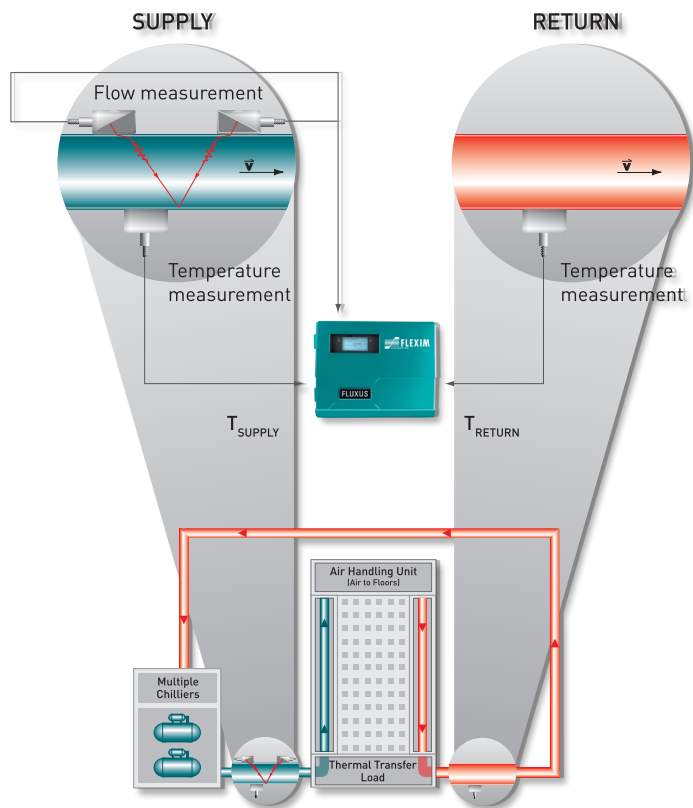


Flexim Non-Intrusive Ultrasonic Flow and Thermal Energy Meters

Energy Efficiency | Continuous Commissioning | Building Optimization

FLEXIM


EMERSON



Emerson's Flexim Thermal Energy Flow Meters support your efforts towards more energy efficient buildings and facilities:

- Flexim offers portable meters for temporary measurements as well as permanent meters for long term flow and energy monitoring.
- With accuracy of 1% on the flow rate and 0.03° F temperature differential, they are the perfect instrument for:
- Verification of built-in meters,
 - Measurement of chilled and hot water supply,
 - Measurement of domestic water
 - Measurement of condenser water
 - Measurement of condensate (steam return)
- If it is a LEED that you are pursuing, Flexim's thermal energy meters are the ideal tool.
- Being non-intrusive, Flexim's thermal energy meters are free of wear. In addition, Flexim's permanent transducer coupling makes the meter maintenance free.

Flexim FLUXUS® Energy

Non-intrusive Thermal Energy Metering

The controlling, balancing, and monitoring of thermal energy flows is of utmost importance in times of rising energy prices, environmental regulations and financial benefits of energy efficient buildings.

Flexim's thermal energy meter FLUXUS® BTU is up to the task.

Application Versatility

Chiller Plants

Heating Plants

HVAC

District Energy

Submetering

Energy Optimization

Energy Audits

Metering & Verification

Retrofits

Billing

Water Control / Leak Detection

Demand Response

Combined Heat and Power /
Cogeneration Plants

Integrated System

- Flexim's energy meters combine the attributes of non-intrusive ultrasonic flow measurement with superior temperature monitoring into an integrated energy computer.
- All flow transducers and temperature sensors are connected to one unit.
- This eliminates errors associated with multiple devices and provides for a complete turn-key solution for your energy metering needs.

