

Non-Intrusive, Clamp-On Ultrasonic Flow Meters and Process Refractometers



Measurement Principles

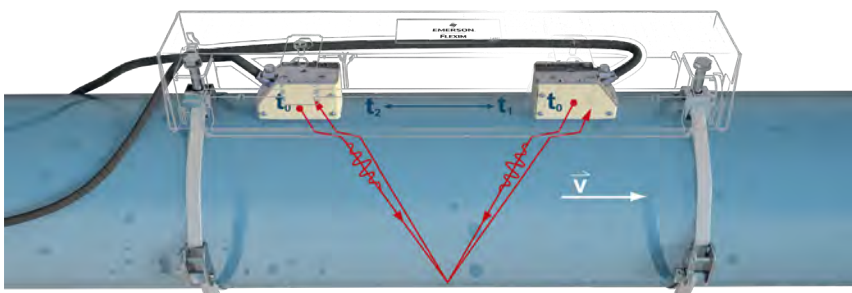
Flexim™ FLUXUS measures the difference

Emerson's Flexim FLUXUS clamp-on ultrasonic systems determine the volume flow according to the transit-time difference method. Since the ultrasonic signal that is irradiated into the pipe is carried by the fluid flowing inside, a time delay occurs between the acoustic transit-time both with and against the flow of direction. This time delay can be measured very accurately. The transmitter calculates the volumetric flow rate based on the parameters input for the pipe geometry and the physical properties of the fluid stored in the internal database.

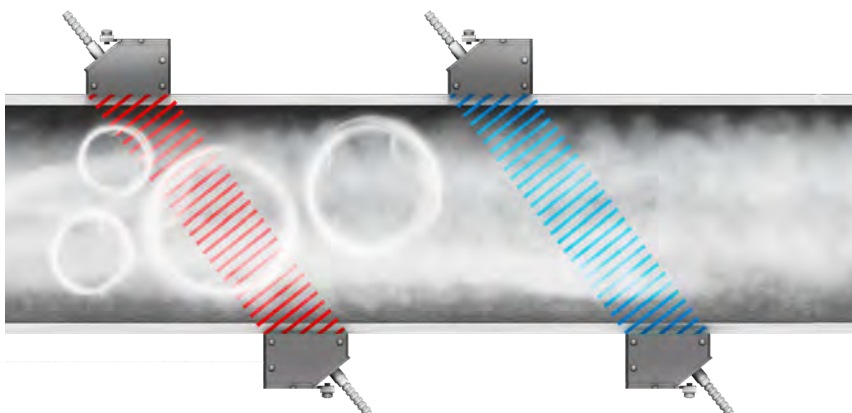
The non-intrusive acoustic measuring method is inertia-free and is characterized by very high measuring dynamics in both flow directions. Clamp-on ultrasonic transducers are mounted on the outside of the pipe at a specific distance from each other which allows the meter to determine the sound speed in the fluid. This depends on the density.

Combining density determination through measurement of the transit-time and flow recording through transit-time difference measurement results in the mass flow rate. A particularly practical use for the non-intrusive measuring technique is the fact that the current output of liquid-based thermal consumers, e.g. heating or cooling systems, can be easily recorded.

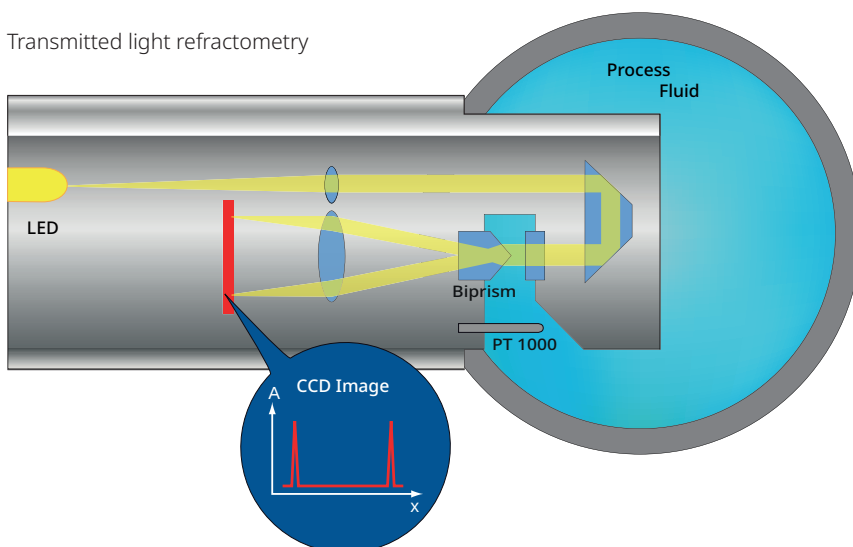
Transit-time difference measurement



Cross-correlation measurement



Transmitted light refractometry



Proven accuracy

The reliability and accuracy of measuring systems depend on the quality of their manufacturing and calibration. Consistent quality management according to DIN ISO 9001 is essential for Flexim, which has a calibration laboratory certified to ISO/IEC 17025:2018. Calibration is carried out on individual calibration equipment according to national standards. Flexim calibrates pairs of transducers and transmitters independently of one another so that the narrowly defined measurement uncertainties are always observed, regardless of which transducers are used with which transmitters.

Flow Disturbance Correction

Emerson's Flexim measuring systems feature a correction algorithm for constrained installation conditions. This enables reliable measurements with limited straight runs down to 2D. Based on CFD, flow testing and laser doubler measurements, the meter applies automatic corrections within a defined uncertainty window when a disturbance is programmed.

Cross-correlation for high-temperature steam

Flexim has paved the way for the non-intrusive flow measurement of steam with clamp-on ultrasonic technology. High-temperature steam measurement at temperatures over 392 °F is based on a different measurement principle: cross-correlation measurement. Two ultrasonic transducer pairs are mounted onto the pipe at a specific distance to each other forming two gates. They send ultrasonic signals through the pipe. The modulation of the signals tracks turbulence characteristics of the steam flow. By cross-correlation of the modulation signals of both gates over time, FLUXUS determines the steam's flow velocity. In conjunction with Emerson's patented Flexim WaveInjector high-temperature sensor mounting device, this enables non-intrusive flow measurement of steam up to 1166 °F.

