SIEMENS

Manage flow and stay in control of your budget

SITRANS F US clamp-on ultrasonic flow technology offers exceptional performance with a low cost of ownership

Answers for Industry.

Cost savings without compromise

In today's volatile economy, companies worldwide are finding it increasingly necessary to cut costs in order to remain profitable. For an industrial facility, this includes making prudent choices when selecting process instrumentation. You face the formidable challenge of striking a balance between value and performance – and the decision you make can have long-lasting implications for your bottom line.

With SITRANS F US clamp-on ultrasonic flowmeters from Siemens, no compromises are necessary. Clamp-on flow measurement technology offers outstanding cost savings without sacrificing the high level of accuracy and reliability required by a wide variety of industries. The result: improved process efficiency with a smaller impact on your budget.

Siemens clamp-on flowmeters can enhance productivity and save money for a broad range of industries and applications, including:

- HVAC
- Power
- Water and wastewater
- Gas
- Hydrocarbon
- Chemical
- Mining
- Leak detection
- HVAC

Why choose clamp-on?
Flow measurement determines the quantity of a material passing through a pipe at a particular location and point in time. It is a critical element of most industrial processes for the purposes of product quality control, efficiency and safety monitoring, and revenue-based custody transfer.

SITRANS F US clamp-on flowmeters are one of the most versatile and affordable flow measurement options available, offering a combination of advantages unmatched by other meters:

- Low cost of ownership since no cutting of the pipe or process downtime is required for installation or replacement
- Virtually no need for maintenance due to a lack of moving parts
- High level of accuracy comparable to alternative flow technologies
- No potential for leak points
- Comprehensive diagnostic menus for valuable insight into process characteristics
- High resistance to suspended solids and aeration
- Measurement of both conductive and non-conductive liquids

The sensors are key

The cost-effectiveness of SITRANS F US clamp-on flowmeters stems from their use of external sensors to measure flow. Unlike conventional flowmeters, which require shutting down the process to cut into the pipe, clamp-on meters are externally mounted – simplifying installation and eliminating the need for plant downtime. And, since the sensors never touch the fluid, they are practically maintenance-free.

But while the sensors are the key to the reasonable upfront and operating expenses of the SITRANS F US clamp-on line, they also play a crucial role in ensuring exceptional performance for almost any application. Their unique WideBeam (high precision) measurement capability uses the resonant frequency of the pipe to transmit the sound wave through the flowing liquid or gas, with the pipe wall acting as a waveguide. This method optimizes the signal-to-noise ratio to produce a particularly strong and focused signal for the highest possible measurement precision.

Other benefits of SITRANS F US clamp-on technology include:

- Measurement of practically any liquid or gas
- Performance unaffected by viscosity, flow rate, pipe size, outside noise and presence of aeration or solids
- High accuracy and repeatability via automatic temperature compensation and zero drift correction
- Installation on pipe sizes up to DN 9140 (360")
- Built-in algorithms compensate for many different upstream pipe configurations, including limited straight runs
- Bidirectional flow capability
- No pressure drop
- High turndown ratio
- Easy-to-use Si-Ware interface software
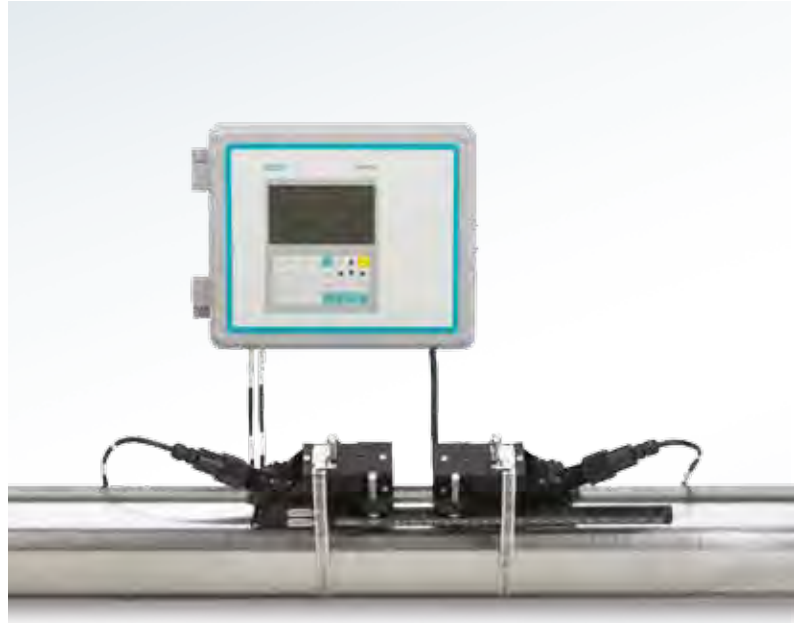
Flexible solutions for every industry and application

No two industrial facilities are exactly the same – so why settle for a one-size-fits-all flow solution? Siemens offers a diverse portfolio of clamp-on ultrasonic flowmeters designed to meet every need, complemented by a highly customizable catalog of configuration options and accessories.

