

# Upstream Solutions

Non-intrusive Flow Measurement of Liquids and Gases  
Offshore and Onshore

## Oil and Gas Exploration and Production

- Wellhead Monitoring
- Gathering Lines
- Separator Outlets
- Water Injection
- Produced Water
- Coalescers and Desalters
- Scrubbers and Reboilers
- Chemical Injection
- Gas Compression
- Gas Injection and Gas Lift

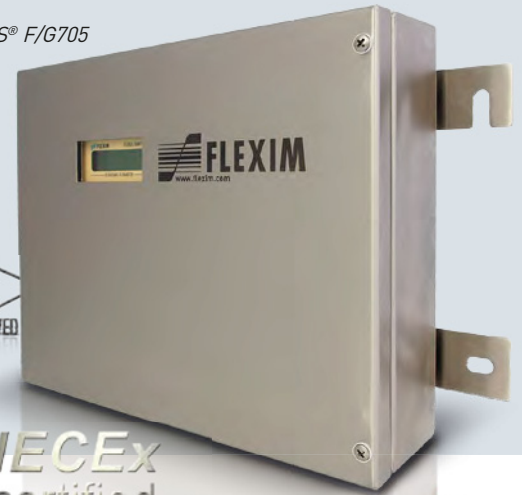


FLUXUS® F/G705

The superior metering solution Upstream

## Non-intrusive ultrasonic flow measurement with FLEXIM

Rugged - Reliable - Efficient



IECEx  
certified

**Extracting oil and gas means handling enormous amounts of energy. High pressures and corrosive environments are often the norm. Operational safety is the first commandment, and efficient production is imperative. FLEXIM flow meters will help reduce your maintenance and leak points, while improving safety and efficiency.**

Upstream operations often encounter some of the most challenging conditions in the Oil&Gas industry - inside and outside the pipe. High pressures, extreme temperatures, abrasive media, seawater spray and so on. Moreover, the produced flows rarely come in a single, pure phase, but are mostly mixtures of gases, liquids and entrained solids. No contacts means fewer problems.

### External Excellence

FLEXIM's non-intrusive flow meters provide bi-directional flow measurement from outside the pipe. Our hermetically sealed transducers are installed in rugged stainless steel mounting fixtures, and may be commissioned under flowing conditions. External means no exposure to corrosive or hazardous media, resulting in accurate and reliable measurement over an almost unlimited flow range.

The FLUXUS® G - for gases - and FLUXUS® F - for liquids - meter series comprises permanent and portable instruments certified for ATEX (IECEx) Zones 1 / 2 and FM Class I, Div. 1 / 2. Each pair of transducers is carefully matched, features a unique internal temperature compensation (acc. to ANSI / ASME regulations) and is wet-flow calibrated at the factory (traceable to national standards), ensuring a very high accuracy.







## Unrivalled advantages of the non-intrusive flow measurement with FLEXIM in Upstream applications:

- No process shut-downs or interruption of flow / productions - maintenance free (no need for frequent work in hazardous areas)
- High tolerance of wet gas (LVF up to 5%) or entrained solids in the liquid media (up to 10% content by volume)
- Certified for operation within hazardous areas (ATEX, IECEx, FM)
- Fast measuring dynamics capturing highly pulsating flows
- High operational safety with no leak risk
- No pressure losses, no line clogging
- Independent of pipe material, diameter, wall thickness and internal pressure
- Accurate and repeatable measurement readings - even at extremely low flow rates (high turndown ratio)
- Highly cost efficient in comparison to wetted instrumentation

