

FLEXIM – Flexible Industrial Measurement

# PRODUCT OVERVIEW

Clamp-on ultrasonic flow meters and process refractometers









# FLEXIM

Flexible Industrial Measurement

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# FLEXIM

## Flexible Industrial Measurement

### Measurement technology made in Berlin – used worldwide

FLEXIM develops, manufactures, and sells advanced process measuring devices for industrial applications. For more than 30 years, FLUXUS® has been setting the standard for non-invasive ultrasonic flow measurement. The name PLOX® stands for process analytics – non-invasive with PLOX® S ultrasonic systems, wetted with the PLOX® R transmitted light refractometer.

### Continuously setting standards

After the fall of the Berlin Wall in 1989, one thing was clear to four university graduates: „We have to get something going ourselves.“ In the spring of 1990, they founded FLEXIM to bring to the market what they had studied at university: they developed a non-invasive flow meter. The first FLUXUS® already set a new benchmark in the field of clamp-on ultrasonic measurement technology, which was still up and coming at the time. The business idea proved to be sustainably successful.

What started back then in a small ground-floor flat in Berlin soon developed into a flourishing company. Today, FLEXIM is active in all corners of the world with around 500 employees. Half of the workforce is based at the new headquarters in Berlin working in research & development, management, production, and sales. They are all united by one ambition: To offer FLEXIM's customers the best possible measurement solution for their application.

### If it flows, FLUXUS® will measure it

FLEXIM's FLUXUS® ultrasonic flowmeters are used wherever something flows. Non-invasive clamp-on ultrasonic technology opens up an unrivaled wide range of applications. FLUXUS reliably measures the flow of virtually any medium, be it liquid or gas, regardless of the flow direction (bidirectional) and over an extremely wide measuring range. We at FLEXIM are particularly proud of our success in transferring ultrasonic technology to the non-invasive flow measurement of steam.

Due to its practical advantages, external flow measurement with clamp-on ultrasonic transducers has become a standard measuring technique in a broad range of industries and applications. Since the ultrasonic transducers are simply mounted on the

outside of the pipe wall, there is no need to open the pipe in order to set up a flow measuring point. As a result, plant operation can continue as normal.

Measuring from the outside of the pipe means measuring from the safe side. The transducers are not subjected to any wear and tear by the medium inside and they do not pose any risk of leakage. FLEXIM's product portfolio also includes flow meters with SIL certification and covers liquid flow measurements in pipes ranging from DN6 to DN8000. Our patented transducer mounting WaveInjector® extends the scope of application of non-invasive ultrasonic measurement technology to extreme temperatures ranging from -250 °C to 630 °C.



# FLEXIM

## Progressive process analytics with PLOX®

Clamp-on ultrasonic technology can also be used for process analytical purposes. Non-invasive measurement of acoustic velocity with FLEXIM's PLOX® S ultrasonic systems makes it possible to identify and distinguish media as well as to determine density and concentration. The application range of non-invasive 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 PLOX® 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 FLEXIM's acoustic and optical process analytical technologies are combined, multicomponent mixtures can also be analyzed accurately and reliably.





## Measurement principles

### FLUXUS® measures the difference

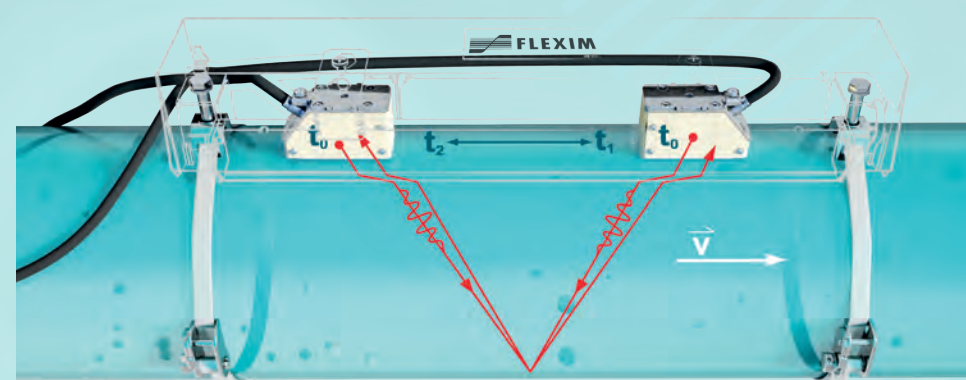
FLUXUS® clamp-on ultrasonic systems determine the volume flow according to the transit-time difference method. Since the ultrasonic signal that is irradiated into the pipe is carried by the medium flowing inside, a time delay occurs between the acoustic transit time both with and against the flow of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

The non-invasive 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 acoustic velocity in the medium. 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-invasive measuring technique is the fact that the current output of liquid-based thermal consumers, e.g. heating or cooling systems, can be easily recorded.

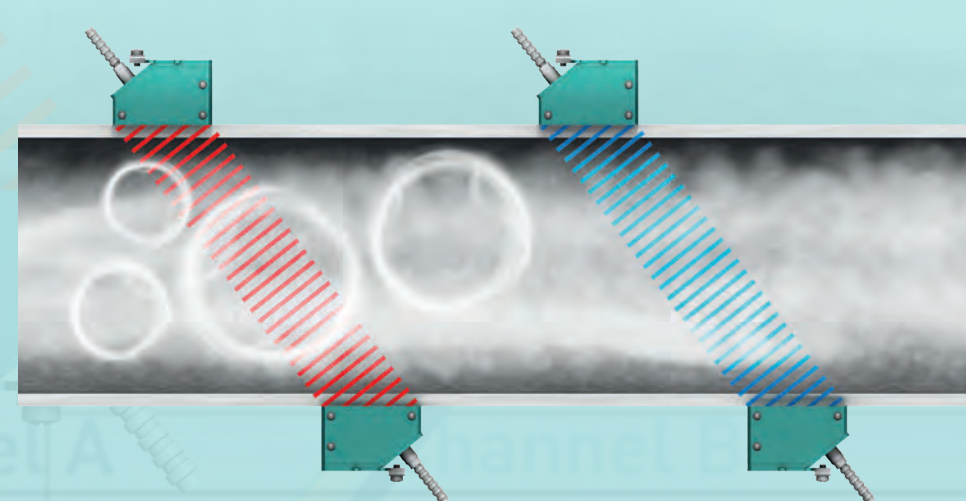
### Proven accuracy

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 measuring transmitters independently of one another so that the narrowly defined measurement uncertainties are always observed, regardless of which transducers are used with which measuring transmitters.