SITRANS FUS1010
The SITRANS FUS1010 is the most versatile clamp-on ultrasonic flowmeter available. Because it can operate in either WideBeam or Doppler mode, there is no need to change the meter when operating conditions change.

SITRANS FST020
The SITRANS FST020 performs basic flow functionalities and is an optimal and affordable alternative to more complex flow solutions. It features one-channel configuration options and a user-friendly design for quick and easy setup.

SITRANS FUP1010
The SITRANS FUP1010 offers maximum versatility and robustness plus 7 hours of battery power for portable field use. It is ideal for general flow survey work or as a check meter for existing conventional meters, and can also serve as a temporary replacement for inoperable flow devices.

SITRANS FUE1010
The SITRANS FUE1010 is designed for revenue-grade thermal energy submetering and energy efficiency distribution monitoring. Particularly suitable for large pipe sizes, it allows for measurement of both low flow rates and low differential temperatures.

SITRANS FUG1010
The SITRANS FUG1010 offers a number of advantages for the gas industry, including tolerance of challenging wet gas conditions. It also measures standard volume flow for fixed gas compositions without needing a separate flow computer.

SITRANS FUH1010
The SITRANS FUH1010 for hydrocarbon applications is available in three versions: Standard Volume, Precision Volume and Interface Detector. It demonstrates high-level performance under a wide range of viscosities and is ideal for pipelines carrying multiple products.

SITRANS FUT1010
The SITRANS FUT1010 is a perfect match for the hydrocarbon industry. With the unique TransLoc mounting system, the sensors are permanently installed on a supplied pipe section appropriately sized for the application, and lab calibrated to allow for custody-transfer accuracy.

Check metering kits
For added convenience, several SITRANS F US clamp-on flowmeters are also available as portable, pre-configured check metering kits with weatherproof rolling cases. The kits come in four versions: general liquid, water and wastewater, energy, and gas.

FUS-LDS Leak Detection System
The FUS-LDS Leak Detection System is a complete software and hardware solution for liquid pipelines. It uses clamp-on ultrasonic flowmeters and SIMATIC WinCC leak detection software for up-to-the-minute monitoring of all pipeline activity.

Thickness gauge
High-quality pipe dimensional data is essential for accurate clamp-on ultrasonic flow measurement, which makes the stand-alone digital pipe wall thickness gauge an indispensable tool. It operates at a 5 MHz frequency for extremely precise measurement of any pipe thickness.

Si-Ware
This free, multi-language software package combines the functions of five individual tools to interface with a SITRANS F US clamp-on flowmeter and assist in selecting the proper equipment for a given application.

Mounting options
Installation of SITRANS F US external sensors can be simplified and made more precise with one of several application-dependent mounting frames:

- **Standard.** Appropriate for most applications in non-challenging environments and constructed in anodized aluminum, standard mounting frames are attached to a pipe with stainless steel straps to maintain a fixed location. Sensors can then be installed or removed without moving the frames.

- **Hi-Precision.** Hi-Precision Mounts are manufactured in rugged 316 stainless steel to provide secure mounting and maximum protection for all C, D high-precision and E universal sensors. They are ideal for harsh or corrosive environments.

- **Magnetic.** Magnetic Mounts are a strap-free solution for large pipe sizes DN200 (8") or greater where employing straps would be cumbersome and expensive. Compatible with all C, D and E universal and high-precision sensors, they feature powerful magnets to ensure quick and accurate setup, even for one person. Magnetic Mounts can also be paired with straps for permanent installations.

Sensor selection
For a clamp-on flowmeter to work exactly the way you want, it is crucial to have a varied selection of sensors designed for many different operating conditions. Siemens offers four types of sensors to ensure accuracy in almost any installation: universal (transit-time), universal high temperature, high precision (WideBeam) and Doppler. See the Sensor Selection chart on page 13 for more information.
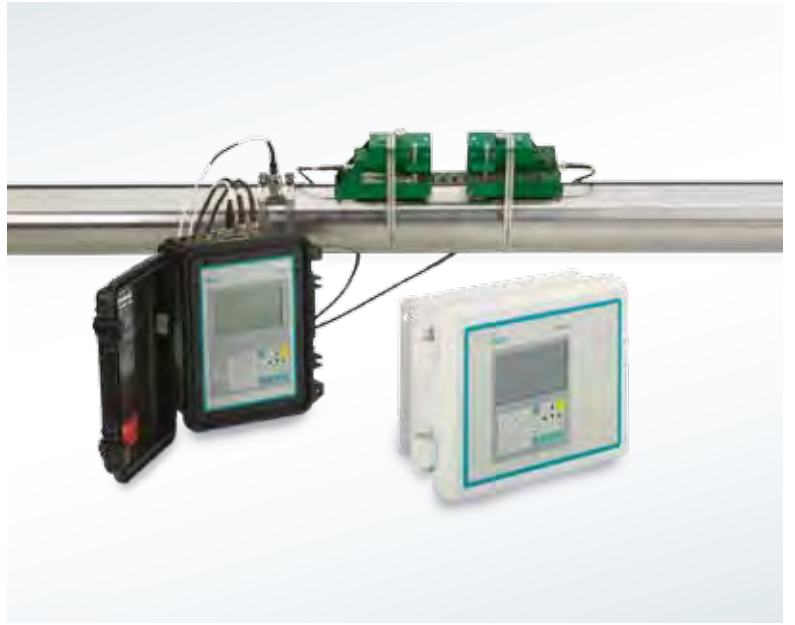
HVAC & power: Enhancing energy efficiency

