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
		 	
design		standard field device	standard field device zone 2
measurement			
measurement principle		transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content	
flow direction		bidirectional	
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...240 V ±10 %/50...60 Hz or • 11...32 V DC	
power consumption	W	< 15	
number of measuring channels		1, optional: 2	
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)	stainless steel 316L (1.4404)
degree of protection		IP66	
dimensions	mm	see dimensional drawing	
weight	kg	aluminum housing: 4.5 stainless steel housing: 5.8	5.8
fixation		wall mounting, optional: 2" pipe mounting	
ambient temperature	°C	-40...+60 (< -20 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**			
marking		-	II3G Ex ec IIC T4 Gc T_a -40...+59/60 °C
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: • Modbus RTU • BACnet MS/TP • M-Bus • HART • Profibus PA • FF H1 • Modbus TCP • BACnet IP	max. 1 option: • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1

[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
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, 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...20 (alarm current: 3.2...3.99, 20.01...24, hardware fault current: 3.2)	
uncertainty		0.04 % of output value ±3 µA	
active output		R_{ext} = 250...530 Ω, $U_{opencircuit}$ = 28 V DC	
passive output		U_{ext} = 9...30 V DC, depending on R_{ext} (R_{ext} < 458 Ω at 20 V)	
current output in HART mode		option	
• range	mA	4...20 (alarm current: 3.5...3.99, 20.01...22, hardware fault current: 3.2)	
• active output		R_{ext} = 250...530 Ω, $U_{opencircuit}$ = 28 V DC	
• passive output		U_{ext} = 9...30 V DC, depending on R_{ext} (R_{ext} = 250...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...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...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)	
frequency output			
• range	kHz	0.002...10	
• damping	s	0...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...1000	
• pulse width	ms	0.05...1000	
• pulse rate		max. 10 000 pulses	
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	°C	-150...+560	
resolution	K	0.01	
accuracy		±0.01 % MV ±0.03 K at 18...28 °C ±0.01 % MV ±0.03 K ±0.0005 %/K at <18 °C/>28 °C	
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 18...28 °C ±0.1 % MV ±0.01 mA ±0.005 %/K at <18 °C/>28 °C	
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...20	
passive input		U_{ext} = 24 V, R_{int} = 35 Ω, I_{max} ≤ 24 mA	
• range	mA	0...20	

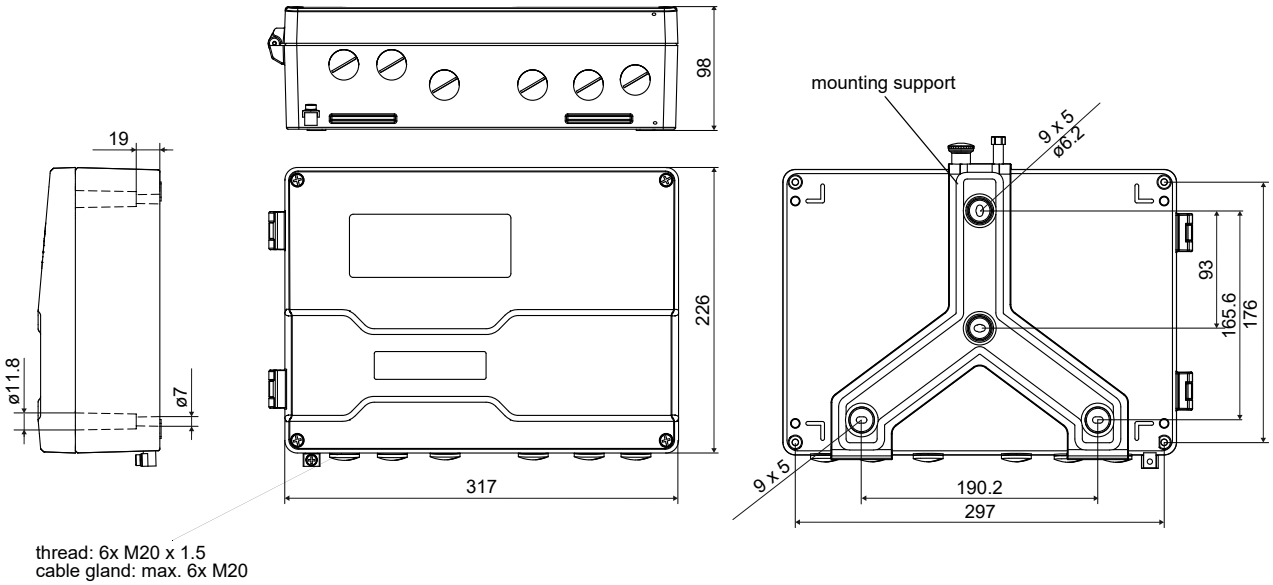
[1] with aperture calibration of the transducers