Unique measurement principle

Emerson's process refractometer Flexim PIOX R measures with transmitted light. The refraction measurement takes place directly in the fluid flow as opposed to indirectly at the boundary layer. This method is particularly reliable and not affected by deposits.

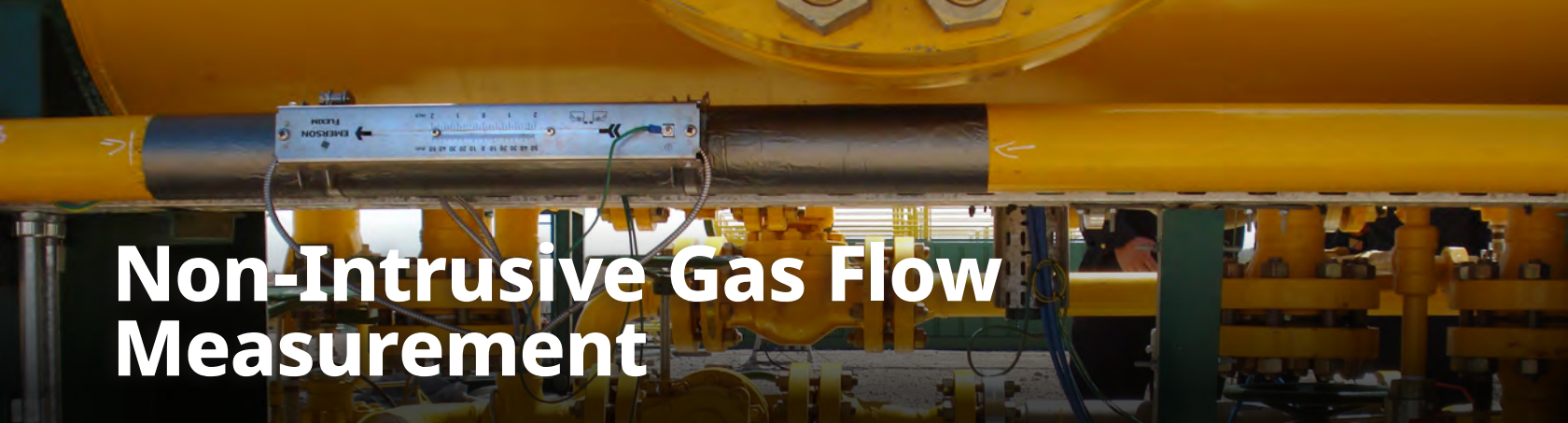
With PIOX R, the refraction of two light beams is measured: the monochromatic measuring beam is refracted by a double prism in two different directions. The difference between the two resulting peaks is measured. The patented measuring method ensures stable measuring results, even in the event of temperature and pressure fluctuations in harsh process environments.

Progressive process analytics with PIOX

Clamp-on ultrasonic technology can also be used for process analytical purposes. Non-intrusive measurement of sound speed with Flexim's PIOX S ultrasonic systems makes it possible to identify and distinguish fluids as well as to determine density and concentration. The application range of non-intrusive process analytics extends from the food & beverages industry to concentration and mass flow measurement of acids in the chemical and fertilizer industries to product identification in the oil & gas industry.

Measurement of light refraction is a long-term established laboratory method for determining concentrations and quality control. Flexim's patented PIOX R transmitted light refractometer brings laboratory accuracy into the process. Specially developed sensor designs ensure the best possible adaptation to the respective measuring task, whether in hygienic applications in the pharmaceutical sector or under the challenging conditions of the chemical industry.

If Emerson's Flexim acoustic and optical process analytical technologies are combined, multicomponent mixtures can also be analyzed accurately and reliably.



Non-Intrusive Gas Flow Measurement

Measuring from the safe side

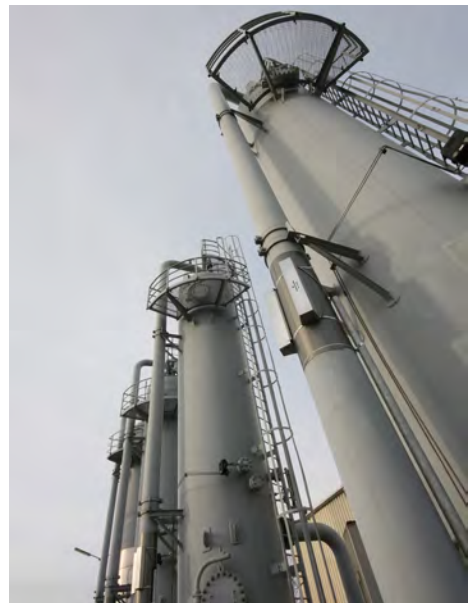
Emerson's Flexim FLUXUS G gas flow meter series is the measurement system of choice wherever gas poses a hazard, be it is explosive, toxic, or chemically aggressive. Wetted flow meters would wear out quickly. Therefore, FLUXUS G is used to measure the flow of natural gas, from the production well to the consumer.

Other typical applications include the flow measurement of gaseous ammonia in refrigeration plants or the flow measurement of process gases such as high-pressure ethylene or hydrogen chloride gas in the chemical industry.

Fit for the energy transition

Clamp-on ultrasonic transducers do not come into direct contact with the flowing media and never disturb the operability of the respective installation. As a result, FLUXUS G is also the preferred solution when hygiene matters and availability is crucial, e.g. for measuring medical gases in hospitals, ultra-pure gases in semiconductor and pharma applications or compressed air in productive environments.

As a leader in non-intrusive ultrasonic flow measurement, Emerson's Flexim devices bring many years of experience in hydrogen applications. With the advanced Dynamic Gas Meter feature, Flexim FLUXUS G gas flow meters can determine standard volumetric flow rates even when gas compositions vary. They also measure gas concentration and density—without requiring a chromatograph.



