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: -40…+140 °F

Terminal assignment

***731**



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

transducers				
measuring channel A		**measuring channel B**		
terminal	**connection**	**terminal**	**connection**	**transducer**
AV or AV+	signal	BV or BV+	signal	
AVS or AV-	shield	BVS or BV-	shield	
ARS or AR-	shield	BRS or BR-	shield	
AR or AR+	signal	BR or BR+	signal	

outputs, inputs[1, 2]	
terminal	**connection**
depending on configuration	current output, digital output, current input
1, 2, 3, 4 5, 6, 7, 8 9, 10, 11, 12 13, 14, 15, 16	temperature input
29+, 30-	passive current output/HART
29-, 30+	active current output/HART
29, 30	Modbus RTU, BACnet MS/TP, Profibus PA, FF H1

temperature probe		
terminal	**direct connection**	**connection with extension cable, inline temperature probe**
1, 5, 9, 13	red	white
2, 6, 10, 14	white	red
3, 7, 11, 15	red	black
4, 8, 12, 16	white	green

USB	type C Hi-Speed USB 2.0 Device	service (FluxDiag/FluxDiagReader)
LAN	RJ45 10/100 Mbps Ethernet	• service (FluxDiag/FluxDiagReader) • Modbus TCP • BACnet IP

[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

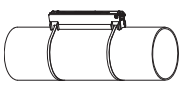
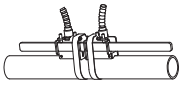
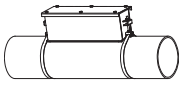
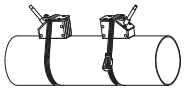
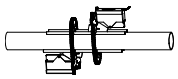
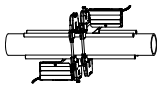
Shear wave transducers

	technical type					
	G	**K**	**M**	**P**	**Q**	**S**
zone 2 - FM Class I Div. 2 - nonEx with stripped cable ends normal temperature range	CDG1N53 CLG1N53	CDK1N53 CLK1N53	CDM2N53 CLM2N53	CDP2N53 CLP2N53	CDQ2N53 CLQ2N53	CDS1N53
zone 2 - nonEx IP68	CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8		
zone 2 - FM Class I Div. 2 - nonEx with stripped cable ends extended temperature range	CDG1E53[1] CLG1E53[1]	CDK1E53[1] CLK1E53[1]	CDM2E53 CLM2E53	CDP2E53 CLP2E53	CDQ2E53 CLQ2E53	
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 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

[1] nonEx, FM

for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Transducer mounting fixture

Variofix L		**PermaLok**	**quick release clasps and tension straps**	**WaveInjector with chains**
	 transducer frequency S		 transducer frequency M, P, Q	
				WaveInjector with threaded rods
				 outer pipe diameter: 1.4 to 15 inch

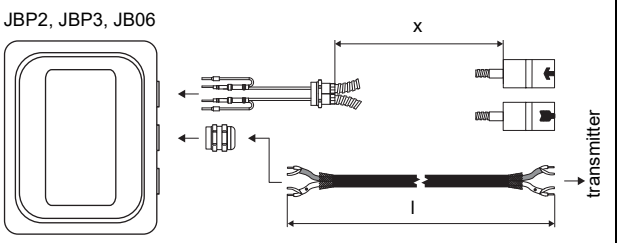
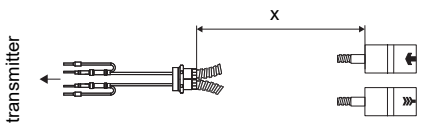
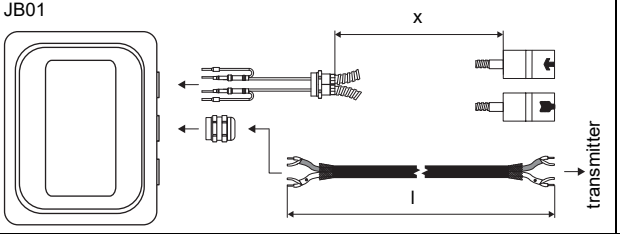
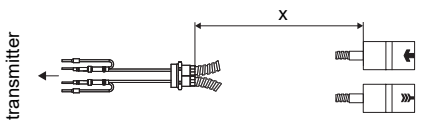
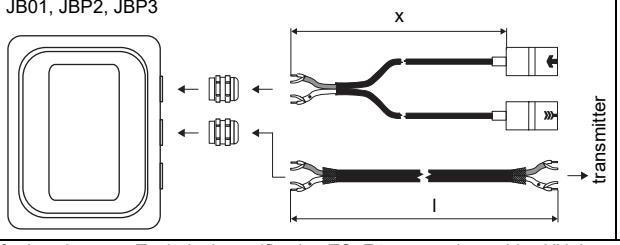
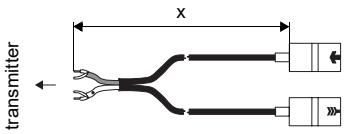
for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Coupling materials for transducers

	normal temperature range (4th character of transducer order code = N)		**extended temperature range higher temperatures** (4th character of transducer order code = E, S)			**WaveInjector**	
	< 212 °F	< 266 °F	< 356 °F	< 392 °F	392 to 464 °F	< 536 °F	536 to 1166 °F
< 24 h	coupling compound type N or coupling pad type VT	coupling compound type type N or E or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type E or coupling pad type VT	coupling compound type H or coupling pad type TF	coupling pad type A and coupling pad type VT	coupling pad type B and coupling pad type VT
long time measurement	coupling pad type VT	coupling pad type VT	coupling pad type VT	coupling pad type VT	coupling pad type TF	coupling pad type A and coupling pad type VT	coupling pad type B and coupling pad type VT

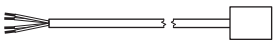
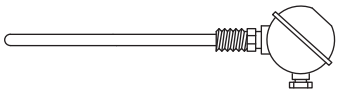
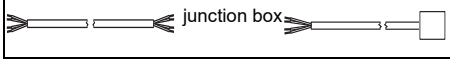
for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Connection systems

connection system T1		
connection with extension cable	direct connection	transducers technical type
JBP2, JBP3, JB06 		****N53 ****E53 ****S53
JB01 		*****8*
JB01, JBP2, JBP3 		****LI*

for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Temperature Probes

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

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

For more information: **Emerson.com**