

FLEXIM - Flexible Industrial Measurement

## PRODUCT CATALOGUE

Clamp-on ultrasonic flow measurement  
and process analytics

### Non-intrusive flow measurement with FLUXUS®

- Liquids
- Gases
- Thermal energy / BTU

### Non-intrusive process analytics with PIOX® S

- Concentration
- Density
- Mass flow rate

### PIOX® R process refractometer

- Concentration
- Density
- ° Brix etc.



# Contents

<b>Non-intrusive flow measurement with clamp-on ultrasonic technology</b>	<b>4</b>
<b>Transmitters</b>	
Portable flowmeters – for non-hazardous areas	<b>6</b>
Portable flowmeters – for hazardous areas	<b>7</b>
Stationary measuring transmitters - for non-hazardous areas	<b>8</b>
Stationary measuring transmitters - for hazardous areas	<b>9</b>
<b>Transducers</b>	
For liquid flow measurement	<b>10</b>
For gas flow measurement	<b>11</b>
Portable and permanent transducer mounting fixtures	<b>12</b>
<b>Real-time process analytics</b>	<b>14</b>
PIOX® S ultrasonic process analyzer	<b>16</b>
PIOX® R inline process refractometer	<b>18</b>

### Measurement technology made in Berlin – used worldwide

FLEXIM develops, manufactures, and sells advanced process measuring devices for industrial applications. For more than 20 years, non-intrusive ultrasonic flow measurement has its name: FLUXUS®. The name PIOX® stands for process analytics – non-intrusive with the PIOX® S ultrasonic analyzer, wetted with the PIOX® R transmitted light refractometer.

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

FLEXIM's FLUXUS® ultrasonic flowmeters are used wherever something flows. Non-intrusive clamp-on ultrasonic technology opens up an unrivalled wide range of applications. FLUXUS® reliably measures on very small tubes (e.g. DN 6 tubes in paint finishing systems) and very large pipes (e.g. DN 6500 downpipes in hydropower plants).

The field of application is not only limited to liquids. FLEXIM is also particularly proud of its pioneering work carried out in transferring ultrasonic technology to the non-intrusive flow measurement of gases. Clamp-on measuring technology also covers an extraordinary range of applications in this area – from the recording of quantities drawn off by individual pneumatic consumers in a compressed air network, to the non-intrusive measurement of gas quantities conveyed in a gas transmission pipeline.

#### Progressive process analytics with PIOX®

Clamp-on ultrasonic technology can also be used for process analytics through non-intrusive determination of the acoustic velocity in the medium. PIOX® S ultrasonic systems really stand the test in applications where wetted measuring equipment is subject to considerable wear and tear, for example during concentration and mass flow measurements of acids.

Measurement of light refraction is a proven method for determining concentrations. Laboratory Calibrated accuracy is ensured in the process with the patented PIOX® R transmitted light refractometer.

If both measuring methods are combined, multi-component mixtures can also be analyzed accurately and reliably.

# FLUXUS®

## Non-intrusive flow measurement with clamp-on ultrasonic technology

**FLUXUS® measures flow rates non-intrusively with ultrasound. Clamp-on ultrasonic transducers are simply mounted on the outside of the pipe. The practical advantages are obvious: no wear and tear by the medium flowing inside the pipe, no risk of liquid leakage or fugitive gas emissions, no pressure loss and, above all, unlimited plant availability.**

### 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 injected 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 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.

FLUXUS® clamp-on ultrasonic systems allow for the flow measurement of almost all liquid and gaseous media – even those with increased inputs of solids and gas (<10% of volume content) or even wet gas (LVF <5%).

### Versatile clamp-on solution

The non-intrusive acoustic measuring method is inertia-free and is characterized by very high measuring dynamics in both flow directions. When combined with density measurement, the transit-time difference measurement is suitable for determining the volume flow rate and mass flow rate of liquids. When combined with pressure measurement, it is suitable for determining the standard volume flow of gases. A particularly practical use for the non-intrusive measuring technique is the fact that the current power of liquid-based thermal consumers, e.g. heating or cooling systems, can be easily recorded.

As a technology leader in clamp-on ultrasonic systems, FLEXIM has developed two sensor technologies for non-intrusive flow measurement: shear wave transducers for the flow measurement of liquids and Lamb wave transducers for the flow measurement of gases. By means of these two technologies and the internal, automatic compensation of varying ambient temperatures, FLEXIM ensures maximum measuring accuracy and reliability, even under difficult conditions.

## Flexible Industrial Measurement Technology

### Fundamentally flexible

Non-intrusive clamp-on technology offers maximum flexibility and the sophisticated electronics of FLUXUS® ensure the highest degree of reliability. The measuring system, which consists of a transmitter and ultrasonic transducer system, can be adapted optimally to specific requirements.

The product range of the FLUXUS® series covers a wide spectrum of various measuring transmitters and transducers, from basic devices for standard applications to measuring systems for usage offshore. It goes without saying; this also includes transmitters and transducers which can be used in hazardous areas.


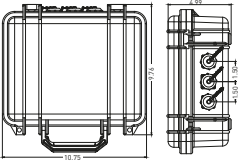

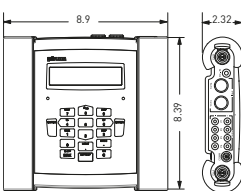

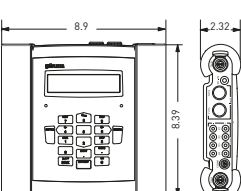
### Proven accuracy

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 absolutely essential for FLEXIM. From the moment the goods arrive at the warehouse to the moment the finished measuring system is shipped, operational checks are carried out at every single production stage and everything is documented. Paired transducers ensure high measuring accuracy of the measuring systems.

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.

