

FLUXUS[®] G

Non-Invasive Gas Flow Measurement

Natural Gas Extraction

Offshore

Gas Transmission

Storage

Chemical Industry

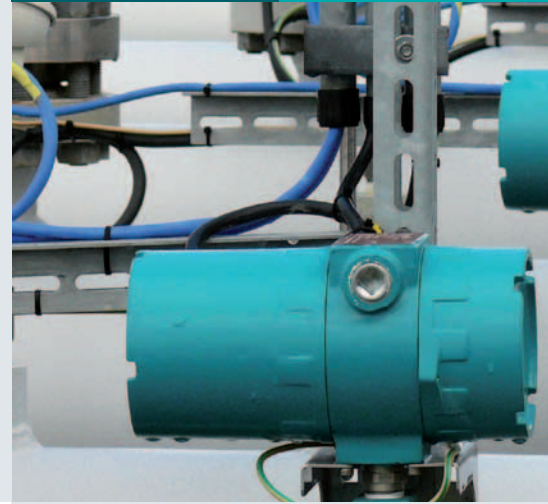
Petrochemical Industry

Manufacturing Industry

**External Measurement
of Internal Flow**



Non-Invasive Gas Flow Measurement with FLUXUS® G



FLEXIM's ultrasonic gas flow meters use the proven clamp-on transit-time correlation technique also employed for the F series liquid meters. Special ultrasonic transducers are simply clamped onto the outside of the pipe and never come in contact with the gas.

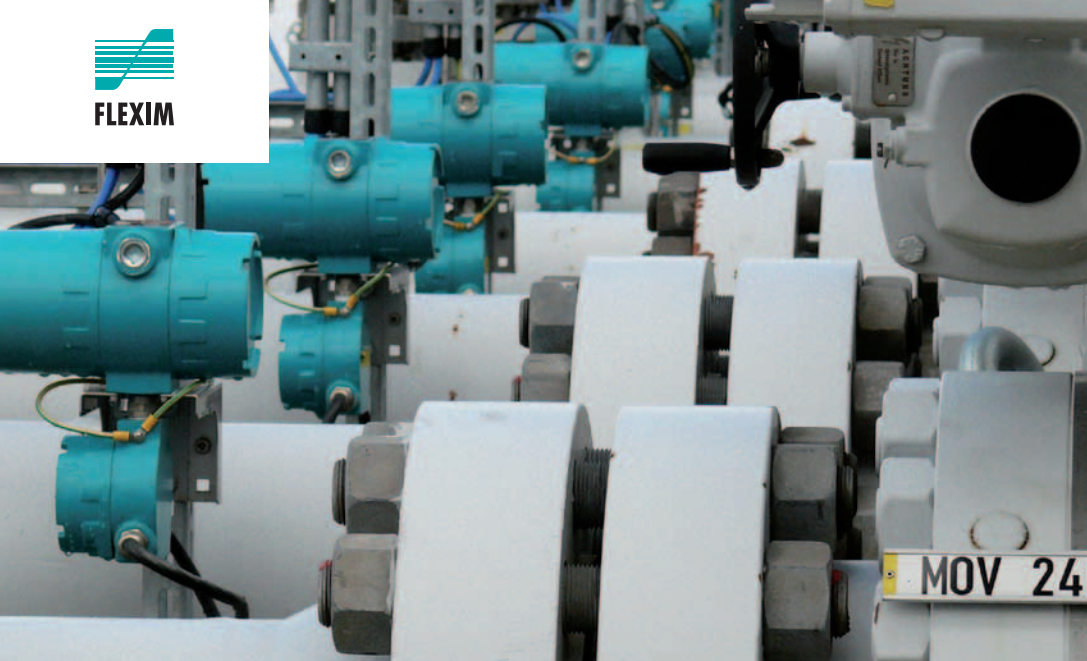
The FLUXUS® G series contains a broad variety of transmitters and transducers: from basic models for standard applications up to robust measuring systems for offshore use or for use in hazardous areas.



Our tradition is innovation

Ever since its inception, FLEXIM has been among the pioneers in the field of ultrasonic flow measurement. Many years of application experience combined with innovative concepts and solutions have allowed FLEXIM to extend the scope of the ultrasonic technology to non-invasive measurement of gases.

Now, with the FLUXUS® G series, FLEXIM sets a new standard. Special transmission technology combined with powerful software algorithms and intelligent adaptive signal processing gives these instruments the dependability you have come to expect from FLEXIM.