[2] for transit time difference principle and reference conditions

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

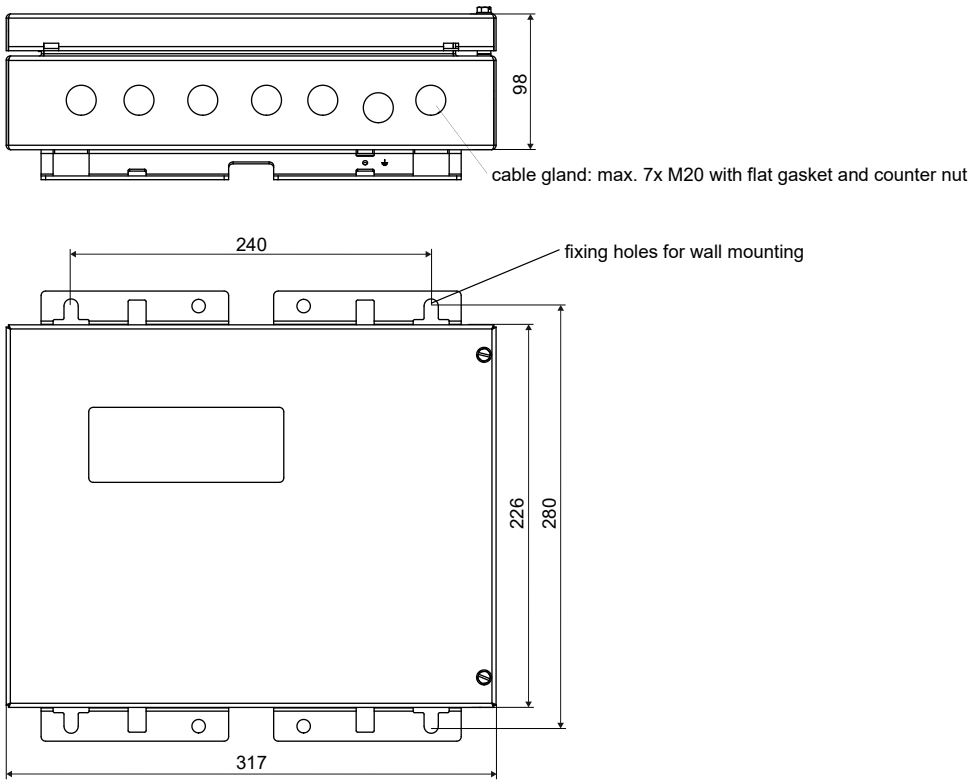
Dimensions

731**-**-*AL**



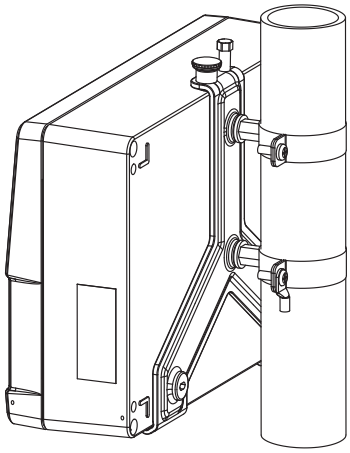
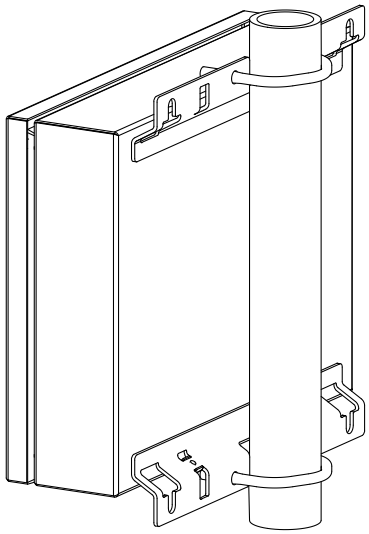
in mm