# Portable Flow Meters FLUXUS® F401 and F/G 601


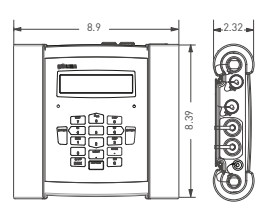

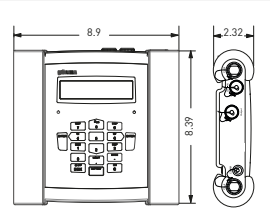

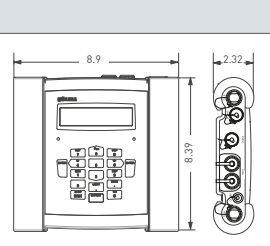
## Liquids / Gases / Thermal Energy (BTU)

	<b>FLUXUS® F401</b>		The portable FLUXUS® F401 is a single channel meter for the flow measurement of water and wastewater streams (<6% of solid / gas content by volume). It is equipped with IP68 / NEMA 6P transducers and housed in a IP67 / NEMA 6 enclosure for long term remote measurements outdoor.		
	Calibrated accuracy:		± 2.0 % of rd. ± 0.03 ft/s		
	Operating temp.:		14 °F ... +140 °F (Transmitter)		
	Pipe wall temp.:		-40 °F ... +210 °F		
	Pipe size (ID):		1 inch ... 122 inches		
	Inputs:		--		
	Outputs:		2x Current, 2x Binary		
	Battery life:		>24 hrs. battery supplied measurement, with add. battery suitcase >1 week		
	Flow velocity:		0.03 ft/s ... 80 ft/s		
	Degree of protection:		IP67 / NEMA 6 (Transmitter), IP68 / NEMA 6P (Transducers)		
	<b>FLUXUS® F601</b>		The portable FLUXUS® F601 is the ideal metering solution for the flexible operation during temporary control and service tasks on all liquid filled pipes and can also be employed for thermal energy measurements.		
	Product variant:		Standard	(Double) Energy	Multifunctional
	Calibrated accuracy:		± 1.0 % of rd. ± 0.03 ft/s (ext. calibr.); ± 0.5 % of rd. ± 0.03 ft/s (process calibr.)		
	Operating temp.:		14 °F ... +140 °F (Transmitter)		
	Pipe wall temp.:		-40 °F ... +390 °F ( -310 °F ... +1100 °F) *		
	Pipe size (ID):		1/4 inch ... 250 inches		
	Inputs:		--	2x (4x) Temperature	2x Temperature, 2x Current
	Outputs:		2x Current, 2x Binary	2x Current, 2x Binary	4x Current, 2x Binary
	Battery life:		>17 hrs. battery supplied measurement		
	Flow velocity:		0.03 ft/s ... 80 ft/s		
Degree of protection:		IP65 / NEMA 4 (Transmitter)			
	<b>FLUXUS® G601</b>		The portable FLUXUS® G601 is the ideal metering solution for the flexible operation during temporary control and service tasks on gas pipes. Additionally, the G601 CA Energy allows the measurement of liquids, gases (incl. compressed air) and thermal energy quantities combined in one device.		
	Product variant:		(Extended) Standard	Multifunctional	CA Energy
	Calibrated accuracy		Liquids: ± 1.0 % of rd. ± 0.03 ft/s (ext. calibr.); ± 0.5 % of rd. ± 0.03 ft/s (process calibr.) Gases: ± 1 ... 3 % of rd. ± 0.03 ft/s (appl.); ± 0.5 % of rd. ± 0.03 ft/s (process calibr.)		
	Operating temp.:		14 °F... +140 °F (Transmitter)		
	Pipe wall temp.:		-40 °F ... +390 °F ( -310 °F ... +1100 °F)* for liquids; -40 °F ... +210 °F for gases		
	Pipe size (ID):		1/4 inch ... 250 inches for liquids; 0.4 inch ... 83 inches for gases		
	Inputs:		(2x Current)	1x Temp., 2x Current, 1x Voltage	2x Temp., 2x Current
	Outputs:		2x Current, (1)2x Binary, 1x Frequency	2x Current, 2x Binary, 1x Frequency	2x Current, 2x Binary
	Battery life:		>17 hrs. battery supplied measurement		
	Flow velocity:		0.03 ft/s ... 80 ft/s (for liquids); 0.03 ft/s ... 115 ft/s (for gases)		
Degree of protection:		IP65 / NEMA 4 (Transmitter)			

# Portable Flow Meters FLUXUS® F/G 608

Liquids / Gases / Thermal Energy (BTU)  
FM Class I, Div. 2, ATEX (IECEX) Zone 2 certified

(Transducers certified for FM Class I, Div. 2 and ATEX (IECEX) Zones 1 / 2)


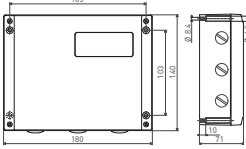

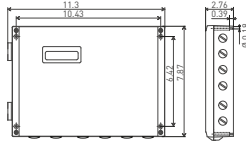

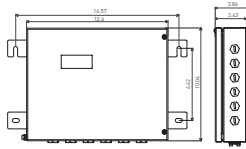
	<b>FLUXUS® F608</b>			The portable FLUXUS® F608 is the ideal metering solution for flow measurements on liquid filled pipes located in hazardous areas being FM Class I, Div. 2 and ATEX (IECEX) Zone 2 certified.	
	Product variant:	Standard	Energy	Double Energy	
	Calibrated accuracy:	±1.0 % of rd. ± 0.03 ft/s (ext. calibr.); ±0.5 % of rd. ± 0.03 ft/s (process calibr.)			
	Operating temp.:	14 °F... +140 °F (Transmitter)			
	Pipe wall temp.:	-40 °F ... +390 °F (-310 °F ... +1100 °F)*			
	Pipe size (ID):	1/4 inch .... 250 inches			
		Inputs:	-	2x Temperature	4x Temperature
Outputs:		-	-	-	
Battery life:		>17 hrs. battery supplied measurement			
Flow velocity:		0.03 ft/s ... 80 ft/s			
Degree of protection:		IP65 / NEMA 4, FM Class I, Div. 2, ATEX (IECEX) Zone 2 (Transmitter)			
		<b>FLUXUS® G608</b>			The portable FLUXUS® G608 is the ideal metering solution for flow measurements on gas pipes located in hazardous areas being FM Class I, Div. 2 and ATEX (IECEX) Zone 2 certified.
		Product variant:	Standard		
	Calibrated accuracy:	±1...3 % of rd. ± 0.03 ft/s (appl.); ± 0.5 % of rd. ± 0.03 ft/s (process calibr.)			
	Operating temp.:	14 °F... +140 °F (Transmitter)			
	Pipe wall temp.:	-40 °F ... +210 °F			
	Pipe size (ID):	0.4 inch ... 83 inches			
		Inputs:	-		
Outputs:		-			
Battery life:		>17 hrs. battery supplied measurement			
Flow velocity:		0.03 ft/s ... 115 ft/s			
Degree of protection:		IP65 / NEMA 4, FM Class I, Div. 2, ATEX (IECEX) Zone 2 (Transmitter)			
		<b>FLUXUS® G608 CA Energy</b>			The portable FLUXUS® G608 CA Energy is a meter that can measure liquid and gas (incl. compressed air) flow rates as well as quantify thermal energy flows. It is specifically designed for use in hazardous areas and thus FM Class I, Div. 2 and ATEX (IECEX) Zone 2 certified.
		Calibrated accuracy			
	Liquids:	± 1.0 % of rd. ± 0.03 ft/s (ext. calibr.); ± 0.5 % of rd. ± 0.03 ft/s (process calibr.)			
	Gases:	± 1 ... 3 % of rd. ± 0.03 ft/s (appl.); ± 0.5 % of rd. ± 0.03 ft/s (process calibr.)			
	Operating temp.:	14 °F... +140 °F (Transmitter)			
	Pipe wall temp.:	-40 °F ... +390 °F (-310 °F ... +1100 °F)* for liquids -40 °F ... +210 °F for gases			
	Pipe size (ID):	1/4 inch ... 250 inches for liquids; 0.4 inch ... 83 inches for gases			
	Inputs:	4x Temperature			
	Outputs:	-			
	Battery life:	>17 hrs. battery supplied measurement			
	Flow velocity:	0.03 ft/s ... 80 ft/s (for liquids); 0.03 ft/s ... 115 ft/s (for gases)			
	Degree of protection:	IP65 / NEMA 4, FM Class I, Div. 2, ATEX (IECEX) Zone 2 (Transmitter)			