## Technical facts

Temperature ranges:	
Liquid media:	-40 °C to +200 °C (-190 °C up to +600 °C possible)
Gaseous media:	-40 °C to +100 °C
Flow rates:	
Liquids:	0,01 to 25 m/s
Extremely low flows:	> 3 l/h on 1/4 inch pipes (up to 1.5 inch pipes)
Gases:	0,01 to 35 m/s
Repeatability:	0.15% of reading ± 0.01 m/s (± 0,001 m/s for low flows)
Calibrated accuracy:	
Liquids:	± 1,2% of reading ± 0,01 m/s
Gases:	± 1% ... 3% of reading ± 0,01 m/s
(if field calibrated):	± 0.5% of reading ± 0,01 m/s (liquids and gases)
Pipe sizes (outer diameter):	
Liquid filled pipes:	6 mm to 6,5 m (no wall thickness limitation)
Gas carrying pipes:	10 mm to 2,1 m up to 35 mm inches wall thickness
Protection degree:	up to IP68 / NEMA 6P
Ex approvals:	ATEX (IECEx) Zone 1 and 2, FM Class I, Div. 1/2
Pressurisation:	no limitations for liquids > 5 bar for gases in steel pipes; plastic pipes < 1 bar

## Unique features of the FLUXUS® flow meters:

- Engineered for the reliable measurement of liquid and gas flow rates
- Accurate and reliable metering at wet gas or particle loaded liquids - due to its built-in HybridTrek® mode
- Virtually free of wear and tear with no maintenance required due to measurement outside the pipe wall
- Every measurement system is pre-calibrated in house (traceable to national standards) and delivered with a calibration certificate
- Matched transducers, integrated temperature compensation (according to ANSI/ASME MFC-5.1-2011 regulations) and digital signal processing guarantee a high zero point and flow measurement stability
- Permanent coupling with unique couplant pads, FlexSpring secured mounting fixtures guarantee durable contact pressure also on heavily vibrating pipes
- Applicable on pipes with cathodic protection

# Field-Proven Clamp-On Flow Measurement

## State-of-the-Art Ultrasonic Technology for Flow Measurement in Upstream Operations

Today, FLEXIM stands its ground in upstream operations worldwide, onshore and offshore. FLEXIM's ultrasonic flowmeters have been approved by major oil & gas companies. Renowned and independent calibration rigs and laboratories have tested and verified their performance.

In comparison to conventional measurement technologies, FLEXIM's ultrasonic liquid and gas flow meters offer the superior solution for virtually any liquid and gaseous media, especially within challenging applications. From wellhead to the refinery: FLEXIM's clamp-on flowmeters are used every step of the way at many global Oil & Gas operators.

### Also for portable measurements

With the FLUXUS® F/G60X portable flow meters, FLEXIM also provides solutions for the temporary measurement of liquids and gases – even within hazardous areas (ATEX / IECEx Zone 2 and FM Class I, Div. 2 approved).



FLUXUS® F/G60X



# Upstream Flows

- 1. Wellhead and Gathering Lines
- 2. Separators
- 3. Gas Dehydration and Compression
- 4. Produced Water Injection / Dumping
- 5. Gas Injection and Gas Lift
- 6. Chemical Injection
- 7. Shale Gas - Water Logistics
- 8. Shale Gas - Wellhead Production







## Wellhead and Gathering Lines

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Flow rate monitoring in regard to the performance of individual wellheads and gathering lines is of crucial importance for **wellhead pump control and separator feed balancing**.

FLEXIM's clamp-on flow meters **accurately measure pulsating flows at highly dynamic pressure rates even at multiphase (water/oil mixtures) streams with solid / gaseous contents of up to 10 % by volume or on lines carrying heavily moisturized gas up to Liquid Volume Fractions of 5%**. Also aging gas wells with low production pressures are not a challenge for FLEXIM as the system measures at pipes with internal pressures rates as low as 5 bar.

## Separators

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Whether On- or Offshore, FLEXIM's gas and liquid flow meters are the ideal solution for monitoring gas, oil and water outlet streams at a separator. Being mounted on the pipe wall outside they are **not affected by wear or mechanical stress due to the abrasive media and are thus virtually maintenance free**.

Even thick walled pipes (up to 35 mm) - to cope for the high internal pressurisation levels - are not a challenge for the FLEXIM flow meters.