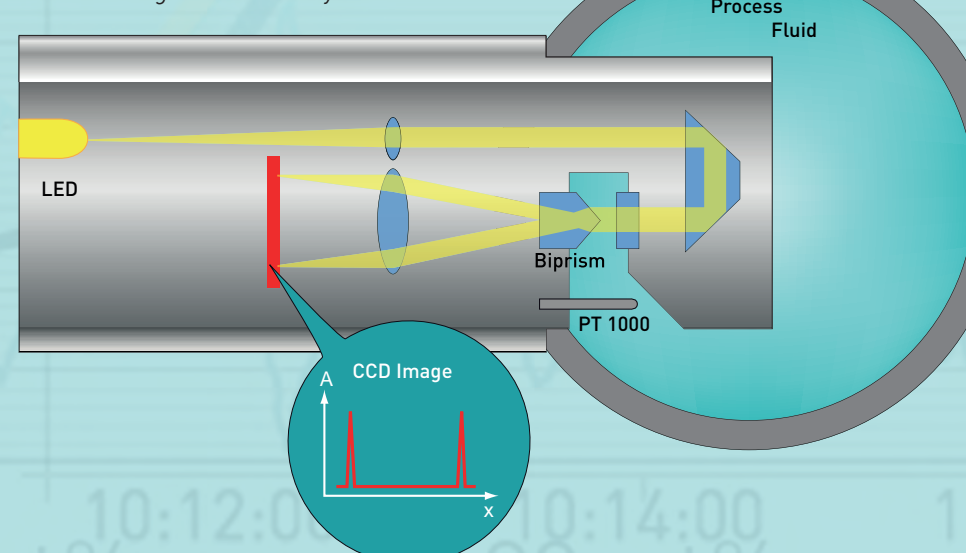
Transit-time difference measurement



Cross-correlation measurement



Transmitted light refractometry



### Cross-correlation for high-temperature steam

FLEXIM has paved the way for the non-invasive flow measurement of steam with clamp-on ultrasonic technology. High-temperature steam measurement at temperatures over 180 °C 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 FLEXIM's patented WaveInjector high-temperature sensor mounting device, this enables non-invasive flow measurement of steam up to 630 °C.

### Unique measurement principle

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

With PLOX® R, the refraction of two light beams is measured: the monochromatic measuring beam is refracted by a biprism 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.





## Non-invasive gas flow measurement

### Measuring from the safe side

The best way to measure gas flows is from the outside of the pipe. FLEXIM's FLUXUS® G gas flowmeter series is the measurement system of choice wherever gas poses a hazard, whether it is explosive, toxic or chemically aggressive, so wetted flowmeters 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 the field of non-invasive flow measurement with ultrasonic technology, FLEXIM has long-term experience in measuring hydrogen. With a new and sophisticated feature – the Natural Gas Engine – FLEXIM's gas flowmeters FLUXUS G® are able to determine the standard volume flow rate of gases even with varying compositions – without chromatograph.



	G831
	
Meter type	High-performance flow meter for hazardous areas
Fluid	All gases
Inner pipe diameter	7...1600 mm
Pipe surface temperature	-40...+240 °C
Pressure range	1 bar(a) ... unlimited
Flow velocity	0.01...35 m/s
Measurement uncertainty	$\pm 1...2\%$ MV $\pm 0.005$ m/s
Repeatability	0.15 % MV $\pm 0.005$ m/s
Inputs	Current, temperature
Outputs	Current, binary, frequency, HART, Foundation Fieldbus Ex-ia, Profibus PA Ex-ia
Service interfaces	USB
Explosion protection	Aluminium housing: ATEX/IECEEx zone 1, FM Class I Div. 1 Stainless steel housing: ATEX/IECEEx zone 1
Approvals	Aluminium housing: ATEX, IECEEx, FM Stainless steel housing: ATEX, IECEEx






	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	7...1600 mm	
Pipe surface temperature	-40...+240 °C	
Pressure range	1 bar(a) ... unlimited	
Flow velocity	0.01...35 m/s	
Measurement uncertainty	±1.3 % MV ±0.01 m/s	
Repeatability	0.15 % MV ±0.01 m/s	
Inputs	None	
Outputs	Current, binary, pulse	
Service interfaces	RS232	
Explosion protection	ATEX/IECEX Zone 1	
Approvals	ATEX, IECEx	

	G722	G721	G721CA
			
Meter type	High-performance flow meter for challenging and highly dynamic flow conditions	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	7...1600 mm		10...250 mm
Pipe surface temperature	-40...+240 °C		-40°C...+130 °C
Pressure range	1 bar(a) ... unlimited		
Flow velocity	0.01...35 m/s		
Measurement uncertainty	±1 ... 2 % MV ±0.005 m/s		
Repeatability	0.15 % MV ±0.005 m/s		
Inputs	Current, temperature, binary, voltage		Current, temperature
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus		Current, binary, pulse, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus
Service interfaces	USB, LAN		
Explosion protection	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2		
Approvals	ATEX, IECEX, FM		