G831



Meter type	High-performance flow meter for hazardous areas
Fluid	All gases
Inner pipe diameter	0.28 to 63 inch
Pipe surface temperature	-40 to 464 °F
Pressure range	15 psi to unlimited
Flow velocity	0.03 to 115 ft/s
Measurement uncertainty at the measuring point	±1 to 2 % MV ±0.02 ft/s
Repeatability	0.15 % MV ±0.02 ft/s
Inputs	Current (Ex-ia optional), temperature (Ex-ia optional)
Outputs	Current (Ex-ia optional), binary, pulse, frequency, HART (Ex-ia optional), Foundation Fieldbus (Ex-ia optional), Profibus PA (Ex-ia optional), Modbus RTU, BACnet MSTP
Service interfaces	USB-C
Explosion protection / Approvals	Aluminum housing: ATEX/IECEX Zone 1, FM Class I Div. 1 Stainless steel housing: ATEX/IECEX Zone 1

	G800SR	G801SR
 		
Meter type	SIL 2 certified flow meter for hazardous areas	SIL 2 certified flow meter for hazardous areas in offshore environments
Fluid	All gases	
Inner pipe diameter	0.28 to 63 inch	
Pipe surface temperature	-40 to +464 °F	
Pressure range	15 psi to unlimited	
Flow velocity	0.03 to 115 ft/s	
Measurement uncertainty at the measuring point	± 1 to 3% MV ± 0.03 ft/s	
Repeatability	0.15 % MV ± 0.03 ft/s	
Inputs	None	
Outputs	Current, binary, pulse	
Service interfaces	RS232	
Explosion protection / Approvals	ATEX/IECEX Zone 1	

	G731	G731CA
		
Meter type	High-performance flow meter	High-performance flow meter for compressed air and technical gases
Fluid	All gases	Air; nitrogen, oxygen, helium, argon
Inner pipe diameter	0.28 to 63 inch	0.28 to 14.2 inch
Pipe surface temperature	-40 to +464 °F	-40 to +266 °F
Pressure range	15 psi...unlimited	
Flow velocity	0.03...115 ft/s	
Measurement uncertainty at the measuring point	$\pm 1...2\%$ MV ± 0.005 m/s	
Repeatability	0.15% MV ± 0.02 ft/s	
Inputs	Current, temperature	
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus	
Service interfaces	USB-C, LAN	
Explosion protection / Approvals	NonEx, ATEX/IECEx Zone 2, FM Class I Div. 2, DNV Marine	NonEx, ATEX/IECEx Zone 2, FM Class I Div. 2

	G736	G704SR
		
Meter type	High-performance quad-beam flow meter	SIL 2 certified flow meter
Fluid	All gases	
Inner pipe diameter	0.28 to 63 inch	
Pipe surface temperature	-40 to 464 °F	
Pressure range	15 psi to unlimited	
Flow velocity	0.03 to 115 ft/s	
Measurement uncertainty at the measuring point	±1 to 2 % MV ±0.02 ft/s	±1 to 3% MV ±0.03 ft/s
Repeatability	0.15 % MV ±0.02 ft/s	0.15% MV ±0.03 ft/s
Inputs	Current, temperature	None
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus	Current, binary, pulse
Service interfaces	USB-C, LAN	RS232
Explosion protection / Approvals	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2

	G532CA	G631	G608
			
Meter type	Flow meter for compressed air and technical gases	High-performance portable flow meter	High-performance portable flow meter for hazardous areas
Fluid	Air, nitrogen, oxygen, helium, argon	All gases	
Inner pipe diameter	0.28...14.2 inch	0.28...63 inch	
Pipe surface temperature	-40 to +266 °F	-40...+392 °F	
Pressure range	15 psi...unlimited		
Flow velocity	0.03...115 ft/s		
Measurement uncertainty at the measuring point	± 1...2% MV ± 0.02 ft/s		
Repeatability	0.15% MV ± 0.02 ft/s		
Inputs	Current, temperature		Temperature
Outputs	Current, binary, pulse, HART, frequency, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP	Current, binary, frequency, pulse, Modbus RTU	Current, binary, frequency, pulse
Service interfaces	USB-C, LAN	USB-C	RS232
Explosion protection / Approvals	NonEx		ATEX/IECEX Zone 2, FM Class I Div. 2



Non-Intrusive Liquid Flow Measurement

When sustainability matters

Ultrasonic transducers mounted on the outside of the pipe do not suffer wear and tear by any fluid and cannot become clogged by any particles. As a result, Emerson's Flexim FLUXUS F liquid flow meters are a standard measuring instrumentation in countless chemical plants and Oil & Gas operations today.

More and more, FLUXUS also becomes the preferred solution for presumably simple measuring tasks. A particularly useful application is the non-intrusive measurement of thermal energy flows, be it in district heating networks or in building automation.

Keep the water flowing

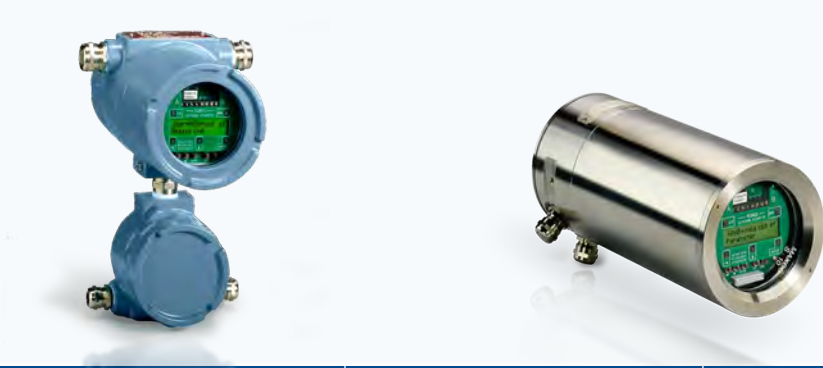
FLUXUS is also the ideal solution for applications in the water industry as it is easy to retrofit flow measurement points without any need to open the pipe. However, FLUXUS proves to be impressive for two more reasons: Acoustic measurement shows an exceptional sensitivity to very low flow velocities (lying beyond the threshold of conventional wetted instrumentation) which makes it ideally suited for leakage monitoring.