\* with WaveInjector®

# Stationary Transmitters

Liquids (ADM / F) and Gases (G)


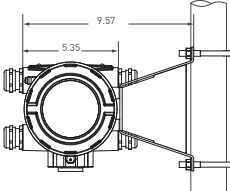

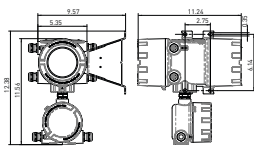

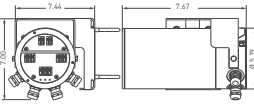
Non-ex and FM Class I, Div. 2, ATEX (IECEX) Zone 2 approved

	<b>FLUXUS® ADM 5X07</b> <b>FLUXUS® F50X</b>	<p>The FLUXUS® F50X is a basic meter available in dedicated solution packages for water, thermal energy and flexible tubing applications. The basic meter FLUXUS® ADM5X07 is designed for water and water / glycol applications.</p>
	<p><b>Product variant:</b> FLUXUS® F501 IP (buried water pipes)   FLUXUS® F502 BTU (thermal energy meter)   FLUXUS® F501 Semiconductor (for liquids in tubes)</p> <p><b>Accuracy:</b> ± 1.6 % of rd. ± 0.03 ft/s   ± 2 % of rd. ± 0.03 ft/s   ± 2 % of rd. ± 0.03 ft/s</p> <p><b>Operating temp.:</b> 14 °F ... +140 °F</p> <p><b>Pipe wall temp.:</b> -40 °F ... +210 °F</p> <p><b>Pipe size (ID):</b> 1 inch ... 122 inches   0.4 inch ... 100 inches   OD: 3/8", 1/2", 3/4", 1", 1,25"</p> <p><b>Inputs:</b> --   2x Temperature   -</p> <p><b>Outputs:</b> 1x Current, 2x Binary   2x Current, 2x Binary   2x Current, 2x Binary</p> <p><b>Power supply:</b> 100 V ... 240V / 50 ... 60 Hz or 20 ... 32 V DC</p> <p><b>Communication:</b> RS485 (emitter) or Modbus RTU or BACnet MS/TP or M-Bus (meter dependent)</p> <p><b>Flow velocity:</b> 0.03 ft/s ... 80 ft/s</p> <p><b>Degree of protection:</b> IP 66 (Transducers IP68)   IP 66   IP 66</p>	
	<b>FLUXUS® F704</b> <b>FLUXUS® F709</b> <b>FLUXUS® G704</b> <b>FLUXUS® G709</b>	<p>The non-intrusive ultrasonic flow meters FLUXUS® F704 / F709 and G704 / G709 are the standard flow and thermal energy meters for virtually any liquid and gaseous media in any industry.</p>
	<p>FLUXUS® F704 and F709   FLUXUS® G704 and G709</p> <p><b>Calibrated accuracy:</b> ± 1.0 % of rd. ± 0.03 ft/s (ext. calibr.), ± 0.5 % of rd. ± 0.03 ft/s (field calibr.)   ± 1 ... 3 % of rd. ± 0.03 ft/s (appl.), ± 0.5 % of rd. ± 0.03 ft/s (field calibr.)</p> <p><b>Operating temp.:</b> 14 °F ... +140 °F</p> <p><b>Pipe wall temp.:</b> -40 °F ... +390 °F (-310 °F ... +1100 °F)*   -40 °F ... +210 °F</p> <p><b>Pipe size (ID):</b> 1/4 inch ... 250 inches   0.4 inch ... 83 inches</p> <p><b>Inputs:</b> maximum 4, possible are: Temp. (Pt 100/1000 4-Loop), Current, Voltage</p> <p><b>Outputs:</b> Many combinations available, possibilities: Current (0/4 mA ... 20 mA), Voltage, Frequency, Impulse, Alarm</p> <p><b>Power supply:</b> 100 ... 240 V / 120...140 Hz oder 20 ... 32 V DC</p> <p><b>Communication:</b> HART, Modbus, Foundation Fieldbus, BACnet</p> <p><b>Flow velocity:</b> 0.03 ft/s ... 80 ft/s   0.03 ft/s ... 115 ft/s</p> <p><b>Degree of protection:</b> F704 / G704: IP65 /NEMA 4, FM Class I, Div. 2 opt., SIL2; F709 / G709: IP20 /NEMA 1</p>	
	<b>FLUXUS® F704.316SE</b> <b>FLUXUS® G704.316SE</b>	<p>The non-intrusive flow meters FLUXUS® F/G704.316SE are, with their Stainless Steel enclosures [316L / 1.4404], engineered for measurements at liquid or gas filled pipes in especially corrosive environments.</p>
	<p>FLUXUS® F704.316SE   FLUXUS® G704.316SE</p> <p><b>Calibrated accuracy:</b> ± 1.0 % of rd. ± 0.03 ft/s (ext. calibr.), ± 0.5 % of rd. ± 0.03 ft/s (field calibr.)   ± 1...3 % of rd. ± 0.03 ft/s (appl.), ± 0.5 % of rd. ± 0.03 ft/s (field calibr.)</p> <p><b>Operating temp.:</b> -40 °F ... +140 °F</p> <p><b>Pipe wall temp.:</b> -40 °F ... +390 °F (-310 °F ... +1100 °F)*   -40 °F ... +210 °F</p> <p><b>Pipe size (ID):</b> 1/4 inch ... 250 inches   0.4 inch... 83 inches</p> <p><b>Inputs:</b> maximum 4, possible are: Temp. (Pt 100/1000 4-Loop), Current, Voltage</p> <p><b>Outputs:</b> Many combinations available, possibilities: Current (0/4 mA ... 20 mA), Voltage, Frequency, Impulse, Alarm</p> <p><b>Power supply:</b> 100 ... 240 V / 120...140 Hz or 20 ... 32 V DC</p> <p><b>Communication:</b> HART, Modbus, Foundation Fieldbus, BACnet</p> <p><b>Flow velocity:</b> 0.03 ft/s ... 80 ft/s   0.03 ft/s ... 115 ft/s</p> <p><b>Degree of protection:</b> IP66 /NEMA 4X, FM Class I, Div. 2, ATEX (IECEX) Zone 2 optional, SIL2 rated</p>	