As energy costs and environmental concerns continue to increase exponentially, facility managers are being held more accountable for the energy consumption of the buildings they oversee. SITRANS F US clamp-on flowmeters give you greater control over every system, making it easier to optimize efficiency and manage expenses.

The SITRANS FUE1010 is an ideal flow solution for thermal energy and power applications, and is particularly well-suited for large pipelines. It is available in a single- or dual-channel dedicated version as well as a dual-channel portable version. Dual-channel operation allows for simultaneous measurement of hot and chilled water lines or for enhanced accuracy on installations with convoluted piping runs.

The meter features a built-in data logger capable of accepting input from other sources. Time-stamped data can then be downloaded at any time to facilitate billing and efficiency analysis. The meter can be set to calculate kW usage for various functions, including cooling load (kW/ton), coefficient of performance (COP) and energy efficiency ratio (EER).

The SITRANS FUE1010 can also be ordered as a pre-configured check metering kit, which tracks both flow and BTU measurement to aid in conducting flow surveys or verifying the performance of any permanently installed energy meter. The kit includes a portable SITRANS FUE1010, a sturdy rolling case with a telescopic handle and all required accessories.

Key application areas for the HVAC and power industries include revenue-grade chilled and hot water submetering, condenser water, potable water, ammonia, glycol, river and lake water, lake source cooling, and energy efficiency monitoring of HVAC equipment and power plants.

SITRANS FUE1010: Additional benefits
- Precise computation of energy rate and total consumption
- Accurate measurement at low flow and low differential temperatures (delta T)
- 1000 ohm platinum RTDs for supply and return temperature measurements are precision-matched to within 0.01 °C (0.02 °F)
- Communication options: RS232 serial digital port, MODBUS/Metasys N2 (IP65 [NEMA 4X] only)
- Available configurations: IP65 (NEMA 4X) wall mount, IP40 (NEMA 1) portable

Water & wastewater: Conserving a precious resource

For the water and wastewater industry, the growing need for water conservation makes careful monitoring of treatment and distribution processes more important than ever. Integrating SITRANS F US clamp-on flowmeters into your applications can help you to reduce water wastage and better comply with stringent regulations.

Key application areas for the water and wastewater industry include raw and potable water, low-flow chemical dosing, raw sewage and effluent, mixed liquor and sludges, leak detection, consumption monitoring, billing, and plant testing and surveying.

The SITRANS FUS1010 is a versatile flow solution suitable for a diverse range of flow applications found in the water and wastewater industry. It can accommodate shifting measurement conditions by switching between WideBeam mode for homogenous liquids and Doppler mode for liquids with aeration or suspended solids – a feature that usually requires two separate meters.

SITRANS FUS1010: Additional benefits
- Suitable for most liquid applications
- Can be installed on virtually any pipe size and material
- Available in single-, dual- and four-channel versions
- Available configurations: IP65 (NEMA 4X) wall mount, IP66 (NEMA 7) wall mount explosionproof, IP65 (NEMA 7) compact explosionproof

A lower-cost yet still highly accurate option is the SITRANS FST020, which offers simplified flow measurement functionalities without sacrificing performance. The SITRANS FST020 offers a number of competitive advantages, including single-channel configuration options that make product selection straightforward, a user-friendly design to ensure easy setup, and rapid delivery times.

SITRANS FST020: Additional benefits
- Suitable for clean liquid applications
- Compact, integral design reduces installation costs
- Communication: RS232 serial digital port with DB9 connector
- Available configuration: IP65 (NEMA 4X) wall mount

For applications that do not require long-term monitoring, Siemens offers the SITRANS FUP1010. This convenient portable meter includes an internal battery that provides up to seven hours of continuous operation, with AC or DC power for backup. It comes in single- and dual-channel models and can operate in both WideBeam and Doppler mode.