Adaptive Signal Processing

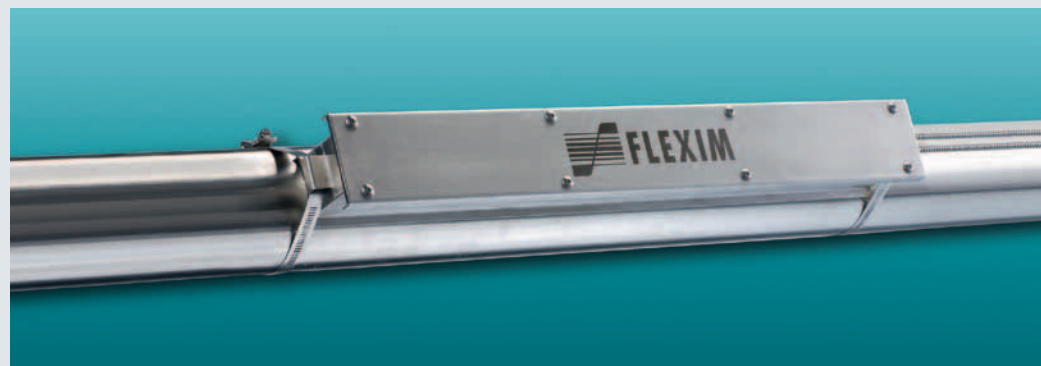
In order to maximize the signal to noise ratio, an optimized transmission process featuring **multipulse excitation** was developed. The versatile measurement algorithm automatically adapts to the varying application conditions. Thus, disturbing factors such as beam dispersal and structure-borne pipe noise can be effectively compensated.

The **FLUXUS® G** series instruments use digital signal processing. This enables them to adapt easily to a great variety of measuring tasks. Up to 1000 raw signals per second are transmitted for signal processing and analysis.

FLEXIM's signal processing algorithms reflect many years of experience in extracting desired signals and rejecting unwanted noise signals. Thus, even weak signals of only a few μV are reliably detected and processed.

Wide dynamic range amplifier

The **FLUXUS® G** measurement amplifier offers a uniquely wide dynamic range by including various frequency filters which are automatically tuned to the appropriate transducer frequency. This is particularly advantageous in the case of clamp-on ultrasonic gas flow measurement, which has to contend with very low signal levels.



Superior Functionality



FLUXUS® G represents the ideal solution for non-invasive gas flow measurement. FLEXIM's non-invasive technology is an advantageous and cost-effective alternative to conventional methods, particularly with chemically aggressive, poisonous or high pressure media. With their extremely wide turn-down ratios, the instruments of the **FLUXUS® G** series register even the smallest flows.

Non-invasive measurement

- No contact with the medium, therefore no possibility of chemical attack. No need for expensive special materials (sour gas applications for example)
- No wear and tear, even with high flow velocities or with gas containing particles
- No clogging of small bore impulse lines with deposits, condensate, inhibitors, oil vapours, dust (as happens when using impulse lines in the measuring system)
- Insensitive to dust and humidity





Transducers are mounted on the pipe

- Very cost-effective installation
- Easy installation without process interruption
- No welding work
- No risk of leakage
- Cost-advantageous, especially in high-pressure applications and for large pipe diameters
- Absolutely no pressure loss, thus low operating costs
- No pipe diameter reduction, therefore no pipe clogging

No moving mechanical or pressure loaded parts

- Safe and maintenance-free
- Measurements can be made even at high operating pressures
- Unharmed by pressure peaks (for example at the onset of condensation)

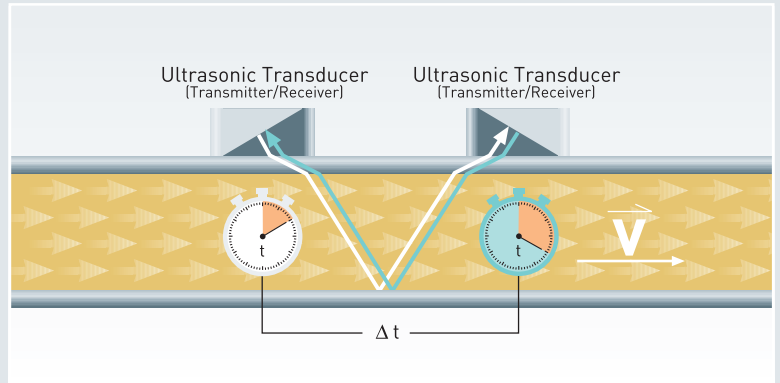
Precise, bi-directional flow measurement with high measurement dynamics

- Even minute flows are measurable
- Measurement is unaffected by gas density, viscosity and composition, dust, humidity, temperature or pressure
- Not sensitive to velocity peaks, swirling flows or transverse flows
- Long-term stable measurement results
- High measurement rate, fast response time

→ Approved for explosion hazard areas



Technical Data



Ultrasonic flow meters natively measure the actual volumetric flow. The transmitters feature an integrated flow computer which makes use of external temperature and pressure data to convert the actual volumetric flow into standard volume (mass) flow based on ISO 12213-1.