# Stationary Transmitters

Liquids (F) and Gases (G)  
FM Class I, Div. 1, ATEX (IECEX) Zone 1 approved

	<b>FLUXUS® F808</b>	The FLUXUS® F808 is a FM Class I, Div. 1 / 2 and ATEX (IECEX) Zone 1 approved single channel liquid flow meter. As special product variant „FLUXUS® XLF“ (also available for the F704 and F704.316SE) it is engineered for measuring extremely low flow rates.
	<b>Calibrated accuracy:</b>	FLUXUS® F808: $\pm 1.0\%$ of rd. $\pm 0.03$ ft/s (ext. calibr.), $\pm 0.5\%$ of rd. $\pm 0.03$ ft/s (field calibr.) FLUXUS® XLF: $\pm 10\%$ of reading and better for volume flow rates down to and below 1 gal/h
	<b>Operating temp.:</b>	-20 °F ... [+120] +140 °F
	<b>Pipe wall temp.:</b>	-40 °F ... +390 °F
	<b>Pipe size (ID):</b>	1/4 inch ... 250 inches   0.4" to 2"
	<b>Inputs:</b>	-
	<b>Outputs:</b>	2 (various combinations between Current and Binary outputs available)
	<b>Power supply:</b>	100 ... 240 V / 120 ... 140 Hz or 20 ... 32 V DC
	<b>Communication:</b>	HART, Modbus
	<b>Flow velocity:</b>	0.03 ft/s ... 80 ft/s   down to 0.003 ft/s
<b>Degree of protection:</b>	IP66 / NEMA 4X, ATEX (IECEX) Zone 1 (Ex d e), FM Class I, Div. 1, SIL2 rated	
	<b>FLUXUS® F809</b> <b>FLUXUS® G809</b>	The FLUXUS® F809 liquid and FLUXUS® G809 gas flow meters are the ideal measurement devices for the non-intrusive dual channel flow measurement of liquids and gases in hazardous areas (FM Class I, Div. 1 / 2).
	<b>Calibrated accuracy:</b>	FLUXUS® F809: $\pm 1.0\%$ of rd. $\pm 0.03$ ft/s (ext. calibr.), $\pm 0.5\%$ of rd. $\pm 0.03$ ft/s (field calibr.) FLUXUS® G809: $\pm 1...3\%$ of rd. $\pm 0.03$ ft/s (appl.), $\pm 0.5\%$ of rd. $\pm 0.03$ ft/s (field calibr.)
	<b>Operating temp.:</b>	-20 °F ... [+120] +140 °F
	<b>Pipe wall temp.:</b>	-40 °F ... +390 °F [-310 °F ... +1100 °F]*   -40 °F ... +210 °F
	<b>Pipe size (ID):</b>	1/4 inch ... 250 inches   0.4 inch ... 44 inches
	<b>Inputs:</b>	-
	<b>Outputs:</b>	4 (various combinations between Current and Binary outputs available)
	<b>Power supply:</b>	100 ... 240 V / 120 ... 140 Hz oder 20 ... 32 (11 ... 16) V DC or 24 V DC $\pm 10\%$ (with outputs: increased safety)
	<b>Communication:</b>	HART, Modbus
	<b>Flow velocity:</b>	0.03 ft/s ... 80 ft/s   0.03 ft/s ... 115 ft/s
<b>Degree of protection:</b>	IP66 / NEMA 4X, FM Class I, Div. 1 / 2, ATEX Zone 1 (Ex d e (ib))	
	<b>FLUXUS® ADM8127</b> <b>FLUXUS® G801</b>	The clamp-on ultrasonic flow meters FLUXUS® ADM8127 (for liquids) and G801 (for gases) are, with their highly corrosion resistant stainless steel enclosures the ideal meters for usage offshore (ATEX Zone 1 certified).
	<b>Calibrated accuracy:</b>	FLUXUS® ADM8127: $\pm 1.0\%$ of rd. $\pm 0.03$ ft/s (ext. calibr.), $\pm 0.5\%$ of rd. $\pm 0.03$ ft/s (field calibr.) FLUXUS® G801: $\pm 1...3\%$ of rd. $\pm 0.03$ ft/s (appl.), $\pm 0.5\%$ of rd. $\pm 0.03$ ft/s (field calibr.)
	<b>Operating temp.:</b>	14 °F ... [+120] +140 °F
	<b>Pipe wall temp.:</b>	-40 °F ... +390 °F [-310 °F ... +1100 °F]*   -40 °F ... +210 °F
	<b>Pipe size (ID):</b>	1/4 inch ... 250 inches   0.4 inch ... 83 inches
	<b>Inputs:</b>	-
	<b>Outputs:</b>	1 ... 2x Current, 1 ... 4x Binary, (1x Frequency)
	<b>Power supply:</b>	100 ... 240 V / 120 ... 140 Hz oder 20 ... 32 V DC or 11 ... 16 V DC or 24 V DC $\pm 10\%$ (with outputs: increased safety)
	<b>Communication:</b>	HART, Modbus
	<b>Flow velocity:</b>	0.03 ft/s ... 80 ft/s   0.03 ft/s ... 115 ft/s
<b>Degree of protection:</b>	IP66 / NEMA 4X, ATEX Zone 1 (Ex d e (ib))	

\* with WaveInjector®

# Clamp-On Ultrasonic Transducers

## For the flow measurement of liquids

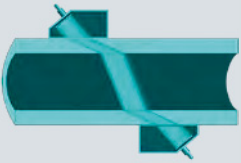





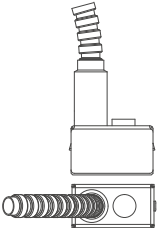
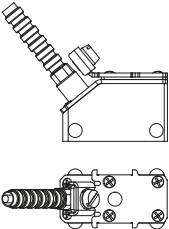
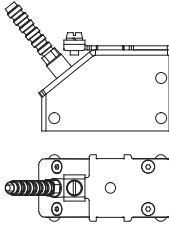
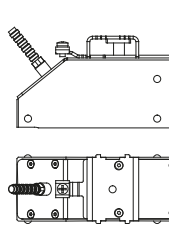
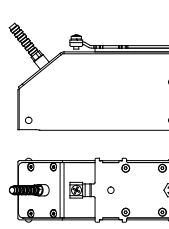
FLEXIM has developed two sensor technologies in order to ensure the highest possible measuring accuracy even in challenging environments: shear wave transducers with a focused signal insertion for measuring liquids and Lamb-wave transducers with a wide signal insertion in the medium for measuring the flow of gases.