	G736	G704SR
		
Meter type	High-performance quad-beam flowmeter	SIL 2 certified flow meter
Fluid	All gases	
Inner pipe diameter	7...1600mm	
Pipe surface temperature	-40...+240 °C	
Pressure range	1 bar(a) ... unlimited	
Flow velocity	0.01...35 m/s	
Measurement uncertainty	±1...2 % MV ±0.005 m/s	±1...3 % MV ±0.01 m/s
Repeatability	0.15 % MV ±0.005 m/s	0.15 % MV ±0.01 m/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, LAN	RS232
Explosion protection	NonEx, ATEX/IECEX Zone 2, FM Class I Div. 2	
Approvals	ATEX, IECEX, FM	

	G532CA	G601	G608
			
Meter type	Flowmeter 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	7...360 mm	7...1600 mm	
Pipe surface temperature	-40...+130 °C	-40...+200 °C	
Pressure range	1 bar(a) ... unlimited		
Flow velocity	0.01...35 m/s		
Measurement uncertainty	±1...2 % MV ±0.005 m/s		
Repeatability	0.15 % MV ±0.005 m/s		
Inputs	Current, temperature	Current, temperature	Temperature
Outputs	Current, binary, pulse, frequency, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP	Current, binary, pulse, Modbus RTU	
Service interfaces	USB, LAN	RS232	
Explosion protection	NonEx		ATEX/IECEX Zone 2, FM Class I Div. 2
Approvals	-		ATEX, IECEX, FM



## Non-invasive liquid flow measurement

### When sustainability matters

FLEXIM has opened up the world of non-invasive ultrasonic flow measurement by providing solutions for particularly challenging measurement tasks. Ultrasonic transducers mounted on the outside of the pipe do not suffer wear and tear by any media and cannot become clogged by any particles. As a result, FLEXIM's 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-invasive 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 flowmeter for standard volumetric flow rate and API determination of hydrocarbons	High-performance flowmeter for mass flow rate, concentration and density
Fluid	All liquids	Various hydrocarbons	All liquids
Inner pipe diameter	6...6500 mm		
Pipe surface temperature	-200...+630 °C		
Flow velocity	0.01...25 m/s		
Measurement uncertainty	±1 % MV ±0.005 m/s		
Repeatability	0.15 % MV ±0.005 m/s		
Inputs	Current, temperature		
Outputs	Current, binary, pulse, frequency, HART, Modbus RTU, Foundation Fieldbus, Profibus PA		
Service interfaces	USB		
Explosion protection	Aluminium housing: ATEX/IECEEx zone 1, FM Class I Div. 1 Stainless steel housing: ATEX/IECEEx zone 1		
Approvals	Aluminium housing: ATEX, IECEEx, FM Stainless steel housing: ATEX, IECEEx		




	F808SR	F808LF
		
Meter type	SIL 2 certified flow meter for hazardous areas	High-performance extreme low flow meter for hazardous areas
Fluid	All liquids	
Inner pipe diameter	6...6500 mm	10...240 mm
Pipe surface temperature	-200...+630 °C	-40...+130 °C
Flow velocity	0.01...25 m/s	Depending on pipe diameter
Measurement uncertainty	±1.2 % MV ±0.01 m/s	Depending on pipe diameter
Repeatability	0.15 % MV ±0.01 m/s	Depending on application
Inputs	None	
Outputs	Current, binary, pulse	
Service interfaces	R232	
Explosion protection	ATEX/IECEX Zone 1, FM Class I Div. 1	
Approvals	ATEX, IECEX, FM	

	F801SR	F801LF
		
Meter type	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	6...6500 mm	10...240 mm
Pipe surface temperature	-200...+630 °C	-40...+130 °C
Flow velocity	0.01...25 m/s	Depending on pipe diameter
Measurement uncertainty	±1.2 % MV ±0.01 m/s	Depending on pipe diameter
Repeatability	0.15 % MV ±0.01 m/s	Depending on pipe diameter
Inputs	None	
Outputs	Current, binary, pulse	
Service interfaces	RS232	
Explosion protection	ATEX/IECEX Zone 1	
Approvals	ATEX, IECEX	



	F722	F721	S721
			
Meter type	High-performance flow meter for challenging and highly dynamic flow conditions	High-performance flow meter	High-performance mass flow, density, and concentration meter
Fluid	All liquids		
Inner pipe diameter	6...6500 mm		
Pipe surface temperature	-200...+630 °C		
Flow velocity	0.01...25 m/s		
Measurement uncertainty	±1 % MV ±0.005 m/s		
Repeatability	0.15 % MV ±0.005 m/s		
Inputs	Current, temperature, voltage, binary		
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus		
Service interfaces	USB, LAN		
Explosion protection	NonEx, Ex Zone 2, FM Class I Div. 2		
Approvals	ATEX, IECEx, FM		

	H721	F721LF	F721TE
			
Meter type	Hydrocarbon standard volume flow 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	6...6500 mm	6...6500 mm	6...6500 mm
Pipe surface temperature	-200...+630 °C	-40...+130 °C	-40...+240 °C
Flow velocity	0.01...25 m/s	Depending on pipe size	0.01...25m/s
Measurement uncertainty	±1 % MV ±0.005 m/s	±1 % MV ±0.0006 m/s	±1 % MV ±0.005 m/s
Repeatability	0.15 % MV ±0.005 m/s	0.15 % MV ±0.0006 m/s	0.15 % MV ±0.005 m/s
Inputs	Current, temperature, voltage, binary		Temperature
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP, Profibus PA, Foundation Fieldbus		Current, binary, pulse, frequency, Modbus RTU/TCP, BACnet MSTP/IP, M-Bus, Profibus PA, Foundation Fieldbus
Service interfaces	USB, LAN		
Explosion protection	NonEx, Ex Zone 2, FM Class I Div. 2		
Approvals	ATEX, IECEx, FM		