The transducers of the FLUXUS WD series - which have been specially designed for the needs of the water industry - have an IP68 protection rating and can be operated while permanently submerged. This means it is also possible to set up flow measuring points directly in the ground without having to set up a shaft structure.



	F831	H831	S831
			
Meter type	High-performance flow meter for hazardous areas	High-performance flow meter for standard volumetric flow rate and API determination of hydrocarbons	High-performance flow meter for mass flow rate, concentration and density
Fluid	All liquids	Various hydrocarbons	All liquids
Inner pipe diameter	0.24 to 255.9 inch		
Pipe surface temperature	-328 to +1166 °F		
Flow velocity	0.03 to 82 ft/s		
Measurement uncertainty at the measuring point	±1% MV ±0.02 ft/s		
Repeatability	0.15 % MV ±0.02 ft/s		
Inputs	Current (Ex-ia optional), temperature (Ex-ia optional)		
Outputs	Current (Ex-ia optional), binary, pulse, frequency, HART (Ex-ia optional), Foundation Fieldbus (Ex-ia optional), Profibus PA (Ex-ia optional), Modbus RTU, BACnet MSTP		
Service interfaces	USB-C		
Explosion protection / Approvals	Aluminum housing: ATEX/IECEX Zone 1, FM Class I Div. 1 Stainless steel housing: ATEX/IECEX zone 1		

	F831PW	F808SR	F808LF
			
Meter type	High-performance water flow meter for hazardous areas	SIL 2 certified flow meter for hazardous areas	High-performance extreme low flow meter for hazardous areas
Fluid	Water, produced water, seawater, water/glycol	All liquids	
Inner pipe diameter	0.39 to 255.9 mm	0.24 to 255.9 inch	0.39...9.45 inch
Pipe surface temperature	-40 to +437 °F	-328 to +1166 °F	-40 to +266 °F
Flow velocity	0.03 to 82 ft/s	0.03...82 ft/s	Depending on pipe diameter
Measurement uncertainty at the measuring point	±1 % MV ±0.02 ft/s	± 1% MV ± 0.03 ft/s	Depending on pipe diameter
Repeatability	0.15 % MV ±0.02 ft/s	0.15% MV ± 0.03 ft/s	Depending on application
Inputs	None		
Outputs	Current (Ex-ia optional), binary, pulse, frequency, HART (Ex-ia optional), Foundation Fieldbus (Ex-ia optional), Profibus PA (Ex-ia optional), Modbus RTU, BACnet MSTP	Current, binary, pulse	
Service interfaces	USB-C	R232	
Explosion protection / Approvals	ATEX/IECEX Zone 1, FM Class I Div. 1	ATEX/IECEX Zone 1, FM Class I Div. 1	

	F800SR	F801SR	F801LF
			
Meter type	SIL 2 certified flow meter for hazardous areas	SIL 2 certified flow meter for hazardous areas in offshore environments	High-performance extreme low flow meter for hazardous areas in offshore environments
Fluid	All liquids		
Inner pipe diameter	0.24 to 255.9 inch		0.39...9.45 inch
Pipe surface temperature	-328 to +1166 °F		-40 to +266 °F
Flow velocity	0.03...82 ft/s		Depending on pipe diameter
Measurement uncertainty at the measuring point	$\pm 1.2\% \text{ MV} \pm 0.03 \text{ ft/s}$		Depending on pipe diameter
Repeatability	$0.15\% \text{ MV} \pm 0.03 \text{ ft/s}$		Depending on pipe diameter
Inputs	None		
Outputs	Current, binary, pulse		
Service interfaces	RS232		
Explosion protection / Approvals	ATEX/IECEX Zone 1		

	F731	S731
		
Meter type	High-performance flow meter	High-performance mass flow rate, density and concentration meter
Fluid	All liquids	
Inner pipe diameter	0.24 to 255.9 inch	
Pipe surface temperature	-328 to +1166 °F	
Flow velocity	0.03...82 ft/s	
Measurement uncertainty at the measuring point	± 1% MV ± 0.02 ft/s	
Repeatability	0.15% MV ± 0.02 ft/s	
Inputs	Current, temperature	
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus	
Service interfaces	USB-C, LAN	
Explosion protection / Approvals	NonEx, ATEX/IECEx Zone 2, FM Class I Div. 2, DNV marine	

	H731	F721LF	F731TE
			
Meter type	Hydrocarbon standard volumetric flow rate and API determination meter	Extreme low flow meter	High-performance thermal energy and flow meter
Fluid	Various hydrocarbons	All liquids	Water, water-glycol, typical heat transfer fluids
Inner pipe diameter	0.24 to 255.9 inch	0.39 to 9.4 inch	0.39 to 94.5 inch
Pipe surface temperature	-328 to +1166 °F	-40 to +266 °F	-40...+464 °F
Flow velocity	0.03...82 ft/s	Depending on pipe size	0.03...82 ft/s
Measurement uncertainty at the measuring point	± 1% MV ± 0.02 ft/s	± 1% MV ± 0.002 ft/s	± 1% MV ± 0.02 ft/s
Repeatability	0.15% MV ± 0.02 ft/s	0.15% MV ± 0.002 ft/s	0.15% MV ± 0.02 ft/s
Inputs	Temperature, voltage	Current, temperature, voltage, binary	Temperature
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus		
Service interfaces	USB-C, LAN	USB, LAN	USB-C, LAN
Explosion protection / Approvals	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2, DNV marine	NonEx	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2

	F731WD	F731PW	F704SR
			
Meter type	High-performance water flow meter	High-performance water flow meter for hazardous areas	SIL 2 certified flow meter
Fluid	Water	Water, produced water, seawater, water/glycol	All liquids
Inner pipe diameter	0.39...255.9 inch		0.24 to 255.9 inch
Pipe surface temperature	-40 to +266 °F	-40 to +455 °F	-328 to +1166 °F
Flow velocity	0.03 to 82 ft/s		
Measurement uncertainty	± 1% MV ± 0.02 ft/s		± 1.2% MV ± 0.03 ft/s
Repeatability	0.03 to 82 ft/s		0.15% MV ± 0.03 ft/s
Inputs	None		
Outputs	Current, binary, pulse, frequency, HART, Modbus RTU/TCP, BACnet MSTP/IP, M-Bus, Profibus PA, Foundation Fieldbus	Current, binary, pulse, frequency, HART, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus	Current, binary, pulse
Service interfaces	USB-C, LAN		RS232
Explosion protection / Approvals	NonEx, MCERTS	ATEX/IECEX Zone 2, FM Class I Div. 2	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2