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.

### Shear wave Transducers



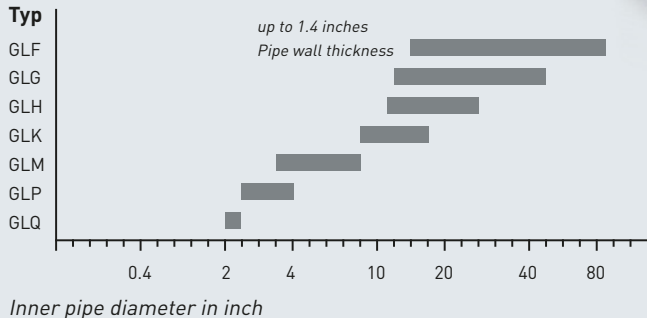
Inner pipe diameter in inch  
(No limitations by pipe wall thickness or pipe wall material)

						
<b>Shear wave transducers for liquids:</b>		<b>FSS</b>	<b>FSQ</b> (also available as metal free product variant)	<b>FSP / FSM</b>	<b>FSK</b>	<b>FSG</b>
<b>Techn. drawing:</b>						
<b>Dimensions of standard transducers in inch (l x w x h):</b>		0.98 x 0.51 x 0.67	0.67 x 0.87 x 1.0	2.46 x 1.26 x 1.59	4.98 x 2.00 x 2.66	5.09 x 2.00 x 2.63
<b>Operating temp.: [ext. temp. area]:</b>		-30 °F ... +130 °F	-40 °F ... +265 °F (-20 °F ... +390 °F)	-40 °F ... +265 °F (-20 °F ... +390 °F)	-40 °F ... +265 °F	-40 °F ... +265 °F
<b>Protection degree:</b>		IP65 / NEMA 4	IP65 / NEMA 4. IP67 / NEMA 6 optional	IP65 / NEMA 4 IP68 / NEMA 6P optional	IP65 / NEMA 4 IP68 / NEMA 6P optional	IP65 / NEMA 4 IP68 / NEMA 6P optional
<b>Hazardous area approval:</b>		FM Class I, Div. 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2

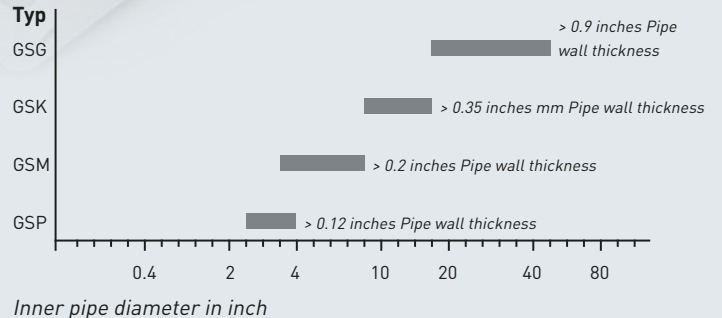
# Clamp-On Ultrasonic Transducers

For the flow measurement of gases

## Lamb wave Transducers



## Shear wave Transducers\*



\*Applications with pipe wall thicknesses that are not within the range of Lamb wave transducers

<b>Lamb wave transd.:</b> <b>Shear wave transd.*:</b> <b>for gases</b>	<b>GLQ</b> -	<b>GLP / GLM</b> <b>GSP / GSM</b>	<b>GLH / GLK</b> <b>GSK</b>	<b>GLG</b> <b>GSG</b>	<b>GLF</b> -
<b>Techn. drawing:</b>					
<b>Dimensions of standard transducers in inch (l x w x h):</b>	1.65 x 0.87 x 1.00	2.91 x 1.26 x 1.59	5.06 x 2.01 x 2.66	5.06 x 2.01 x 2.66	6.41 x 2.12 x 3.59
<b>Operating temp.:</b>	-40 °F ... +210 °F	-40 °F ... +210 °F	-40 °F ... +210 °F	-40 °F ... +210 °F	-40 °F ... +210 °F
<b>Protection degree:</b>	IP65 / NEMA 4 IP68 / NEMA 4X optional	IP65 / NEMA 4 IP68 / NEMA 6P optional	IP65 / NEMA 4 IP68 / NEMA 6P optional	IP65 / NEMA 4 IP68 / NEMA 6P optional	IP65 / NEMA 4
<b>Hazardous area approval:</b>	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2	ATEX (IECEX) Zone 1 and 2 FM Class I, Div. 1 / 2

# Transducer Mounting Fixtures

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

PermaRail and PermaLok transducer systems offer the best stability: the sturdy mounting devices permanently ensure the ultrasonic transducers are positioned precisely. Sophisticated, constructive details guarantee constantly high contact pressure even with high fluctuations in temperature thereby ensuring long-term stable high signal quality.

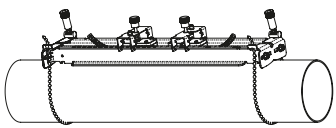
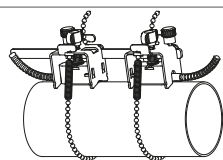
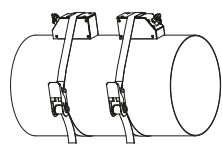
PermaRail is the standard transducer mounting fixture for permanent installation. PermaLok provides optimum protection even under the harshest conditions: below the stainless steel cover, the measuring point is permanently protected from external influences, from wind and weather as well as from mechanical damage.