	F721WD	F704SR
		
Meter type	High-performance water flow meter	SIL 2 certified flow meter
Fluid	Water	All liquids
Inner pipe diameter	50...6500 mm	6...6500 mm
Pipe surface temperature	-40...+130 °C	-200...+630 °C
Flow velocity	0.01...25 m/s	0.01...25 m/s
Measurement uncertainty	±1 % MV ±0.005 m/s	±1.2 % MV ±0.01 m/s
Repeatability	0.15 % MV ±0.005 m/s	0.15 % MV ±0.01 m/s
Inputs	Current	-
Outputs	Current, binary, pulse, frequency, Modbus RTU/TCP, BACnet MSTP/IP, M-Bus, Profibus PA, Foundation Fieldbus	Current, binary, pulse
Service interfaces	USB, LAN	RS232
Explosion protection	NonEx	NonEx, Ex Zone 2, FM Class I Div. 2
Approvals	MCERTS	ATEX, IECEx, FM

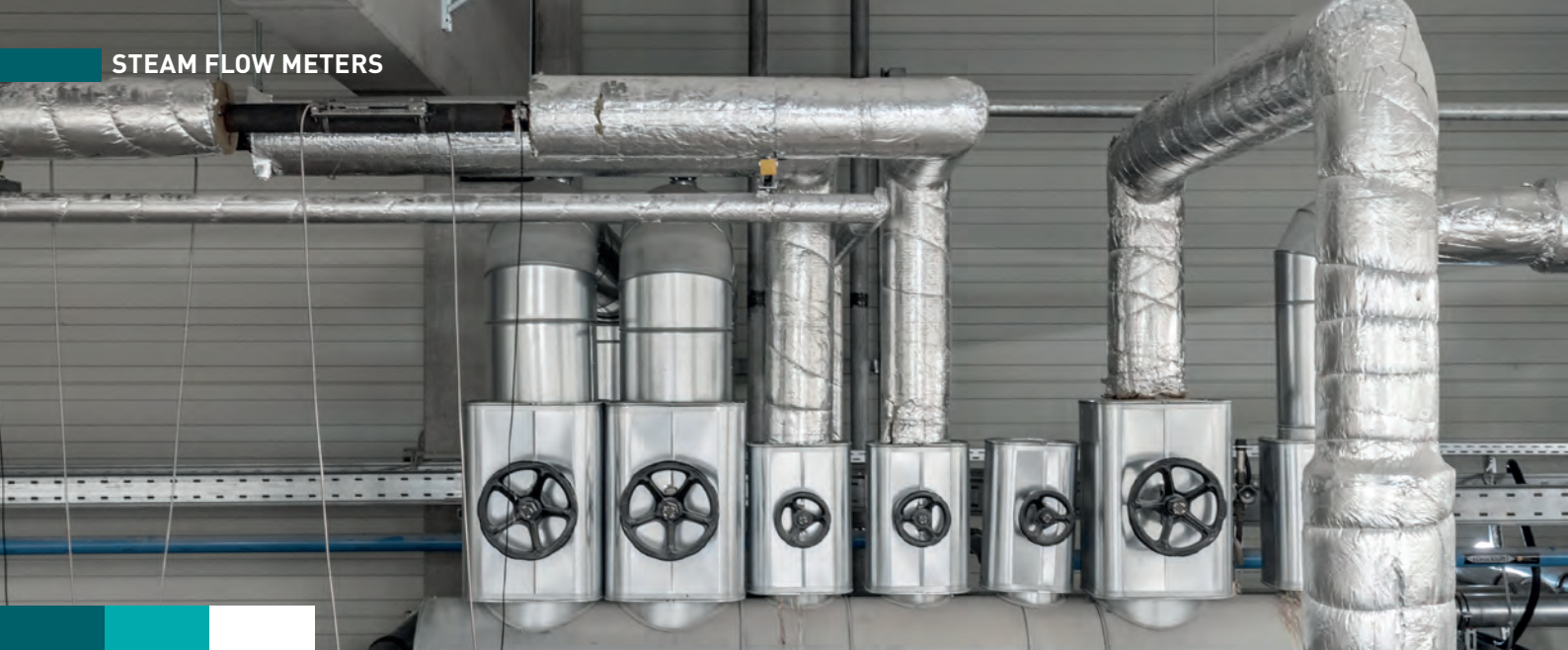


	F736	H736
		
Meter type	High-performance quad-beam flowmeter	High-performance quad-beam flowmeter for standard volumetric flow rate and API determination of hydrocarbons
Fluid	All liquids	Various hydrocarbons
Inner pipe diameter	6...6500 mm	
Pipe surface temperature	-200...+630 °C	
Flow velocity	0.01...25 m/s	
Measurement uncertainty	±1 % MV ±0.005 m/s	
Repeatability	0.15 % MV ±0.005 m/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, LAN	
Explosion protection	NonEx, Ex-Zone 2, FM Class I Div. 2	
Approvals	ATEX, IECEx, FM	

	F532WD	F532TE	F532SC
			
Meter type	Flowmeter for water	Flowmeter for thermal energy measurement	Flowmeter for semiconductor industry
Fluid	Water	Water and water/glycol mixtures	Water and aqueous solutions
Inner pipe diameter	10...2400 mm		8...51 mm
Pipe surface temperature	-40...+130 °C		-20...+100 °C
Flow velocity	0.01...25 m/s		
Measurement uncertainty	±1 % MV ±0.005 m/s		
Repeatability	0.15 % MV ±0.005 m/s		
Inputs	-	Temperature	-
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP		
Service interfaces	USB, LAN		
Explosion protection	NonEx		
Approvals	-		

	F401	F601	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	40...4700 mm	6...6500 mm	
Pipe surface temperature	-40...100 °C	-200...+630 °C	
Flow velocity	0.01...25 m/s		
Measurement uncertainty	±2 % MV ±0.01 m/s	±1 % MV ±0.005 m/s	
Repeatability	0.25 % MV ±0.01 m/s	0.15 % MV ±0.005 m/s	
Inputs	-	Current, temperature	Temperature
Outputs	Current, binary, pulse	Current, binary, pulse, frequency, Modbus RTU	
Service interfaces	RS232		
Explosion protection	NonEx		Ex Zone 2, Class I Div. 2
Approvals	-		ATEX, IECEx, FM