	F736	H736
		
Meter type	High-performance quad-beam flow meter	High-performance quad-beam flow meter for standard volumetric flow rate and API determination of hydrocarbons
Fluid	All liquids	Various hydrocarbons
Inner pipe diameter	0.24 to 255.9 inch	
Pipe surface temperature	-328 to +1166 °F	
Flow velocity	0.03 to 82 ft/s	
Measurement uncertainty	±1 % MV ±0.02 ft/s	
Repeatability	0.15 % MV ±0.02 ft/s	
Inputs	Current, temperature	
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus	
Service interfaces	USB-C, LAN	
Explosion protection / Approvals	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2	

	F532WD	F532TE	F532SC
			
Meter type	Flow meter for water	Flow meter for thermal energy measurement	Flow meter for semiconductor industry
Fluid	Water	Water and water/glycol mixtures	Water and aqueous solutions
Inner pipe diameter	0.39 to 94.5 inch		0.31 to 2 inch
Pipe surface temperature	-40 to +266 °F		-4 to +212 °F
Flow velocity	0.03 to 82 ft/s		
Measurement uncertainty at the measuring point	± 1% MV ± 0.02 ft/s		
Repeatability	0.15% MV ± 0.02 ft/s		
Inputs	None	Temperature	None
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP		
Service interfaces	USB-C, LAN		
Explosion protection / Approvals	NonEx, MCERTS	NonEx	

	F401	F631	F608
			
Meter type	Portable water flow meter	High-performance portable flow and thermal energy meter	High-performance portable flow and thermal energy meter for hazardous areas
Fluid	Water	All liquids	
Inner pipe diameter	1.6 to 185 inch	0.24 to 255.9 inch	
Pipe surface temperature	-40 to +212 °F	-328 to +1166 °F	
Flow velocity	0.03 to 82 ft/s		
Measurement uncertainty at the measuring point	2% MV ± 0.03 ft/s	± 1% MV ± 0.02 ft/s	
Repeatability	0.25% MV ± 0.03 ft/s	0.15% MV ± 0.02 ft/s	
Inputs	None	Current, temperature	Temperature
Outputs	Current, binary, pulse	Current, binary, pulse, frequency, Modbus RTU	Current, binary, pulse, frequency
Service interfaces	RS232	USB-C	RS232
Explosion protection / Approvals	NonEx		ATEX/IECEX Zone 2, FM Class I Div. 2

Non-Intrusive Steam Flow Measurement

Portable and permanent

Flexim FLUXUS ST-LT is Emerson's ultrasonic flow meter series for non-intrusive flow measurement of saturated steam at temperatures up to 392 °F. Flexim FLUXUS low-temperature steam flow meters work according to the transit-time difference principle. They show excellent measuring dynamics making it possible to detect even the smallest steam quantities without any need to increase flow velocity by reducing the pipe diameter.

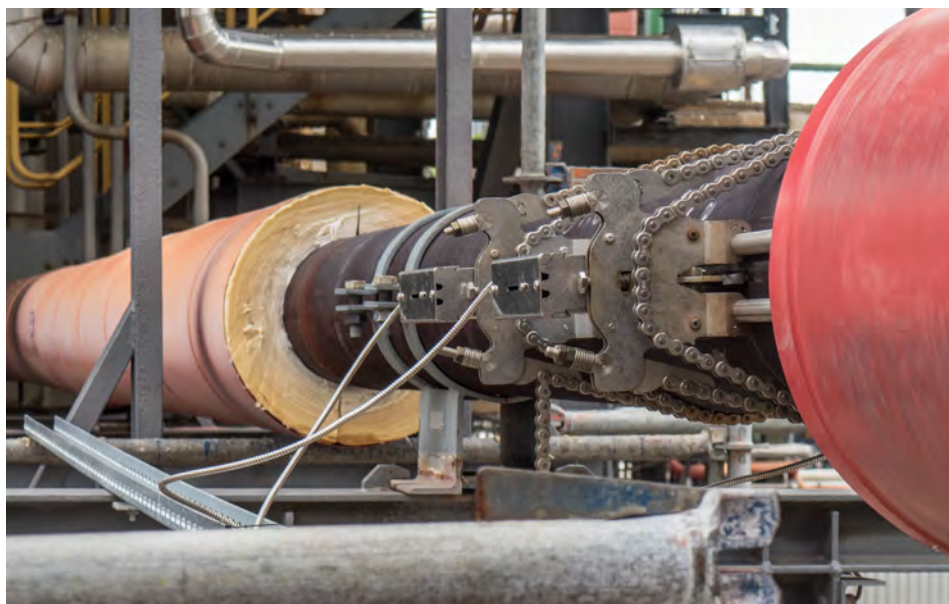
FLUXUS G631 ST is the world's only portable steam flow meter. As it can also measure liquids, gases, compressed air and heat, it is a veritable multi-tool for maintenance and energy managers.



High-temperature steam applications

FLUXUS ST-HT was specially developed for high-temperature steam applications. The ultrasonic system works according to the cross-correlation principle and extends the application range of non-intrusive steam measurement technology to temperatures up to 1166 °F.

Like all other FLUXUS flow meters, the high-temperature steam systems work with clamp-on ultrasonic transducers which are mounted onto the outside of the pipe. FLUXUS ST-HT is therefore the ideal solution where uninterrupted production and supply are crucial.