## When the going gets tough


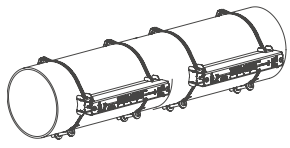
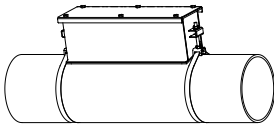
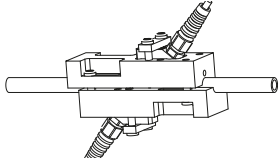

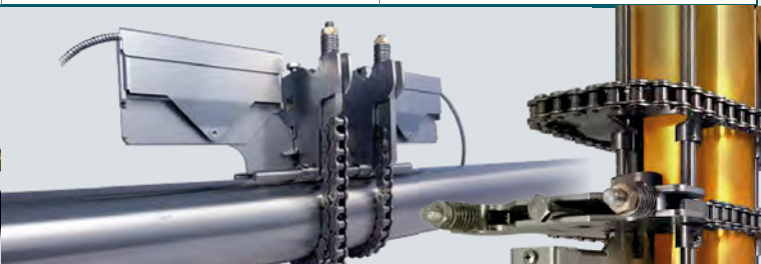
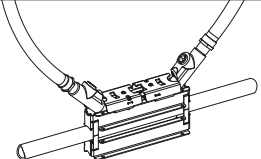
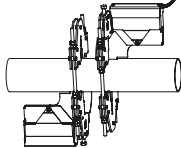
FLEXIM invented the Wavelnjector® for extreme temperatures. The patented device separates the ultrasonic transducers thermally from the pipe thereby extending the application range of non-intrusive clamp-on-ultrasonic technology to temperatures from -310 °F up to 1100 °F.

The Wavelnjector® is a transducer mounting device and 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 Wavelnjector® is also mounted on the outside of the pipe without having to open the pipeline. Since it is a purely mechanical arrangement, the Wavelnjector® can also be used in hazardous areas.

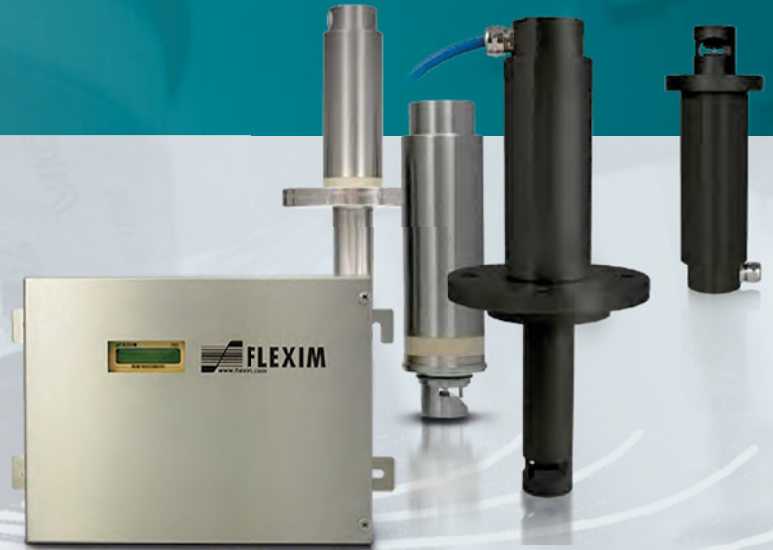
For temporary measurements			
Portable Mounting Fixtures:	Portable VARIOFIX (Chains / Magnets)	Fastening Shoes (FS) (Chains / Magnets)	Tension Belts
Description:	The portable VARIOFIX is the standard mounting fixture for temporary measurements with M and K transducers	The fastening shoes (FS) are used for temporary measurements with S, Q and M transducers.	The tension belts are used for temporary measurements with K transducers at big pipe sizes
Techn. Drawing:			
Material:	Stainless Steel: 304 (1.4301), 301 (1.4310), 303 (1.4305)	Stainless Steel: 304 (1.4301), 301 (1.4310), 303 (1.4305)	Steel, powder coated and textile tension belt
Dimensions in inch (l x w x h):	16.3 x 3.7 x 1.57 [chain length: 6 ft, for bigger pipes magnetic clamps are used]	8.27 x 1.26 x 1.73 for S transducers 16.54 x 1.69 x 2.28 for Q and M transducers (chain length: 1/3/6 ft)	Length: 16/22 ft (on request also longer belts are available)

# Transducer Mounting Fixtures

<p><b>For permanent measurements</b></p>			
<p><b>Mounting Fixture</b></p>	<p><b>PermaRail</b></p>	<p><b>PermaLok</b></p>	<p><b>Block fastener</b></p>
<p><b>Description:</b></p>	<p>The PermaRail is FLEXIM's standard transducer mounting fixture and provides highest mechanical protection within all industrial environments.</p>	<p>The PermaLok is FLEXIM's mounting fixture for especially harsh and corrosive environments, e.g. offshore</p>	<p>The block mounting fixture is completely metal free and designed for applications at flexible tubings, e.g. to be used in clean room environments</p>
<p><b>Techn. Drawing:</b></p>			
<p><b>Material Standard:</b></p>	<p>Stainless Steel: 304 (1.4301), 301 (1.4310)</p>	<p>Stainless Steel: 304 (1.4301)</p>	<p>Polypropylene (PP)</p>
<p><b>Option Offshore:</b></p>	<p>Stainless Steel: 316 (1.4571), 316L (1.4404), 17-7PH (1.4568)</p>	<p>Stainless Steel: 316 (1.4571)</p>	
<p><b>Dimensions in inch (l x w x h):</b></p>	<p>VLK: 16.65 x 3.54 x 3.66 VLK opt. IP68: 17.44 x 3.7 x 4.13 VLM: 12.17 x 2.24 x 2.48 VLQ: 9.72 x 1.69 x 1.85</p>	<p>PLK-RL: 18.87 x 3.83 x 4.00 PLK-DS: 12.87 x 3.83 x 4.00 PLM-RL: 24.87 x 3.08 x 3.26 PLM-RS: 12.87 x 3.08 x 3.26 PLQ-DS: 13.75 x 2.68 x 2.38</p>	<p>For outer pipe diameters: 3/8", 1/2", 3/4", 1", 1 1/4" (others on request)</p>
			
<p><b>Mounting Fixture</b></p>	<p><b>Perma Fix</b></p>	<p><b>WaveInjector®</b></p>	
<p><b>Description:</b></p>	<p>The PermaFix mounting fixture is designed for mounting of FM Class I, Div, 1 transducers and associated conduits.</p>	<p>The WaveInjector® is FLEXIM's mounting fixture for extreme pipe wall temperatures from as low as -310 °F and up to +1100 °F.</p>	
<p><b>Techn. Drawing:</b></p>			
<p><b>Material:</b></p>	<p>Stainless Steel: 304 (1.4301)</p>	<p>Stainless Steel: 304 (1.4301)</p>	
<p><b>Option Offshore:</b></p>	<p>Stainless Steel: 316 (1.4571)</p>		
<p><b>Pipe size:</b></p>	<p>-</p>	<p>1.6 inches ... 40 inches</p>	
<p><b>Dimensions in inch (l x w x h):</b></p>	<p>PFK: 410 x 90 x 73 PFM: 310 x 68 x 44</p>	<p>WI-400K: l = 9.57 inch, h = 7.01 inch WI-400M, WI-400Q, WI-4001, WI-4004: l = 10.98 inch, h = 6.7 inch</p>	