In principle, flow measurement is possible on all types of gases. However, when measuring on metal pipes, a certain minimum pressure is required, depending on the composition of the gas and the pipe material. Plastic pipes will support operation at atmospheric pressure.

Our application engineers will be pleased to advise you.

The **Transit Time Difference Correlation Principle** makes use of the fact that the time of flight of an ultrasonic signal is affected by the flow velocity of the carrier medium. Like a swimmer working his way across a flowing river, an ultrasonic signal travels slower upstream than downstream.

Our instruments work according to this transit-time principle: an ultrasonic pulse is sent downstream through the medium, another pulse is sent upstream. By measuring the transit-time difference, the flow velocity can be determined. The volumetric flow is then calculated out of the flow velocity and the pipe parameters.

General Technical Data

Measuring principle:	Transit time difference correlation principle
Flow velocity:	0.03 to 115 ft/s, pipe size dependent
Repeatability:	0.15 % of reading ± 0.03 ft/s
Accuracy (given a fully developed rotationally symmetric flow profile)	Volume flow: ± 1 % to 3 % of reading ± 0.03 ft/s, depending on the application ± 0.5 % of reading ± 0.03 ft/s with field calibration
Measurable gases:	Ratio of the characteristic acoustic impedance of the pipe wall material to that of the gas < 3000
Operating pressure:	Measurement does not restrict the maximum operating pressure
Pipe size range:	1/4 inch to 62 inches
Gas temperature:	-40 °F to 390 °F, depending on the transducer type

Applications



Oil and Gas

Measurement on natural gas pipelines

Measurement in natural gas storage installations (storage and extraction)

Management of gas storage facilities (efficiency maximization, performance optimization, salt cavern leaching)

Regulation and control of drilling sites in natural gas extraction

Control of compressor stations

Dimensioning of extraction sites and drilling probes (efficiency maximization)

Measurement of ethane, propane and hydrogen

Measurement of sour gas

Measurement for the gas supply industry

Measurement of injection gas in the petroleum industry

Allocation and checkmetering

Inventory control / Lost and unaccounted for gas analysis

Measurement of injection media in gas processing (monoethylamine, TEG, etc.) with upgraded instrument.

Ask FLEXIM!

Chemical Industry

Measurement of synthesized gas

Gas measurement in the plastics production process (high pressure)

Measurement of ethylene, helium and nitrogen

Manufacturing industry

Measurement of compressed air

Service

Supervision of permanently installed meters

Error diagnostics

Service and maintenance



Gas storage facility Kalle, Germany, © RWE

The Transmitters



A FLUXUS® G for all purposes

Whether for portable use, for rack-mounting or for permanent installation, or even for offshore use: FLEXIM offers the appropriate **FLUXUS® G** to meet each measurement challenge. ATEX and FM certified measurement systems for use in hazardous areas are available. Versatile process interfaces assure optimal integration into the user's process.

Guaranteed user friendly

No complex and elaborate instructions are required in order to use the intuitively structured menu of the **FLUXUS® G**. The pipe and material parameters are easily entered, thanks to the internal media and materials data bank. Explosion-proof instruments can be operated without opening the housing and without requiring any additional devices.



Technical Data

Operating temperature:

Measuring channels:

Protection degree acc. to EN60529 / NEMA:

Explosion protection in:

Inputs:

Outputs:

Calculation of the standard volume flow according to AGA-8 and ISO 12213-1:

Communication protocol:

The Portable All-round Meters
FLUXUS® G601 (CA Energy)
FLUXUS® G608

The Multi-function Meters
FLUXUS® G704
FLUXUS® G709

The Explosion-proof Experts
FLUXUS® G800
FLUXUS® G801



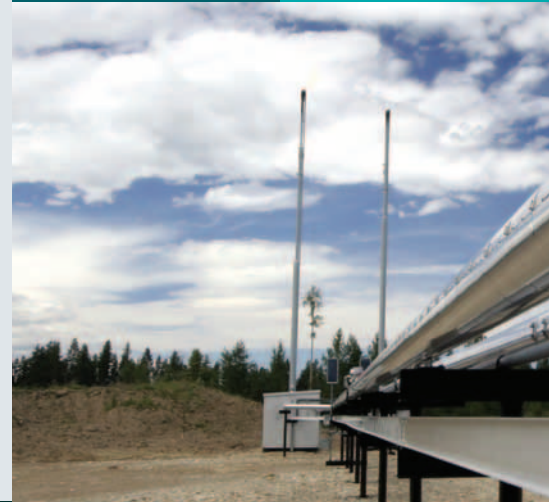
The highly mobile and versatile **G601** is perfectly suited for temporary usage during servicing, maintenance, check metering or as back-up for short term replacement of failed meters. As product variant **G601 CA Energy**, the portable meter is the ideal instrument when compressed air and thermal energy flows have to be measured. The **G608** goes even further and is **ATEX as well as FM approved** for its usage in explosion hazard areas.

Permanently installed and freely configurable: The **FLUXUS® G704** is designed for permanent installation. With its range of electrical inputs and outputs, it can handle a variety of process parameters. Although technically identical to the G704, **FLUXUS® G709** is designed for permanent installation in 19" rack systems.

FLUXUS® G800 and **G801** are ATEX certified for use in hazardous areas. The especially robust **G801** is completely seawater-resistant and therefore ideal for offshore applications.

14 to 140 °F	-4 to 140 °F	-4 to 122 °F
2	1 or 2	1 or 2
IP65 / NEMA 4X	G704: IP65 / NEMA 4X G709: IP20 / NEMA 1	IP66
G608: ATEX Zone 2 (1), FM Class I Div II	ATEX Zone 2, FM Class I Div II for G704	ATEX Zone 1 and 2
Standard: — Multifunctional: 2 x current, 1 x voltage, 1 x temperature (only G601)	Maximum 4. Available are: temperature (Pt 100 / Pt 1000), current, voltage	—
Standard: 2 x current, 2 x binary Multifunctional: 2 x current, 2 x binary, 1 x frequency (only G601)	A variety of combinations are available from the following: current (0/4 mA to 20 mA), voltage, frequency, pulse, alarm	1 current output, 1 binary output (OC). Also available: 1 or 2 binary outputs (relay), 1 binary output (OC) and 1 current output
Yes	Yes	Yes
—	HART, Modbus RS485	HART, Modbus RS485

The Mounting Fixtures



Two transducers types providing a uniquely wide application range

All **FLUXUS® G transmitters** support both lamb wave and shear wave transducers at all transducer frequencies. In this way the measuring system can be optimized to the process. The Lamb wave transducer is ideal for high velocity gas measurement as found in natural gas pipelines. The shear wave transducer covers a wide range of pipe diameters and wall thicknesses. It is the best choice for mobile measurement and application diagnostics, as well as for thick-wall pipes.

Robust construction

All **FLEXIM clamp-on transducers** are watertight and especially made for use in harsh industrial environments. The transducer housings are made of PEEK or PPSU with stainless steel protection caps. Robust construction and rugged wiring guarantee long-term stability and measuring reliability.

Paired, calibrated transducers

Each pair of transducers has been wet-flow calibrated at the factory. All calibration data is stored in a transducer-resident non-volatile memory and is automatically transferred to the transmitter upon connection. Consequently, parameterization errors are eliminated and there is never a need for a zero adjustment.



Our application engineers will be glad to offer you expert advice. Call for an application review today!