731**-**-*ST**



in mm

2" pipe mounting kit

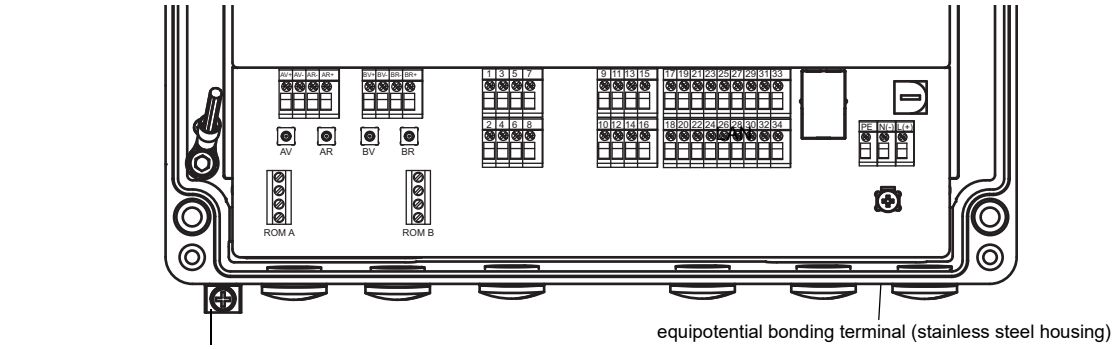
731**-**-*AL** 	item number: 731067-1
731**-**-*ST** 	item number: 721110-4

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...+60 °C

Terminal assignment

***731**



equipotential bonding terminal (aluminum housing)

equipotential bonding terminal (stainless steel housing)

power supply[1]							
AC				**DC**			
terminal		**connection**		**terminal**		**connection**	
L		line conductor		(+)		+	
N		neutral conductor		(-)		-	
PE		protective conductor		PE		protective conductor	
transducers							
transducer cable (transducers *****53, *****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 or AV+	signal	BV	signal		X_AV	X_BV	SMB connector
AVS or AV-	shield	BVS	shield				
ARS or AR-	shield	BRS	shield		X_AR	X_BR	SMB connector
AR or AR+	signal	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, M-Bus, Profibus PA, FF H1

temperature probe		
terminal	**direct connection**	**connection with extension cable**
1, 5, 9, 13	red	red
2, 6, 10, 14	white	white
3, 7, 11, 15	red/blue	grey
4, 8, 12, 16	white/blue	blue
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: 0.25...2.5 mm^2

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

Transducers

Overview

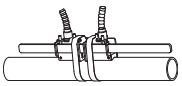
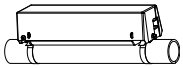
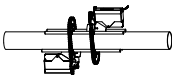
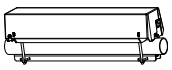
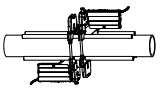
Shear wave transducers

			technical type					
			G	K	M	P	Q	S
zone 2 - FM Class I Div. 2 - nonEx SMB connector normal temperature range			CDG1N52 CLG1N52	CDK1N52 CLK1N52	CDM2N52 CLM2N52	CDP2N52 CLP2N52	CDQ2N52 CLQ2N52	CDS2N52
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	CDS2N53
zone 2 - nonEx IP68			CDG1LI8	CDK1LI8	CDM2LI8	CDP2LI8		
zone 2 - FM Class I Div. 2 - nonEx SMB connector extended temperature range			CDG1E52[1] CLG1E52[1]	CDK1E52[1] CLK1E52[1]	CDM2E52 CLM2E52	CDP2E52 CLP2E52	CDQ2E52 CLQ2E52	
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	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