SITRANS FUP1010: Additional Benefits
- Rugged enclosure allows for outdoor use and protects against harsh environments
- Internal data logger stores extensive site data
- Also comes as a check metering kit for water and wastewater or general liquid applications
- Available configuration: IP67 weatherproof

Gas: Maintaining control in any environment

At every stage of gas exploration and production lies a difficult yet fundamental reality: the need to exert tight control over your processes despite environments that are often adverse or even extreme. Trust SITRANS F US clamp-on flow technology to keep you "in the know" about how much gas is flowing each step of the way – even where other meters cannot.

The SITRANS FUG1010 is the flowmeter of choice for numerous natural, specialty and process gas applications. Thanks to the integrated WideBeam technology, the meter can tolerate the majority of wet gas environments in which most competing meters are incapable of performing, producing accurate readings despite the presence of heavy mist or water droplets. It is also immune to most pressure-reducing valve noises so that installation in very close proximity to valves and pumps is possible.

The SITRANS FUG1010 utilizes an internal AGA-8 table for fixed gas composition to compute standard volume flow without the need for a separate flow computer. It is in compliance with the American Gas Association's AGA-10 speed of sound measurement practice, providing an industry-accepted approach to calculating

the speed of sound in natural gas. Siemens also offers a SITRANS FUG1010 check metering kit for added portability, which makes it an invaluable tool in gas processing and storage plants.

Key application areas for the gas industry include lost and unaccounted for (LAUF) analysis, allocation, production well testing, underground storage and gas-fired power stations.

SITRANS FUG1010: Additional benefits
- Data extraction and analysis through Si-Ware diagnostics tool
- Relay alarms triggered when a change in gas composition is detected
- Can be paired with Hi-Precision Mounts for permanent and direct burial installations
- Available in single-, dual- and four-path versions
- Available configurations: IP65 (NEMA 4X) wall mount, IP66 (NEMA 7) wall mount explosionproof, IP65 (NEMA 7) compact explosionproof
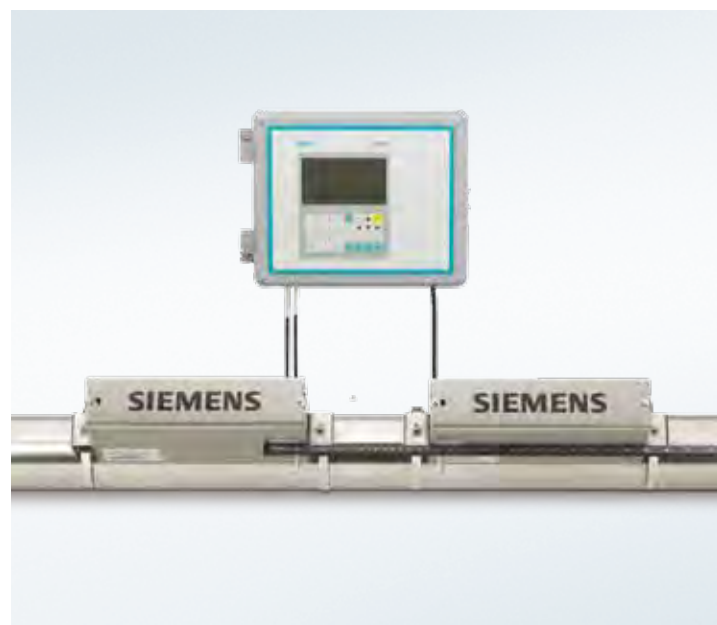
Hydrocarbon: Taking flow measurement further

The hydrocarbon industry has unique needs when it comes to process instrumentation. Many liquid hydrocarbon processes are highly dynamic and therefore demand flow instrumentation capable of keeping up with constantly changing conditions. SITRANS F US clamp-on ultrasonic flowmeters offer the added advantages of viscosity compensation and differentiation between various liquids to maximize your output – and your safety.

The SITRANS FUH1010 Standard Volume performs accurate volume and mass flow measurement and is appropriate for high-end applications carrying multiple liquids and liquids of varying viscosities. It is also ideal for line balance applications requiring normalized volume or mass output. The meter accepts analog inputs from densitometers, temperature sensors, viscometers and pressure transmitters. The Standard Volume version features all functionalities of the Precision Volume and Interface Detectorversions in addition to net volume correction.

For applications that require greater precision than normal gross volume flowmeters without the need for standard volume measurement, the SITRANS FUH1010 Precision Volume offers automatic Reynolds Number correction by compensating for viscosity changes as liquid properties change. It allows for analog outputs of inferred viscosity values in addition to providing valuable diagnostic data. The SITRANS FUH1010 Precision Volume can be

incorporated into the FUS-LDS Leak Detection System. See page 11 for more information.

The SITRANS FUH1010 Interface Detector offers extremely precise interface and multi-product identification, making it the best choice for density indication as well as scraper and pig detection. Because the meter provides liquid density and API outputs, it eliminates the need for additional equipment by serving as a direct replacement for intrusive densitometers.

Key applications for the hydrocarbon industry include ship offloading, pipeline transportation, line balance and allocation, liquid quality monitoring, offshore production, water injection/recovery, storage tank inflow/outflow, scraper and pig detection, and leak detection.