	G831ST-HT	G831ST-LT
		
Meter type	High temperature steam flow meter for hazardous areas	Low temperature steam flow meter for hazardous areas
Measurement principle	Cross-correlation principle	Transit-time difference
Fluid	Superheated steam	Saturated steam
Inner pipe diameter	0.39 to 35.4 inch	0.9 to 39.4 inch
Pipe surface temperature	212 to 1166 °F	275 to 365 °F
Pressure range	Min. 15 psi	44 to 145 psi
Flow velocity	Flow velocities at Re > 60,000	0.03 to 197 ft/s
Measurement uncertainty at measuring point	±3 to 4% MV	± 1 to 2% MV ± 0.02 ft/s
Repeatability	1% MV	0.15% MV ± 0.02 ft/s
Inputs	Current, temperature	
Outputs	Current (Ex ia optional), binary, pulse, frequency, HART (Ex ia optional), Foundation Fieldbus (Ex ia optional), Profibus PA (Ex ia optional), Modbus RTU, BACnet MSTP	
Service interfaces	USB-C, LAN	
Explosion protection / Approvals	Aluminum housing: ATEX/IECEX Zone 1, FM Class I Div. 1 Stainless steel housing: ATEX/IECEX Zone 1	

	G731ST-HT	G731ST-LT
		
Meter type	High temperature steam flow meter	Low temperature steam flow meter
Measurement principle	Cross-correlation principle	Transit-time difference
Fluid	Superheated steam	Saturated steam
Inner pipe diameter	0.39 to 35.4 inch	0.9 to 39.4 inch
Pipe surface temperature	212 to 1166 °F	275 to 392 °F
Pressure range	Min. 15 psi	44 to 2248 psi
Flow velocity	Depending on the application	0.03 to 197 ft/s
Measurement uncertainty at measuring point	± 1% MV (Re > 60,000) ± 3% MV (Re 10,000...60,000)	± 1 to 3% MV ± 0.02 ft/s
Repeatability	1% MV	0.3% MV ± 0.02 ft/s
Inputs	Current, temperature	
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MS/TP, Modbus RTU, Profibus PA, Foundation Fieldbus	
Service interfaces	USB-C, LAN	
Explosion protection / Approvals	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2	

	G532ST-LT	G631ST	G608ST
			
Meter type	Flow meter for low temperature steam	Portable flow meter for low and high temperature steam	Portable flow meter for low temperature steam for hazardous areas
Measurement principle	Transit-time difference	Transit-time difference and cross-correlation principle	Transit-time difference
Fluid	Saturated steam	Saturated and superheated steam	Saturated steam
Inner pipe diameter	0.91 to 15.7 inch	0.9 to 39.4 inch	1.8 to 39.4 inch
Pipe surface temperature	275 to 356 °F	275 to 392 °F	275 to 356 °F
Pressure range	44 to 145 psi	Min. 15 psi	44 to 145 psi
Flow velocity	0.03 to 197 ft/s		
Measurement uncertainty at the measuring point	± 1 to 3% MV ± 0.02 ft/s depending on application		
Repeatability	0.15% MV ± 0.02 ft/s		
Inputs	Temperature	Current, temperature	Temperature
Outputs	Current, binary, pulse, HART, frequency, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP	Current, binary, frequency, pulse, Modbus RTU	Current, binary, pulse
Service interfaces	USB-C, LAN	USB-C	RS232
Explosion protection / Approvals	NonEx		ATEX/IECEx Zone 2

Process Analytics with the Transmitted Light Refractometer

Laboratory accuracy in the process

Refractometry – in other words, the measurement of light refraction – has proven itself as a method of analytics in the laboratory time and time again. Emerson's Flexim PIOX R process refractometer transfers laboratory accuracy into the process. In contrast to laboratory refractometers, PIOX R measures using the transmitted light method patented by Flexim. With a reproducibility of the refractive index n_D 0.00002, very precise concentration measurements can be achieved.

Furthermore, the monochromatic measuring beam is refracted by a biprism in two different directions which means the refraction of two light beams can be measured. The difference between the two resulting peaks is measured. The patented measuring method ensures stable measuring results, even in case of temperature and pressure fluctuations in harsh process environments.

Design follows function

The PIOX R comes in two versions, tailored to the requirements of various industries: PIOX R500-MH and PIOX R500-MC.

PIOX R500-MH was developed specifically for applications that require the highest level of purity and hygiene. The sensor unit is characterized by its cavity-free design which effectively prevents impurities from accumulating.

PIOX R500-MC was developed specifically for applications in the chemical industry. The sophisticated design and high-quality materials ensure operational safety even under challenging conditions, e.g. when measuring highly aggressive fluids as well as in potentially explosive areas.



Transmitter		R721	R532	
				
Transmitter housing material	Stainless steel 316L (1.4404)		Aluminum (powder coated)	
Explosion protection and approvals	NonEx, ATEX/IECEx Zone 2, FM Class I Div. 2		NonEx	
Inputs	current (4...20 mA), binary, voltage		None	
Outputs	max. 4: current (4...20 mA), Modbus RTU/TCP, binary, voltage		max. 1: current (4...20 mA), Modbus RTU, binary	
	R500 MH	R500 *C S4	R500 *C TF	
Sensor	High-performance refractometer for food and beverage industry	High-performance refractometer for process industry	High-performance refractometer for chemical industry	
				
Measurement range	nD: 1.3...1.7, °Brix: 0...100			
Measurement uncertainty at measuring point	nD: 0.0002 (corresponds to: 0.1 °Brix, 0.1 w%)			
Repeatability	nD: 0.00002 (corresponds to: 0.01 °Brix, 0.01 w%)			
Wetted parts materials	Stainless steel 316L (1.4404)	Stainless steel 316Ti (1.4571)	PTFE carbon-fiber reinforced bulk material	
Operating temp. (fluid)	-4 to +302 °F		-4...+248 °F	
Fluid pressure	PN 10	PN16, on request PN40	PN 10	
IP protection	IP67			
Explosion protection / Approvals	NonEx, ATEX/IECEx Zone 0/1, FM Class I Div. 1			
Process connection	Varivent, Tri-Clamp	DIN/ANSI flange, flow cell		

The images in the product overview might show slight differences to the existing products.