## Process Analytics by means of Ultrasound and Refractometry



**Product characteristics like concentration and density can be detected continuously online using PIOX® process analyzers: non-intrusively with PIOX® S clamp-on ultrasonic systems and wetted with the PIOX® R process refractometer.**

### PIOX® brings analytics into the process

Both the acoustic measuring method and optical transmitted light measurement basically involve velocities: PIOX® S ultrasonic systems measure the propagation velocity of sound in the medium – also non-intrusively and with the same clamp-on ultrasonic transducers as FLEXIM's FLUXUS® flowmeter.

Due to the fact that density and volume flow are measured simultaneously, PIOX® S ultrasonic systems are particularly suitable for non-intrusively detecting mass flow rates – especially where any leakage risk must absolutely be excluded.

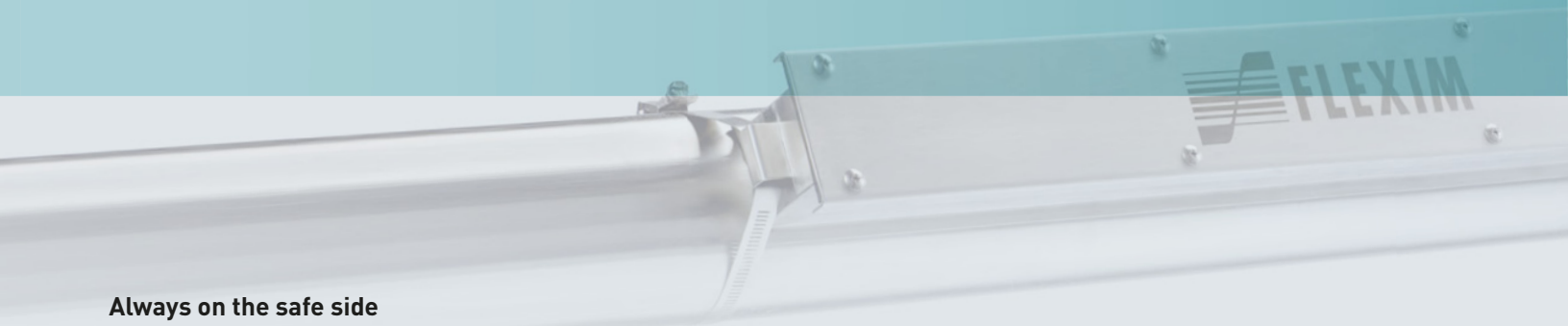
### Process insight through transmitted light

Refractometry – measurement of the refraction of light – is a long-established method for detecting the concentration, density or purity of liquid media. Refraction results from the change in the propagation velocity of light as it passes from the medium to the measuring prism.

Unlike conventionally used lab instruments, the PIOX® R process refractometer does not detect the refractive index indirectly via the critical angle of the total reflection but directly measures the angle of refraction of two monochromatic beams of light as they pass through the sample stream. The patented differential measurement in the transmitted light method is resistant to the formation of deposits and therefore particularly reliable.

# PIOX® S

## Process analytics with clamp-on ultrasonic technology




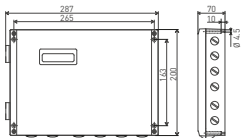
### Always on the safe side

PIOX® S transfers the practical advantages of clamp-on ultrasonic technology to process analytical applications: since the transducers are simply mounted on the – safe – outside of the pipe, they are not subject to any wear and tear by the medium flowing inside. As there is no need to open the pipeline for installation, mounting and initial operation can usually be done during ongoing operation. Non-intrusive process analytics with PIOX® S proves to be just as versatile and flexible as non-intrusive flow measurement with FLUXUS®:

- For almost all pipe sizes and materials – whether it's steel, plastic, glass or special materials with inline or outer coatings, in a nominal size range of 1/4 to 250 inches.
- For temperatures up to +1100 °F
- For hazardous areas – transducers and transmitters are available in FM, ATEX and IEC certified designs.

Non-intrusive online analytics with PIOX® S is the method of choice when materials and processes demand the highest levels of safety and reliability, e.g. in the case of corrosive media like acids or alkalis or even toxic compounds.



	<b>PIOX® S (Mass Flow)</b>	PIOX® S can be used to detect the concentration, density and mass flow rate of a medium in real-time by determination of the acoustic velocity and internal offsetting of the medium temperature.
	<b>FLUXUS® HPI</b>	When applying the specific product variant FLUXUS® HPI, it is possible to measure substance-specific data of hydrocarbons such as the specific density or the API-gravity. It also allows for direct recognition or differentiation of media which are successively transported through the pipeline.
	<b>Calibrated accuracy</b> <b>Mass flow:</b> <b>Concentration:</b> <b>Density:</b>	± 1.0 % of rd. ± 0.03 ft/s (ext. calibr.), ± 0.5 % of rd. ± 0.03 ft/s (Process calibr.) up to 0.1 % of reading* up to 0.1 % of reading* *(dependent of medium, temperature and concentration range)
	<b>Operating temp. of Transmitter:</b>	-4 °F ... +140 °F Transmitter PIOX® S704 / PIOX S709 -40 °F ... +140 °F Transmitter PIOX® S705 (316L / 1.4404 Stainless Steel enclosure)
	<b>Pipe wall temp.:</b>	-40 °F ... +390 °F (-310 °F ... +1100 °F with WaveInjector®)
	<b>Inputs:</b>	maximum 4, possible are: Temp. (Pt 100/1000 4-Loop), Current, Voltage
	<b>Outputs:</b>	Many combinations available, possible types: Current (0/4 mA ... 20 mA), Voltage, Frequency, Impulse, Alarm
	<b>Communication protocols:</b>	HART, Modbus, Foundation Fieldbus
	<b>Degree of protection Transducers:</b>  <b>Degree of protection Transmitters:</b>	IP65 / NEMA 4 to IP68 / NEMA 6P, optional ATEX Zone 2 and FM Class I, Div. 2  PIOX® S704: IP65 / NEMA 4, ATEX (IECEX) Zone 2 optional PIOX® S705: IP66 / NEMA 4X, ATEX (IECEX) Zone 2 as well as FM Class I, Div. 2 optional PIOX® S709: IP20 / NEMA 1, 19" Transmitter for operation in racks

## Process analytics with the transmitted light refractometer

### Laboratory accuracy in the process

Using PIOX® R400, the well-tried transmitted light measurement as a laboratory practice is reliable in the process. Measurement via the patented transmitted light method ensures maximum reliability. Extremely high measuring accuracy is achieved by measuring the refraction of two monochromatic light beams and evaluating the difference.