SITRANS FUH1010: Additional benefits
- Choice of three versions provides a solution for any hydrocarbon application
- Maintains exceptional repeatability independent of changes in temperature, density or viscosity
- Eliminates straight run piping requirements
- Available in single-, dual-, and four-path versions
- Available configurations: IP65 (NEMA 4X) wall mount, IP66 (NEMA 7) wall mount explosionproof, IP65 (NEMA 7) compact explosionproof
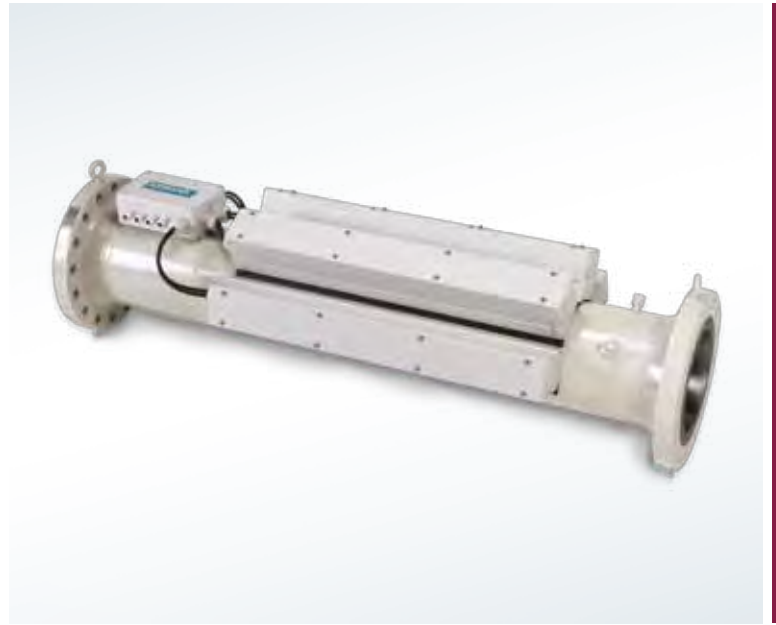
Hydrocarbon: Making custody transfer a reality

When liquid or gas hydrocarbon is changing hands from a supplier to a purchaser, even the smallest supply discrepancy can result in a major loss of revenue – which is why every bit of the medium flowing through the pipe must be carefully accounted for. Siemens has developed an innovative flow solution for the hydrocarbon industry combining custody-transfer accuracy with the very low maintenance requirements of the rest of the SITRANS F US ultrasonic family.

The SITRANS FUT1010 features the unique TransLoc mounting system, in which the WideBeam transducers are permanently installed on the outside of the sensor to prevent contact with the medium and eliminate cavities that can lead to fouling. The SITRANS FUT1010 is available in two versions: one for liquids and another for gases. To accommodate varying accuracy requirements, both meters can be configured with two, three or four paths and are suitable for installation in Div 1/Zone 1 hazardous areas.

Since TransLoc allows for laboratory flow calibration, the performance of the liquid version meets OIML R117 and API recommendations. With output options including liquid density and API, the dual-purpose meter also serves as a perfect replacement for intrusive densitometers.

The gas version is compliant with AGA-9 and features an internal fixed AGA-8 table that allows the meter to report standard volume flow without a separate volume-compensating flow computer. Its non-intrusive configuration and ability to operate at high frequencies mean that it can function in applications with valve-generated acoustic noise.

The SITRANS FUT1010 can be supplied with upstream and downstream pipe sections along with a flow conditioner to allow for the execution of calibrations on the entire meter run. This helps to ensure performance transfer between calibration and actual field conditions.

Key applications for the hydrocarbon industry include production wells, underground storage, transmission, electric power generation, gas processing plants, pipeline balancing, terminal transmix, refinery blending, airport facility management, petrochemical processing and plant optimization.

SITRANS FUT1010: Additional benefits
- Variety of approvals available, including INMETRO, CSA, FM, ATEX (PED) and CRN
- Spool diameters: DN100 to DN600 (4" to 24")
- Choice of three flange ratings (ANSI class 150, 300 or 600)
- Communication: MODBUS RTU RS 232/485
- Available configurations: IP65 (NEMA 4X) wall mount, IP66 (NEMA 7) wall mount explosionproof

Pipeline transportation: Safeguarding against danger

Pipeline leaks can have catastrophic consequences for human health, the environment and the global economy, which is why pipeline transportation companies worldwide face increased governmental scrutiny. This makes it absolutely vital to invest in an accurate and reliable leak detection system. Siemens offers a solution based on SITRANS F US clamp-on ultrasonic flow technology to aid you in detecting and localizing pipeline leaks – before they can cause harm to property or people.

While most suppliers offer only the software component of a leak detection system, the FUS-LDS Leak Detection System is a comprehensive package complete with software as well as all flow and temperature instrumentation. This ensures the best possible performance under any operating conditions and improves the customer service experience.