Transducers

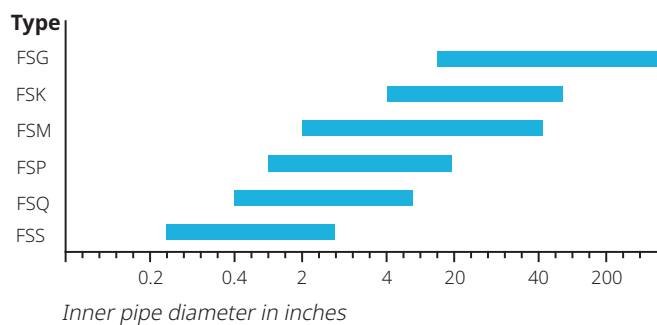
Fundamentally flexible

Emerson always offers the most suitable transducer for the application. We have developed two transducer technologies in order to ensure the highest possible measuring accuracy even in challenging environments: Shear wave transducers with a focused signal insertion for measuring liquids and Lamb wave transducers with a wide signal insertion in the fluid for measuring the flow of gases. Our transducer portfolio covers a pipe diameter range from 0.24 to over 236 inches.



Shear wave transducers

Shear wave transducers for liquids





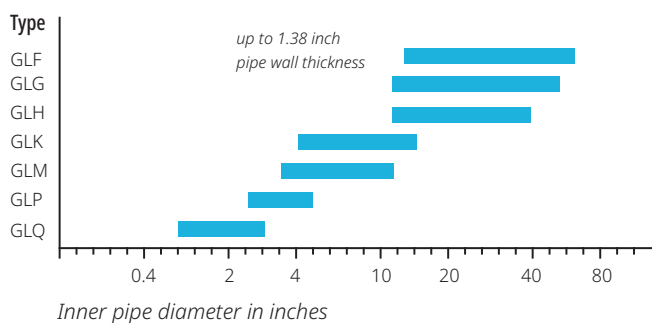
Certified accuracy

Flexim transducer pairs delivered by Emerson are specially paired at the factory and have integrated temperature compensation according to ANSI/ASME MFC-5.1-2011, ensuring the highest zero-point stability and measurement accuracy. In order to guarantee measurements with long-term stability in harsh industrial environments, the transducers and cable connections are made of stainless steel and are available in explosion-proof designs.

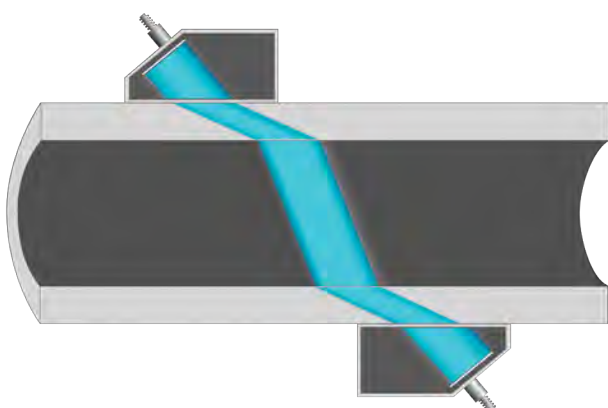


Lamb wave transducers

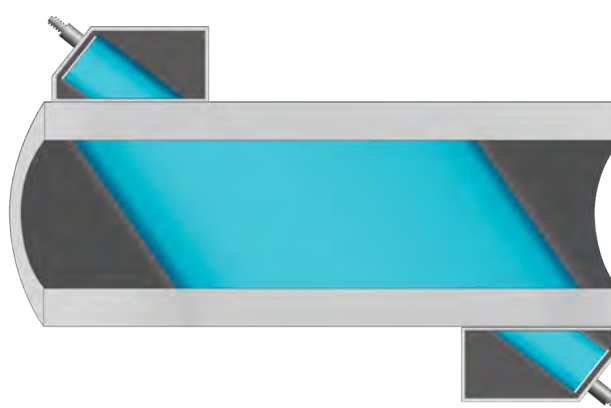
Lamb wave transducers for gases



Propagation of ultrasonic Shear waves:



Propagation of ultrasonic Lamb waves:





Mounting Devices

Fit for purpose

Whether for quick installations during temporary measurement or for permanent installations, for large pipes or small tubes: Emerson offers the right transducer mounting fixture for different applications.

Variofix transducer systems offer the best stability: the sturdy mounting devices ensure the ultrasonic transducers are positioned precisely at all times. Variofix L is the standard transducer mounting fixture for permanent installation. Variofix C provides optimum protection even under the harshest conditions. Under the stainless-steel cover, the measuring point is permanently protected from external influences, from wind and weather as well as from mechanical damage.

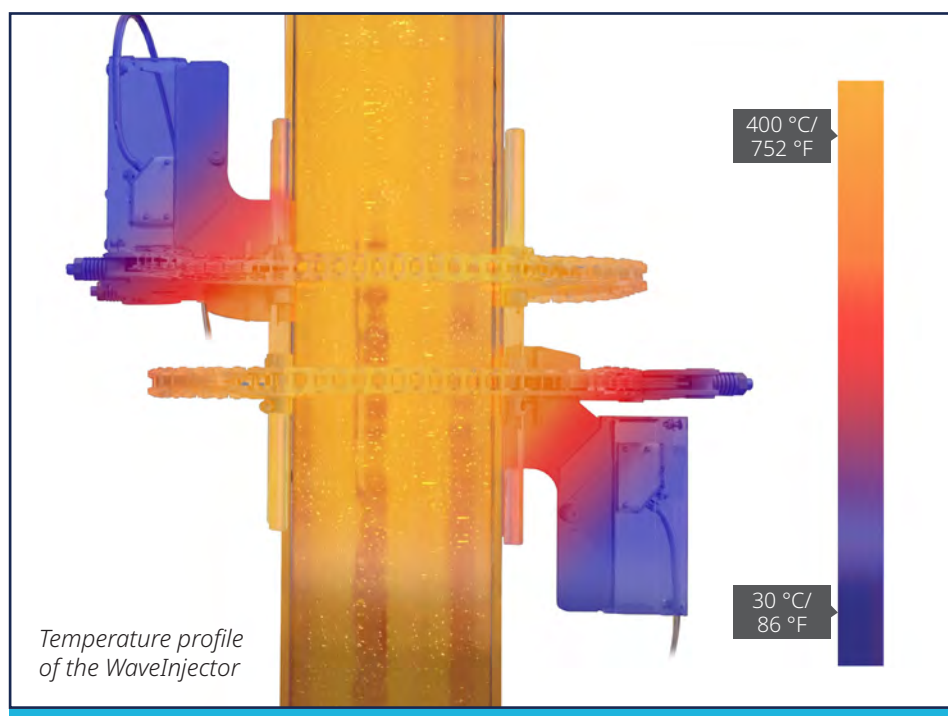




When the going gets tough

Emerson's Flexim WaveInjector was invented for extreme temperatures. The patented transducer mounting device separates the ultrasonic transducers thermally from the pipe thereby extending the application range of non-intrusive clamp-on ultrasonic technology to temperatures of -328°F to $+1166^{\circ}\text{F}$.