[1] nonEx, FM

for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

Transducer mounting fixture

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

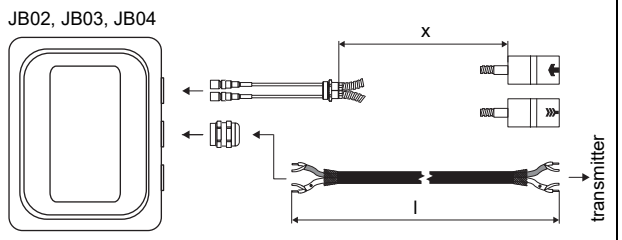
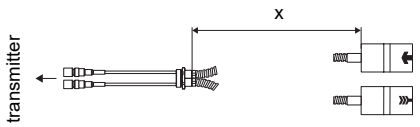
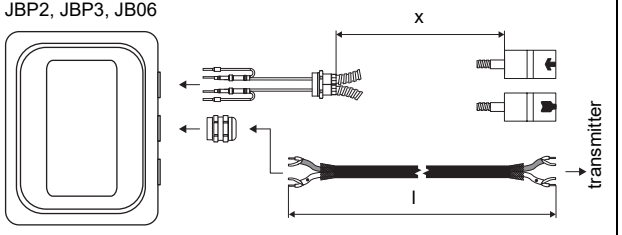
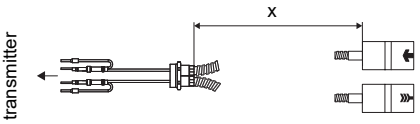
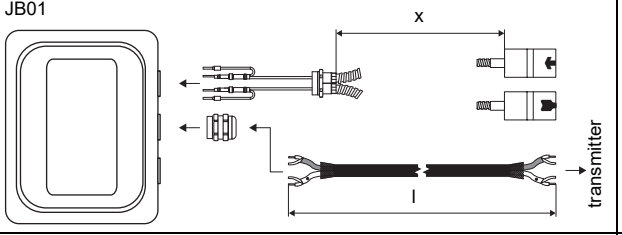
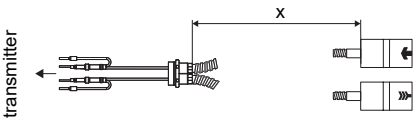
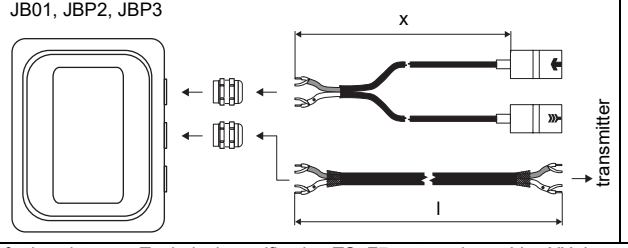
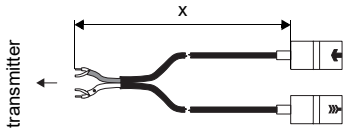
for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

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			

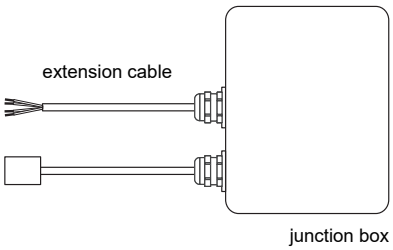
for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

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
JBP2, JBP3, JB06 		****N53 ****E53 ****S53
JB01 		*****8*
JB01, JBP2, JBP3 		****LI*

for further data see Technical specification TS_F7xx-transducersVx-xXX_Leu

Temperature Probes

PT12N		**PT12F**
item number: • 770415-1 • 770414-2 (matched)	item number: • 770415-1A2 • 770414-1A2 (matched)	item number: • 770415-2
• Pt100 • clamp-on • -30...+250 °C	• Pt100 • clamp-on • -30...+250 °C • ATEX/UKCA	• Pt100 • clamp-on • -45...+250 °C • response time: 8 s
direct connection 		
connection with extension cable  		

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

EMERSON