The FUS-LDS consists of two or more site stations, each of which typically contains a SITRANS FUH1010 clamp-on ultrasonic flowmeter, a clamp-on RTD temperature sensor and a method of data communication. A master station computer polls each of the site stations once per minute for a wide range of data. As the system detects releases in real time at both dynamic and static flow conditions by means of pre-set alarm thresholds, it does not require continuous operator attention. An alarm is activated if an imbalance between the inlet and outlet data is detected during any of four integration periods.

To ensure even greater ease of use, the software has been integrated with the powerful SIMATIC WinCC process visualization system to provide a dynamic graphic user interface for the FUS-LDS, allowing for easy identification of specific pipeline locations, line segments and flowmeters. This provides the operator with a better understanding of what is happening across the pipeline and the ability to react instantly to any situation before it escalates.

FUS-LDS Leak Detection System: Additional benefits
- Visual trend line aids in identification of leakage or product theft even before alarm thresholds are breached
- Easily accessible pipeline performance data facilitates multiproduct identification, batch tracking and pig tracking
- Significantly decreases the amount of training required for pipeline operators
- Meets API 1130 "Computational Pipeline Monitoring for Liquid Pipelines" and PHMSA 195.444 CPM Leak Detection requirements for safety
- Communication options: hardwired (point-to-point), hardwired with short-haul modems, leased-line telephone, cellular phone, wireless radio, Ethernet, fiber optic, satellite or any other means that can transmit and receive RS232 ASCII text

Cross-industry success stories

Elimination of costly supply discrepancies
Industry: Hydrocarbon
Company: BKL A/S
Region: Copenhagen, Denmark
Technology: SITRANS FUT1010

Challenge: BKL A/S receives Jet A-1 fuel from a supplier at a terminal in eastern Copenhagen and transports the fuel via pipeline to a storage tank at Copenhagen International Airport. The company has a level device inside the tank to measure the quantity of fuel for fiscal purposes, and they had noticed ongoing disparities between the volume being transferred by the supplier and the readings from the level device in the tank. BKL needed a way to verify these readings using a different measurement technology, so they installed a SITRANS FUT1010 clamp-on ultrasonic flowmeter on the pipeline. Flow readings confirmed that the level device was accurately measuring the quantity of fuel in the tank, which led BKL to conclude that the challenge was stemming from the supplier's own measurement practices. The data derived from the meter helped BKL work with the supplier to ensure that all instrumentation was correctly calibrated and that measurement standards were identical for both supplier and receiver.

Accurate measurement of sewage flow
Industry: Water & wastewater
Company: Welsh Water
Region: Wales, UK
Technology: SITRANS FUP1010/SITRANS FST020

Challenge: Welsh Water uses nearly 2,000 sewage pumping stations (SPSs) to collect wastewater from customers and transport it to treatment works. Until recently, the majority of the SPSs had no system in place to measure flow, which was not operationally efficient and posed a significant environmental risk. To combat this issue, Welsh Water surveyed 80 high-risk SPSs using a portable SITRANS FUP1010 clamp-on ultrasonic flowmeter, which provided a true picture of the flow at locations where no previous metering existed. Survey results confirmed that the SITRANS FST020 would be appropriate for permanent installation. SITRANS FST020 flowmeters were installed on the majority of the SPSs and are now performing highly accurate measurement. The meters have made it possible to monitor each SPS remotely and perform routine checks of pump efficiency. They also provide a comprehensive audit trail for the governmental body that oversees spillage incidents.

Simplified leakage monitoring
Industry: Hydrocarbon
Company: Delaware Storage & Pipeline Co.
Region: Delaware, USA
Technology: FUS-LDS Leak Detection System

Challenge: Delaware Storage has used the FUS-LDS Leak Detection System for several years to monitor three pipelines that carry jet fuel from a loading dock to a primary customer, so they agreed to participate in an on-site test of the newly updated FUS-LDS software when it first launched. A Siemens installation team loaded all of the necessary files onto the master station and, as a testament to the stability of the software, the swap progressed flawlessly and the new system was operational in less than one hour. The team then trained the daytime and nighttime pipeline operators on the system, and both found it very easy to work with. The following day, one of the operators asked if it would be possible to add photographs of actual pipeline locations to the software. Because the FUS-LDS allows for a high level of customization, this request was easily accommodated and within a few minutes the master station was displaying the pictures in their proper positions. Overall, Delaware Storage is very satisfied with the enhanced FUS-LDS due to its improved ease of use.