## Gas Dehydration and Compression

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Separated gas often needs to be dehydrated in scrubbers and associated reboilers before reaching the compressor. FLEXIM's liquid and gas flow meters measure the counter flowing gas and glycol (and others) streams, delivering **accurate flow data for achieving an efficient conversion process**. Gas flow control at the compressor outlet, by making use of the fast measuring dynamics of the FLEXIM flow meter, helps to recognize compressor surges and to immediately take measures to prevent damages. Mounted outside the pipe, the FLUXUS meter is **never a risk for the compressor, as might be the case if a wetted measurement system disintegrated due to process conditions or corrosion**.

## Produced Water Injection / Dumping

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Produced water is an unwanted media during wellhead production. Either it is environmentally treated and later dumped over board - in the case of Offshore rigs - or it is injected back into the wellhead helping to improve the production performance. As produced water often contains significant amounts of sand, it also causes severe abrasion on the piping equipment and wetted instrumentation. As the FLEXIM flow meters reside outside the pipe and **easily cope with a high degree of solids within the medium, due to the built-in Hybrid Trek® mode**, they are the most reliable and long term stable measuring system available.

## Gas Injection and Gas Lift

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The gas lift technology is employed when the wellhead pressure is too low to achieve free flowing oil. **Accurate and reliable flow measurement of the injected gas is vital as too little or too much gas severely impedes the oil production**. Conventionally used DP meters are subject to abrasion, tend to drift and subsequently provide false data for the control of the gas injection rates. **FLEXIM overcomes this challenge by measuring the gas flow rates from the pipe wall outside and enables the operator to achieve higher process efficiencies**.

## Chemical Injection

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Especially during gas exploration, chemical injection is of crucial importance to prevent sulphur crystallization or hydrate formation. **The amounts of chemicals injected are low but highly pulsating, requiring both accurate but especially a highly reliable and durable measurement technology**. Conventional technologies such as Coriolis or DP meters encounter problems coping with such high mechanical stresses and need frequent maintenance. **The FLUXUS® XLF low flow meter is the ideal solution for monitoring low flows down to 3 l/h (and below) on a typical ½ inch line**. Mounted on the pipe outside it is independent of the internal pressurization and wall thickness and can measure bi-directional flow.



FLUXUS® F/G80X

## Portable Flow Surveys

Not every measurement point within an Oil & Gas exploration and production site needs to be constantly monitored by a permanent meter. Thus, it is helpful to employ FLEXIM's range of **hazardous area certified portable liquid and gas flow meters for regular surveys and check metering / verification tasks.**

## Upstream Services

FLEXIM's On- and Offshore certified instrumentation engineers also provide a wide range of flow measurement services for the global Upstream industries, including:

- Fire pump flow performance testing
- Meter verification
- Flow audits
- Valve leak tests
- Regulatory compliance metering



## Shale Gas - Water Logistics

Shale gas E&P requires a strong water logistics in terms of water injection at the wellhead, but also during production when the produced water has to be treated and removed. As most production sites are remote and only temporary, most of the water logistics is done by truck hauling services. In such cases the **FLEXIM meters provide for an ideal mass flow measurement of water including brine solutions and additionally offer the advantage that they can easily be placed from one metering location to another. FLEXIM meters are also impervious to sand abrasion making them ideal flow meters for this demanding application.**

## Shale Gas - Wellhead Production

At the separator outlet several media streams have to be measured - gas or oil as well as the brine fluid. When employing insertion meters, the wells require to be turned down a few times per year for maintenance and or replacement of those meters resulting in a major loss of revenue of the production well(s). **FLEXIM's flow meters require little to no maintenance, resulting in no revenue losses.**



# FLEXIM

In partnership



FLEXIM is an active leader in many areas of process instrumentation. As a worldwide 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 specializes in innovative online process analysis 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 on-site measurements, laboratory analysis, project handling, training, commissioning, instrument rentals and consulting services. The company's focus and dedication is directed towards providing the highest quality equipment with the best support and service possible.