## Non-invasive steam flow measurement

### Portable and permanent

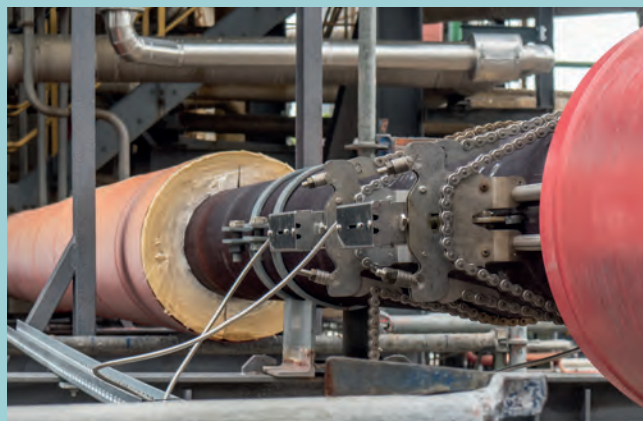
FLUXUS® G ST-LT is FLEXIM's ultrasonic flow meter series for non-invasive flow measurement of saturated steam at temperatures up to 180 °C. FLEXIM's low-temperature steam flow meters work according to the transit-time difference principle. They show excellent measuring dynamics (turndown), making it possible to detect even the smallest steam quantities without any need to increase flow velocity by reducing the pipe diameter.


FLUXUS® G ST-LT601 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® G 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-invasive steam measurement technology to temperatures up to 630 °C.

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® G ST-HT is therefore the ideal solution where uninterrupted production and supply are crucial.

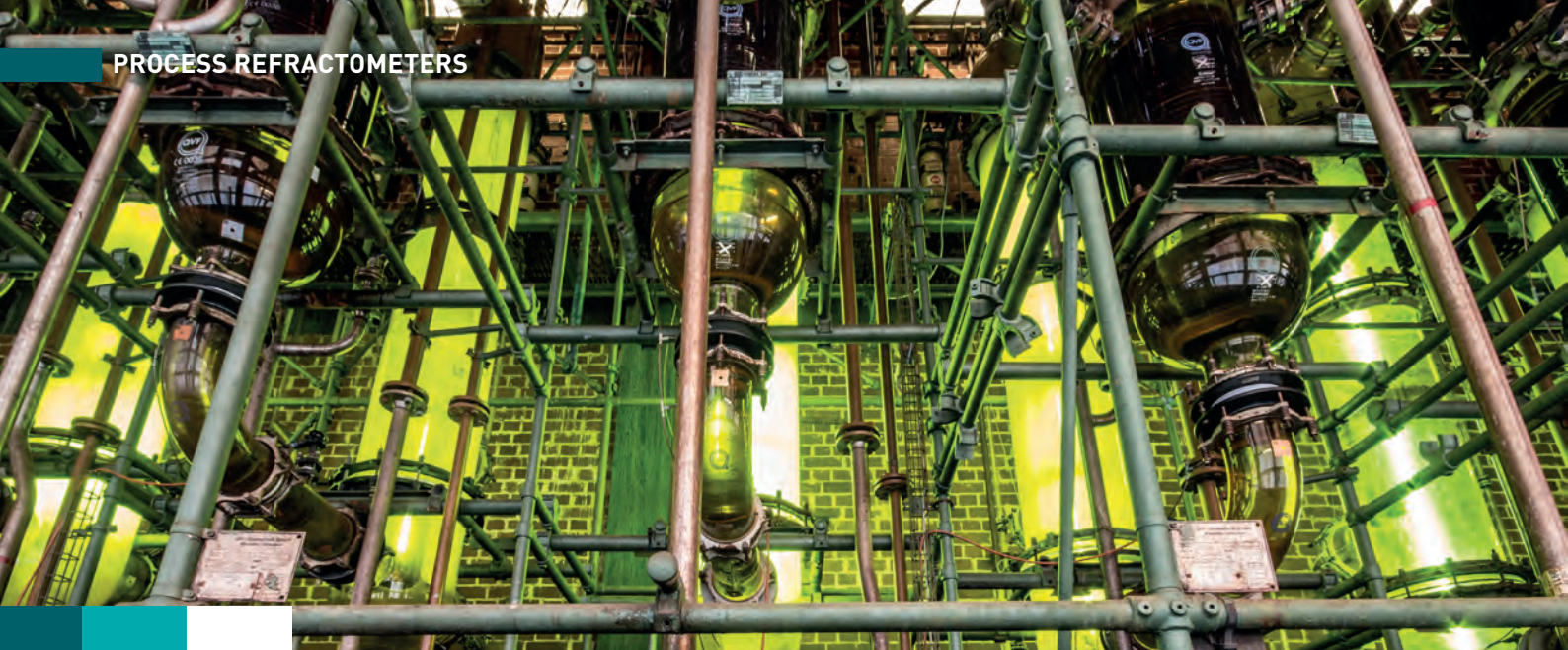


	G831ST-HT	G831ST-LT
		
Meter type	High temperature steam mass flow meter for hazardous areas	Low temperature steam mass flow meter for hazardous areas
Measurement principle	Cross correlation principle	Transit time difference
Fluid	Saturated and superheated steam	
Inner pipe diameter	10...900 mm	23...1000 mm
Pipe surface temperature	+100...+630 °C	+135...+180 °C
Pressure range	1...220 bar(a)	3...10 bar(a)
Flow velocity	Flow velocities at Re > 60.000	0.01 m/s to 60 m/s
Measurement uncertainty	±3 % MV	±1...3 % MV ±0.005 m/s
Repeatability	1 % MV	0.15 % v. MW ±0.005 m/s
Inputs	Current, temperature	
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MS/TP, Modbus RTU, Profibus PA, Foundation Fieldbus	
Service interfaces	USB, LAN	
Explosion protection	Aluminium housing: Zone 1, FM Class I Div. 1 Stainless steel housing: Zone 1	
Approvals	Aluminium housing: ATEX, IECEx, FM Stainless steel housing: ATEX, IECEx	