The best flowmeter for the job

		SITRANS FUS1010	SITRANS FUP1010	SITRANS FUE1010	SITRANS FUG1010	SITRANS FUH1010	SITRANS FST020	SITRANS FUT1010	Check Metering Kits
Water & Wastewater	Abstraction	●	●				●		●
	Water treatment	●	●				●		●
	Distribution	●	●				●		●
	Wastewater treatment	●	●				●		●
	Irrigation	○	●				◐		●
HVAC & Power	District heating	●	●	●			●		●
	Distribution/transmission	●	◐	◐			◐		●
	District cooling and chillers	◐	◐	●			◐		●
Hydrocarbon	Upstream					●		●	
	Midstream					●		●	
	Downstream					●		●	
Gas	Natural gas				●			●	●
	Process gas				●			●	●
	Storage				●			●	●
	Allocation				●			●	●
	Check Metering				●			○	●
Others	Aerospace	○	●						
	Chemical	●	●				●		●
	Mining	●	◐						

● Most often used   ◐ Often used   ○ Can be used

Sensor Selection	Universal	High temp.	High precision	Doppler
Homogeneous liquids with moderate aeration	X	X	X	
Moderately aerated liquids and multiple products		X	X	
Highly aerated liquids or slurries				X
Natural or process gases			X	
Liquid temperatures from +120…+230 °C (+250…450 °F)		X		
Steel pipes and liquid temperatures below 120 °C (+250 °F)			X	
Non-steel pipes and liquid temperatures below 120 °C (+250 °F)	X			
Steel pipes with diameter/wall thickness ratio above 10	X			
Improved stability and repeatability on steel pipes			X	

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Meter	General SITRANS FUS1010	Basic SITRANS FST020	Portable SITRANS FUP1010	HVAC & Power SITRANS FUE1010 (dedicated)
Flow range	±12 m/s (±40 ft/s), bidirectional	±12 m/s (±40 ft/s), bidirectional	±12 m/s (±40 ft/s), bidirectional	±12 m/s (±40 ft/s), bidirectional
Flow sensitivity	0.0003 m/s (0.001 ft/s) of flow	0.0003 m/s (0.001 ft/s) of flow	0.0003 m/s (0.001 ft/s) of flow	0.0003 m/s (0.001 ft/s) of flow
Pipe size	DN 6.4...9140 (0.25...360")	DN 6.4...9140 (0.25...360")	DN 6.4...9140 (0.25...360")	DN 6.4...9140 (0.25...360")
Optional inputs (minimum)	Current: 2x 4-20 mA DC Temperature: 2x 4 wire 1 kΩ RTD 2x digital inputs for totalizer control	Totalizer: 2x digital inputs, one for totalizer start/stop and one for totalizer reset	Current: 2x 4-20 mA DC Temperature: 1x 4 wire 1 kΩ RTD [1]	Current: 2x 4-20 mA[1] Temperature: 2x 4 wire 1 kΩ RTD [1] Totalizer: 2x digital inputs for totalizer control
Outputs (minimum)	Current: 2x 4-20 mA DC Voltage: 2x 0-10V DC Status alarm: 4x SPDT relays Frequency: 2x 0-5 kHz RS232 Modbus	Current: 1x 4-20 mA DC Status alarm: 1x relay 30V DC Pulse: 1x 10 mA RS232	Current: 2x 4-20 mA DC Voltage: 2x 0-10V DC Status alarm: 4x SPDT relays Frequency: 2x 0-5 kHz RS232	Current: 2x 4-20 mA DC Voltage: 2x 0-10V DC Status alarm: 4x SPDT relays Frequency: 2x 0-5000 Hz RS232 Modbus
Accuracy	±0.5-1% of flow at ≥0.3 m/s (1ft/s)	±0.5-1.0% of flow at ≥0.3 m/s (1ft/s)	±0.5-2% of flow at ≥0.3 m/s (1ft/s)	±0.5-1% of flow at ≥0.3 m/s (1ft/s)
Repeatability	±0.15% at ≥0.3 m/s (1ft/s)	±0.15% at ≥0.3 m/s (1ft/s)	±0.15% at ≥0.3 m/s (1ft/s)	±0.15% at >0.3 m/s (1ft/s)
Data refresh rate	5Hz	5Hz	5Hz	5Hz
Enclosure rating	IP65 (NEMA 4X), IP65 (NEMA 7), IP66 (NEMA 7)	IP65 (NEMA 4X)	IP67	IP65 (NEMA 4X)
Liquid temp. Optional	-40...+120 °C (-40...+250 °F) -40...+230 °C (-40...+450 °F)	-40...+120 °C (-40...+250 °F) -40...+230 °C (-40...+450 °F)	-40...+120 °C (-40...+250 °F) -40...+230 °C (-40...+450 °F)	-40...+120 °C (-40...+250 °F) -40...+230 °C (-40...+450 °F)
Power supply	90-240V AC, 50-60 Hz, 30 VA 9-36 V DC, 12W	90-240V AC, 15 VA max. 11.5-28.5V DC, 10W max.	100-240V AC, 50-60 Hz, 30 VA 9-36V DC, 12W Internal battery	90-240V AC, 50-60 Hz, 30 VA 9-36V DC, 12W
Approvals	INMETRO, CSA, FM, CE, ATEX, C-TICK	UL, ULc, CE, C-TICK	UL, ULc, CE	FM, CSA, CE