So much heat is radiated or absorbed via its metallic coupling plates that the temperature of the transducer clamping fixture lies within the working range of the ultrasonic transducers. The WaveInjector is also simply mounted on the outside of the pipe without having to open the pipeline. Since it is a purely mechanical arrangement, the WaveInjector can also be used in potentially explosive areas.





FluxDiag

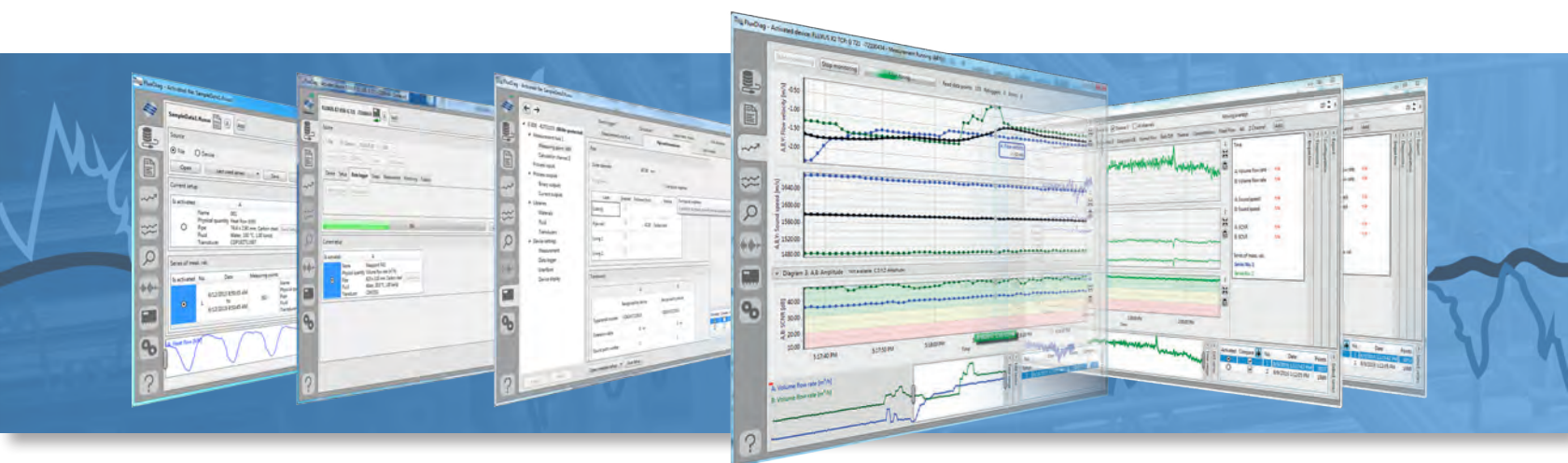
Efficient device and data management, easy reporting

Emerson offers for its Flexim FLUXUS flow meters and PIOX process analytics systems a powerful software package for data management, visualisation, statistical analysis and reporting: FluxDiag.

FluxDiag offers useful features for parameterising the transmitters, such as real-time monitoring and remote access to the measuring device. The user-friendly software enables users to efficiently manage large amounts of data as well as a large number of installed measurement systems. In addition, FluxDiag provides many options for easy visualisation of measurement data and thus serves as an excellent tool for an in-depth understanding of the processes taking place. The statistical functions of FluxDiag allow further in-depth evaluation of the measurement data.

Furthermore, FluxDiag contains useful assistance functions for the comfortable and visually appealing creation of reports. A variety of report templates are available and allow easy customisation by the user.

For flow experts, FluxDiag is an extremely powerful tool for analysing and continuously monitoring signal quality and its change over time, e.g. through the Compare View function. With the remote signal snapshot tool, this can even be done while the process is running. Remote reading and evaluation of the signals enables process diagnosis in real time.



Advanced Meter Verification (AMV)



Easy check, evaluation and documentation of metering performance

Advanced Meter Verification (AMV) allows you to check the health of your FLUXUS in depth directly at the measuring point without the need of process interruption. This saves cost while ensuring the performance of the measurement.

AMV helps you to ensure that your FLUXUS measuring system meets your measurement requirements. The continuous acquisition and permanent storage of diagnostic values by the transmitter enables regular verification. Based on this data, maintenance can be planned, and unexpected failures can be avoided.

The acoustic measurement technology provides meaningful diagnostic values that can be used to reliably assess the measurement quality. AMV reads this diagnostic data and compares it with an initial reference state stored in the transmitter. This gives the user the assurance that the flow measurement is working properly. If the measurement quality deteriorates, this is clearly indicated in the verification report.

Trend analysis enables the predictive planning of maintenance work.

Unexpected failures can therefore be avoided.

The easy and convenient on-site measurement validation minimizes the effort for calibration and maintenance. It requires no interruption of measurement and does not interfere with process operation. AMV is intuitive to use and can be carried out by the user or by Flexim service technicians.





The Emerson logo is a trademark and service mark of Emerson Electric Co. Flexim™ and the Flexim™ logos are registered trademarks of Emerson Inc. All other trademarks are the property of their respective owners. © 2026 Emerson Electric Co. All rights reserved.

For more information, visit
[Emerson.com/Flexim](https://emerson.com/flexim)

FLX-BRO-Flexim-Product-Overview-v02-2026-05-US.pdf

FLEXIM™