	G722ST-HT	G722ST-LT
		
Meter type	High temperature steam mass flow meter	Low temperature steam mass flow meter
Measurement principle	Cross correlation principle	Transit time difference
Fluid	Saturated and superheated steam	
Inner pipe diameter	10...900 mm	23...1000 mm
Pipe surface temperature	+100...+630 °C	+135...+180 °C
Pressure range	1...220 bar(a)	3...10 bar(a)
Flow velocity	Flow velocities at $Re > 60.000$	0.01 m/s to 60 m/s
Measurement uncertainty	$\pm 3\%$ MV	$\pm 1...3\%$ MV $\pm 0.005$ m/s
Repeatability	1 % MV	$\pm 0.3\%$ MV $\pm 0.005$ m/s
Inputs	Current, temperature, binary, voltage	
Outputs	Current, binary, pulse, frequency, HART, M-Bus, BACnet MS/TP, Modbus RTU, Profibus PA, Foundation Fieldbus	
Service interfaces	USB, LAN	
Explosion protection	NonEx, Ex Zone 2, Class I Div. 2	
Approvals	ATEX, IECEx, FM	



	G532ST-LT	G601ST	G608ST
			
Meter type	Mass flow rate meter for low temperature steam	Portable mass flow meter for low temperature steam	Portable mass flow meter for low temperature steam for hazardous areas
Measurement principle	transit time difference		
Fluid	Saturated and superheated steam		
Inner pipe diameter	23...400 mm	23...1000 mm	
Pipe surface temperature	+135...+180 °C		
Pressure range	3...10 bar(a)		
Flow velocity	0.01 m/s to 60 m/s		
Measurement uncertainty	±1...3 % MV ±0.005 m/s		
Repeatability	0.15 % MV ±0.005 m/s	±0.3 % MV ±0.005 m/s	
Inputs	Temperature	Current, temperature, voltage	Temperature
Outputs	Current, binary, pulse, frequency, M-Bus, BACnet MSTP/IP, Modbus RTU/TCP	Current, binary, frequency, pulse, Modbus RTU	Current, binary, frequency, pulse
Service interfaces	USB, LAN	RS232	
Explosion protection	NonEx		NonEx, Ex Zone 2, FM Class I Div. 2
Approvals	-	-	ATEX, IECEx



# 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. FLEXIM's PLOX® R process refractometer transfers laboratory accuracy into the process. In contrast to laboratory refractometers, PLOX® 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.


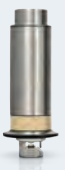


Furthermore, the monochromatic measuring beam is refracted by a biprism in two different directions which means the refraction of two light beams can be measured. The difference between the two resulting peaks is measured. The patented measuring method ensures stable measuring results, even in case of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

## Design follows function

The PLOX® R comes in two versions, tailored to the requirements of various industries: PLOX® 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.

PLOX® 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 media as well as in potentially explosive areas.



	R721		
			
Transmitter housing material	Aluminium (powder coated), stainless steel 316L (1.4404)		
Explosion protection	NonEx, Ex Zone 2, FM Class I Div. 2		
Approvals	ATEX, IECEx, FM		
	R500 MH	R500 MC S4°C	R500 MC TF°C
Meter type	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	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)	-20 °C...+150 °C		-20 °C...+130 °C
Fluid pressure	PN 10	PN 16, on request PN 40	PN 10
IP protection	IP67		
Explosion protection	NonEx, Ex Zone 0		
Approvals	ATEX, IECEx		
Process connection	Varivent, Tri-clamp	DIN/ANSI flange, proprietary FLEXIM flow cell	

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





# TRANSDUCERS

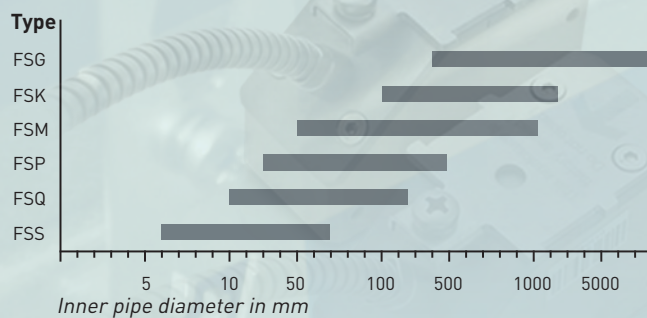
## Fundamentally flexible

FLEXIM always offers the most suitable transducer for the application. FLEXIM has developed two transducer technologies in order to ensure the highest possible measuring accuracy even in challenging environments: shear wave transducers with a focussed signal insertion for measuring liquids and Lamb wave transducers with a wide signal insertion in the medium for measuring the flow of gases. Our transducer portfolio covers a pipe diameter range from 6 millimeters to over 6 meters.