[1] May vary dependent on model and channel selection

Meter	HVAC & Power SITRANS FUE1010 (portable)	Hydrocarbon SITRANS FUH1010	Gas SITRANS FUG1010	Gas and Hydrocarbon SITRANS FUT1010 Gas and Liquid
Flow range	±12 m/s (±40 ft/s), bidirectional	±12 m/s (±40 ft/s), bidirectional	±30 m/s (±100 ft/s), bidirectional	Gas: ±30 m/s (±100 ft/s), bidirectional Liquid: ±12 m/s (±40 ft/s), bidirectional
Flow sensitivity	0.0003 m/s (0.001 ft/s) of flow	0.0003 m/s (0.001 ft/s) of flow	0.0003 m/s (0.001 ft/s) of flow	0.0003 m/s (0.001 ft/s) of flow
Pipe size	DN 6.4...9140 (0.25...360")	DN 6.4...9140 (0.25...360")	DN 25...152 (1...48")	DN 100...600 (4...24")
Optional inputs	Current: 2x 4-20 mA[1] Temperature: 2x 4 wire 1 kΩ RTD [1] Totalizer: 2x digital inputs for totalizer control	Current: 4x 4-20 mA Temperature: 2x 4 wire 1 kΩ RTD	Current: 2x 4-20 mA Temperature: 2x 4 wire 1 kΩ RTD	Current: 4x 4-20 mA (pressure, temperature, etc.)
Outputs	Current: 2x 4-20 mA DC Voltage: 2x 0-10V DC Status alarm: 4x SPDT relays Frequency: 2x 0-5000 Hz RS232	Current: 4x 4-20 mA Voltage: 2x 0-10V DC Pulse: 2x 0-5V TTL (1 forward, 1 reverse) Frequency: 2x open collector (1 forward, 1 reverse) 4x Form C relay RS232 Modbus RS485/422	Current: 4x 4-20 mA Voltage: 2x 0-10V DC Pulse: 2x 0-5V TTL (1 forward, 1 reverse) Frequency: 2x open collector (1 forward, 1 reverse) 4x Form C relay RS232 Modbus RS485/422	Current: 4x 4-20 mA Voltage: 2x 0-10V DC Pulse: 2x 0-5V TTL (1 forward, 1 reverse) Frequency: 2x open collector (1 forward, 1 reverse) 4x Form C relay RS232 Modbus RS485/422
Accuracy	±0.5-1% of flow at ≥0.3 m/s (1ft/s)	±0.5-1% of flow at ≥0.3 m/s (1ft/s) Field calibratable to 0.15...0.3% of flow 0.05% of API No.	±1-2% of actual volume reading (higher accuracy is pipe condition and flow profile dependent)	Gas: <0.2% of flow at ≥0.3 m/s (1 ft/s) Liquid: <0.15% of flow at ≥0.3 m/s (1ft/s) Lab calibratable
Repeatability	±0.15% at ≥0.3 m/s (1ft/s)	±0.05 - 1% at ≥0.3 m/s (1ft/s)	±0.15% at ≥0.3 m/s (1ft/s)	±0.05-0.1% of actual reading
Data refresh rate	5Hz	5Hz	5Hz	5Hz
Enclosure rating	IP40 (NEMA 1)	IP65 (NEMA 4X), IP65 (NEMA 7), IP66 (NEMA 7)	IP65 (NEMA 4X), IP65 (NEMA 7), IP66 (NEMA 7)	P65 (NEMA 4X) IP66 (NEMA 7)
Liquid temp. Optional	-40...+120 °C (-40...+250 °F) -40...+230 °C (-40...+450 °F)	-40...+120 °C (-40...+250 °F) -40...+230 °C (-40...+450 °F)	-40...+120 °C (-40...+250 °F)	-28-...+93 °C (-20...+200 °F)
Power supply	100-240V AC, 50-60 Hz, 30 VA 9-36V DC, 12W Internal battery	IP65 (NEMA 4X) IP66 (NEMA 7) 90-240V AC, 50-60 Hz, 30 VA 9-36V DC, 12W IP65 (NEMA 7) compact 90-240V AC, 50-60 Hz, 15 VA 9-36V DC, 10W	IP65 (NEMA 4X) IP66 (NEMA 7) 0-240V AC, 50-60 Hz, 30 VA 9-36V DC, 12W IP65 (NEMA 7) compact 90-240V AC, 50-60 Hz, 15 VA 9-36V DC, 10W	90-240V AC, 50-60 Hz, 30 VA 9-36V DC, 12W
Approvals	UL, ULc, CE	NMETRO, CSA, FM, CE, ATEX, C-TICK	NMETRO, CSA, FM, CE, ATEX, C-TICK	INMETRO, CSA, FM, ATEX (PED), CRN