The PIOX® R400 comes in two versions, tailored to the requirements of various industries: the PIOX® R400 - H for applications where hygiene is particularly important, e.g. in the pharmaceutical, food and drinks industries as well as the PIOX® R400 - C for applications in the chemical industry. Both versions are available in various designs, materials and with a variety of flange styles which cover a wide range of applications.

Our application engineers are eager to assist you.

### PIOX® R400 - H

#### Process refractometer for hygienic applications

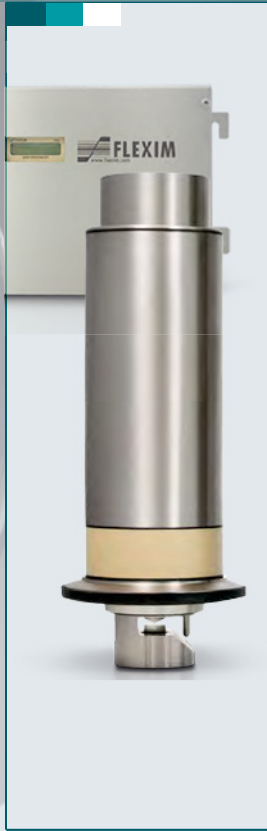
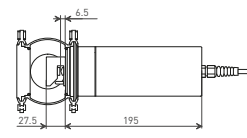

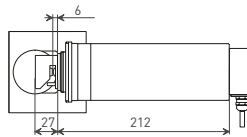
PIOX® R400 - H was developed especially for applications which require the highest level of purity and hygiene. The sensor unit is characterized by its cavity-free design which effectively prevents impurities from accumulating.

### PIOX® R400 - C

#### Process refractometer for chemical applications

PIOX® R400 - C was developed especially 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.

## Process Refractometer for Chemical and Hygienic Applications

	<b>PIOX® R400 Hygienic design:</b>	The hygienic design of the PIOX® R400 is the ideal process refractometer for applications in the pharmaceutical and food industry. The PIOX® R400 offers maximum process reliability, the highest level of precision and is resistant to deposit formation.
	<b>Measurement range:</b>	nD: 1.3 ... 1.7, °Brix: 0...100
	<b>Accuracy:</b>	nD: 0.0002 (corresponds to 0.1°Brix, typically 0.1 M%)
	<b>Temperature range:</b>	-4 °F ... +300 °F
	<b>Pressure range:</b>	PN10, PN 16, upon request PN 40 (dependent of the process connection)
	<b>Materials wetted sensor:</b> <b>Enclosure:</b> <b>Process connection:</b>	Stainless Steel 316L (1.4404), Optic: Sapphire Stainless Steel 304 (1.4301) Varivent or Tri-clamp compatible process connections
	<b>Degree of protection:</b>	Sensor: IP67 / NEMA 6, ATEX (IECEX) Zone 0/1, 1, 2; Transmitter: PIOX® R704: IP65 / NEMA 4, ATEX (IECEX) Zone 2 optional PIOX® R705: IP66 / NEMA 4X, 316L, ATEX (IECEX) Zone 2, FM Class I, Div. 2 optional PIOX® R709: IP20 / NEMA 1, 19 inch rack version
<b>Model MH, Varivent-Flange N</b>		<b>Model MH, Tri-clamp-Flange 3"</b>
	<b>PIOX® R400 Chemical design</b>	The chemical design of the PIOX® R is the ideal process refractometer for applications in the chemical industry. Due to the special seal design and the fact that the measuring head is separated from the transducer equipment, the PIOX® R ensures maximum process reliability even in the presence of corrosive and toxic media.
	<b>Measurement range:</b>	nD: 1.3...1.7, °Brix: 0...100
	<b>Accuracy:</b>	nD: 0.0002 (typically 0.1 M%)
	<b>Temperature range:</b>	-4 °F ... (+265 °F) +300 °F
	<b>Pressure range:</b>	PN10, PN 16, upon request PN 40 (dependent on the process connection)
	<b>Materials wetted sensor:</b> <b>Enclosure:</b> <b>Process connection:</b>	Stainless Steel Version: 316Ti (1.4571), Optic: Sapphire PTFE Version: Completely carbon fibre reinforced PTFE, Optic: Sapphire Stainless Steel Version: 304 (1.4301) PTFE Version: Epoxy resin coated Stainless Steel 304 (1.4301) DIN/ANSI compatible flange, FLEXIM flow chamber, Richter gauge-glass
	<b>Degree of protection:</b>	Sensor: IP67 / NEMA 6, ATEX (IECEX) Zone 0/1, 1, 2; Transmitter: PIOX® R704: IP65 / NEMA 4, ATEX / IECEX Zone 2 optional PIOX® R705: IP66 / NEMA 4X, 316L, ATEX (IECEX) Zone 2, FM Class I, Div. 2 optional PIOX® R709: IP20 / NEMA 1, 19 inch rack version
<b>Model MC, FLEXIM-Flange</b>		<b>Model LC, DIN / ANSI-Flange</b>



## In partnership

For over two decades, 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-intrusive clamp-on ultrasonic flow measurement of liquids and gases, FLEXIM has repeatedly set standards. In addition to non-intrusive 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 AMERICAS is dedicated to the service needs of our customers

FLEXIM's focus and dedication is directed towards providing the highest quality equipment with the best support and service possible.

Our goal is to provide our customers with the level of technical support required to get the maximum benefit from our line of measurement instruments including on-site measurements, flow surveys, flow meter calibration, laboratory analysis, project handling, training, commissioning and consulting.

FLEXIM also offers a wide variety of purchasing options, making the equipment you need affordable on any budget. Whether you are looking to buy, rent, or lease equipment, FLEXIM has a financial plan that will meet your needs.

Individual Service Contracts are available to meet your requirements for preventive maintenance, general maintenance and calibration services. Contact the FLEXIM Service Department for additional information.

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FLEXIM has offices located throughout North America. Please have a look for your local representative at:

**[www.flexim.com](http://www.flexim.com)**

**or call us at:**

**1-888-852-PIPE**