*Propagation of ultrasonic shear waves:*



## Shear wave Transducers for Liquids







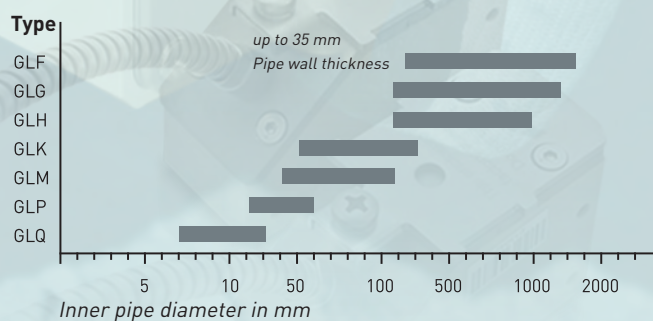
Propagation of ultrasonic Lamb waves:



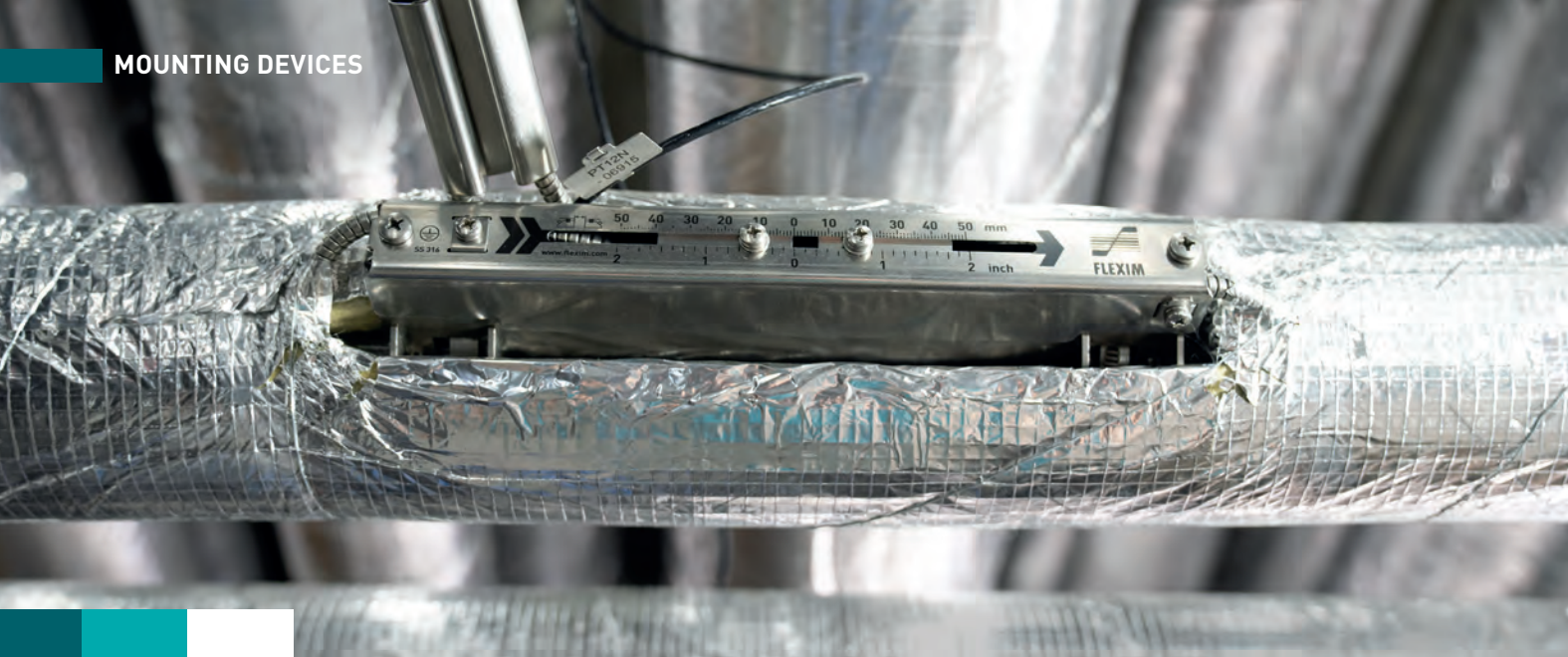
## Certified accuracy

All transducer pairs delivered by FLEXIM 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 for Gases







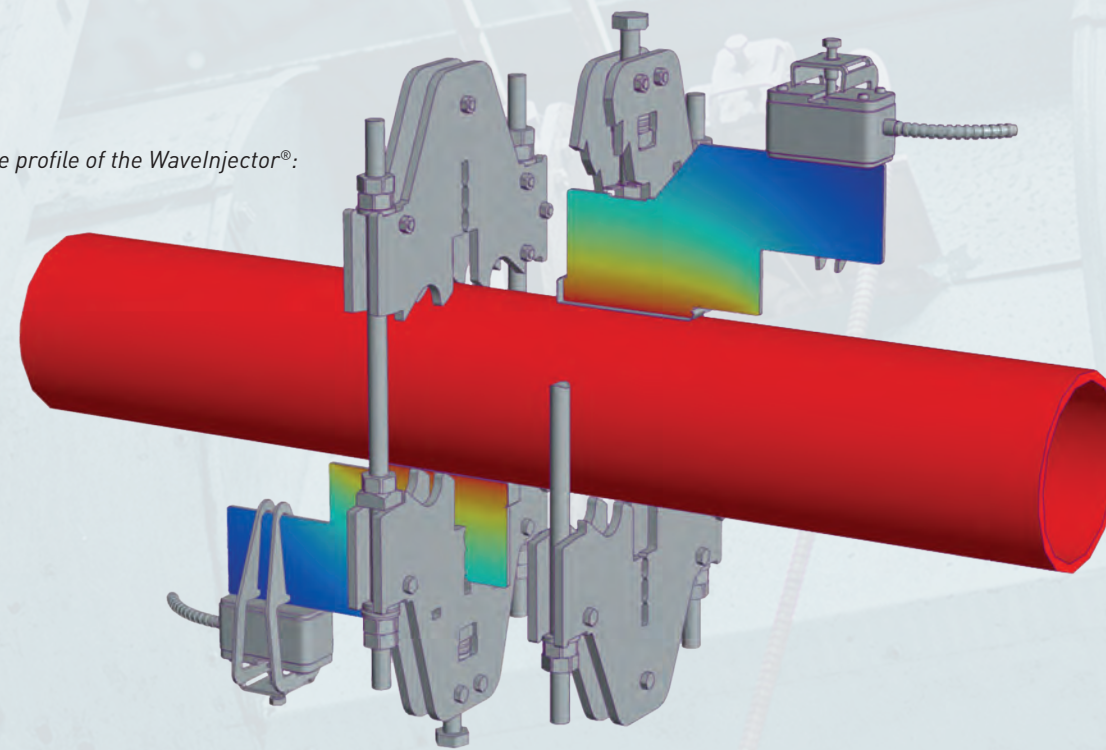
## MOUNTING DEVICES

### Fit for purpose

Whether for quick installations during temporary measurement or for permanent installations, for large pipes or small tubes: FLEXIM 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.