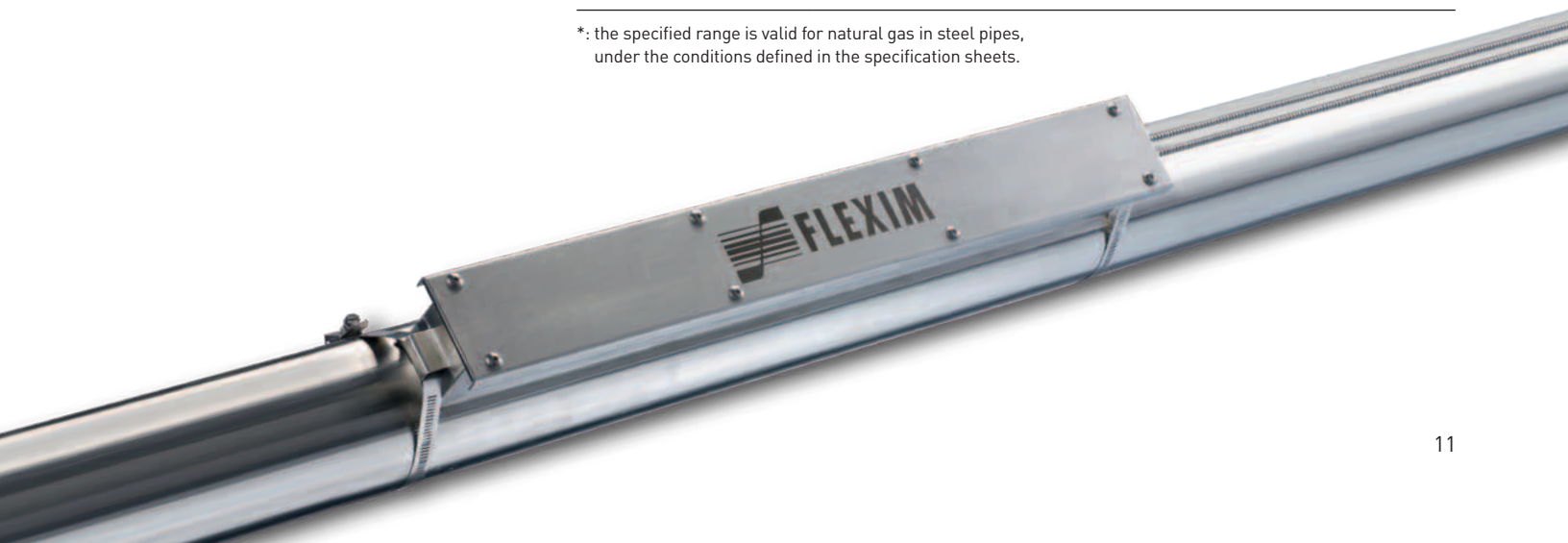
Robust transducer mounting fixtures

The **PermaLok** mounting fixtures hold the transducers safely in place and ensure continuous and constant contact pressure between the transducers and the pipe surface, even if temperature variations cause the pipe diameter to change. Made of stainless steel, they are corrosion-proof and wear resistant. The transducers can be removed and remounted onto the **PermaLok** rail without readjustment.

General Technical Data of the Transducers

Application range*:	Shear wave transducers: Transducers available for diameters from 0.6 to 44 inch. A minimal pipe wall thickness is required.
	Lamb wave transducers: Transducers are available for diameters from 1/4 to 62 inch and wall thicknesses from 0.002 to 0.9 inch. Each transducer type is assigned to a given wall thickness range.
Operating temperature:	Gas temperature and ambient temperature: between -40 to 390 °F, depending on the transducer type.
Use in explosion hazard area:	Transducers for ATEX Zone 1 and 2 as well as for FM Div 2 available
Explosion protection temperature:	Depends on the transducer type and on the atmosphere type. The explosion protection range is usually wider than the operating temperature range.
Protection degree acc. to EN60529 / NEMA:	IP56, IP65, IP67, IP68 / NEMA4, NEMA 6, NEMA 6P
Material:	PPSU or PEEK with stainless steel caps

*: the specified range is valid for natural gas in steel pipes, under the conditions defined in the specification sheets.





FLEXIM

In partnership
with you



FLEXIM is an active leader in many areas of process instrumentation. As a world-wide pioneer in the non-intrusive flow measurement of liquids and gases, FLEXIM has been leading the way in ultrasonic clamp-on flow metering for more than 20 years. In addition to non-intrusive flow measurement, FLEXIM specialises in innovative online process analysers using ultrasonic technology and refractometry.

Year after year, the Berlin based company continues its substantial investment in research and development in order to maintain and further improve its position as an industry leader. In keeping with its core principles, FLEXIM takes customer feedback very seriously. Every generation of FLEXIM products is directly driven by customer and industry needs.

The FLEXIM commitment to customer service

FLEXIM considers itself not only a manufacturer of measuring instruments, but also a provider of technical and consulting services. These services include instrument rentals, on-site measurements, laboratory analysis, project handling, training, commissioning and consulting services.

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

FLEXIM AMERICAS Corp.

Edgewood, NY 11717
Phone: +1 631 492 23 00
Fax: +1 631 492 21 17
Toll free: 1 888 852 74 73
(North America only)
usinfo@flexim.com
www.flexim.com



BUGASV5-2US Subject to change without notification. 2012/01