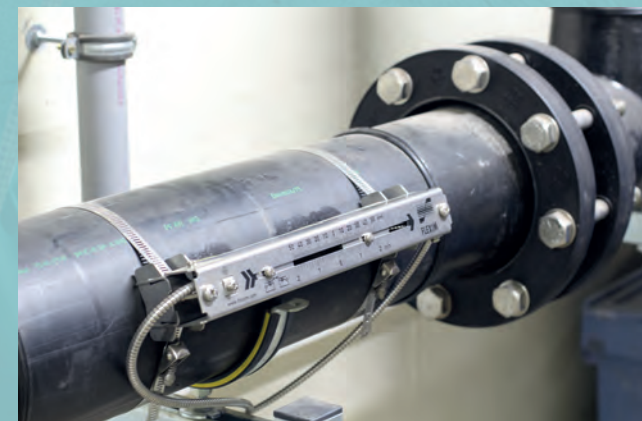
Temperature profile of the WaveInjector®:



### When the going gets tough

FLEXIM invented the WaveInjector® for extreme temperatures. The patented device separates the ultrasonic transducers thermally from the pipe thereby extending the application range of non-invasive clamp-on ultrasonic technology to temperatures of -200 °C to 630 °C.

The WaveInjector® is a transducer mounting device. 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

FLEXIM offers for its FLUXUS® flowmeters 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

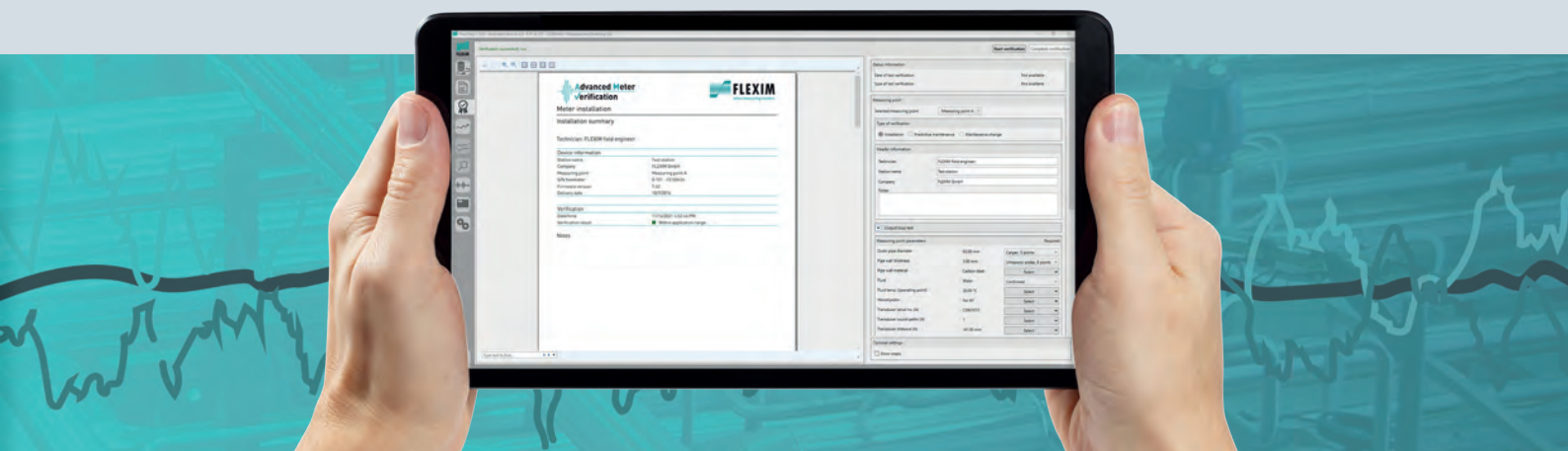
Advanced Meter Verification (AMV) allows you to check the health of your FLUXUS® in depth directly at the measuring point without the need of process interruption. This saves cost while ensuring the performance of the measurement.

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.



## In Partnership

For more than 30 years, FLEXIM has been leading the way nationally and internationally for process instrumentation in many areas of industry. As a technology leader and pioneer in the field of non-invasive clamp-on ultrasonic flow measurement of liquids, gases, and steam, FLEXIM has repeatedly set standards. In addition to non-invasive flow measurement, innovative process analytical methods using ultrasound or refractometry are another focal point of our program.

## Permanently forward-looking

We're not resting on our laurels. Every year, we invest generously in research and development to further strengthen our position as a technological leader.

In addition to that, we maintain close contact with our customers. Innovative and reliable products that meet the requirements of end-users are the result.

## FLEXIM Measurement Services provides you with answers

In today's energy-efficient and environmentally conscious environment, facility and plant metering must be verified and calibrated for accuracy to meet audit and regulatory demands. This is especially true for energy-intensive industries such as Power Generation, Oil & Gas, Chemical and Processing industries.

We confirm and verify flow rates of existing volume and mass flow meters at your industry-specific application.

We also offer complete thermal energy measurements that can help evaluate the performance of your plant and processes.

We provide formal reports and in-depth data by employing our traceable calibrated portable meters along with sophisticated diagnostic software.

Our products are hazardous area approved (ATEX (IECEX) Zone 2 (1) and FM Class I, Div. 2) and provide measurements in even the most demanding environments, e.g. offshore platforms, or refineries at pipe temperatures up to +630 °C and beyond.

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