FLUXUS[®] Energy

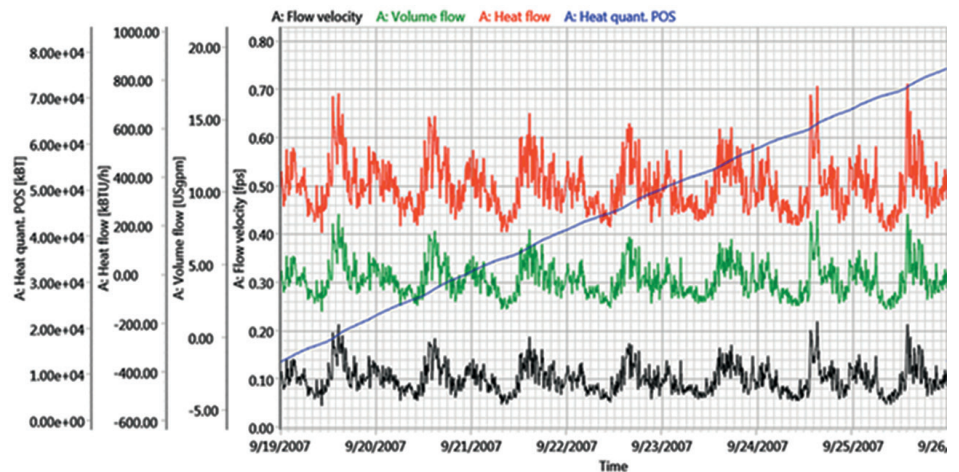
Unparalleled Measurement of Low Flow Rates

Typical HVAC applications run less than 8 hours of peak flow while the remaining 16 hours are usually off-peak low flow rates below the threshold of other metering technologies. Below is a data set from a campus building at a large University. A small amount of chilled water is supplied during off-peak months. Flexim's energy meters are capable to record even extremely low flow velocities. The January usage totaled 26 Ton-Days. At the universities \$11 per Ton-Day rate this amounts to \$286 for the month and \$1144 for 4 months of off-peak (Nov-Feb). The ROI over a 10 year period is \$11,440. Most meters will not measure these low velocities; this amounts to lost revenue generation or lost accounting for the utilities operating costs. Flexim's unparalleled flow range and zero sensitivity allow the system to accurately measure the extremely low flow rates associated with trickle or low flow intervals. This high accuracy is reached by a sophisticated process of matching and pairing the ultrasonic transducers with temperature compensation to rule out drift.

Cost of Not Metering the Low Velocities

Jan 1 to Feb 5	Chilled Water Energy Flow Tons	Chilled Water Energy Flow Ton - Day	CHW Flow Accumulator Kgal (1000)	Chilled Water Delta Temp -Deg F	Chilled Return Temp - Deg F	Chilled Supply Temp - Deg F	Chilled Water Flow Rate - gpm	Chilled Water Flow Velocity ft/sec
2/4/2010 03:00:00 PM	2.49	37.87	91.35	14.93	59.84	44.90	4.01	0.03
2/4/2010 04:00:00 PM	2.60	37.96	91.55	14.95	59.95	44.97	4.17	0.03
2/4/2010 05:00:00 PM	2.66	38.06	91.79	15.29	60.24	44.93	4.17	0.03
2/4/2010 06:00:00 PM	2.71	38.17	92.03	15.61	60.36	44.80	4.17	0.03
2/4/2010 07:00:00 PM	2.97	38.27	92.27	15.09	59.89	44.80	4.71	0.03
2/4/2010 08:00:00 PM	2.15	38.38	92.52	13.98	59.81	45.82	3.66	0.02
2/4/2010 09:00:00 PM	2.34	38.48	92.76	15.37	60.02	44.69	3.71	0.02
2/4/2010 10:00:00 PM	2.87	38.59	93.00	15.30	60.06	44.84	4.50	0.03
2/4/2010 11:00:00 PM	3.37	38.70	93.24	14.73	59.61	44.87	5.50	0.04
2/5/2010 12:00:00 AM	1.76	38.77	93.42	14.16	59.04	44.89	3.02	0.02
2/5/2010 01:00:00 AM	0.98	38.80	93.49	14.49	59.41	44.90	1.70	0.01
2/5/2010 02:00:00 AM	0.84	38.84	93.57	14.44	59.84	45.36	1.43	0.01

This graph at right shows a 7 day trend of energy usage at another campus building. This is a 370 °F hot water supply to the building. In the off-peak summer months the flow velocities only range from .08 - .2 ft./sec. These are very low velocities but not uncommon in district energy submetering loops. The previous meter at this building was unable to measure this. The amount of thermal energy used in the 7 day period is 64 MBTU. Flexim meters now pick up this energy usage for the University.





Improve the energy efficiency of your building with FLUXUS® Energy

Flexim Permanent Meters are completely Maintenance free!

Clamp-on ultrasonic meters have no moving parts and are not in contact with the liquid. There used to be a maintenance requirement associated with the coupling grease in between the transducers and pipe. Since 2006, Flexim has been using a patented non-grease permanent coupling pad rated to 380°F. Today, Flexim has thousands of meters in operation that have never required any maintenance. Flexim also has eliminated the need for a zero check and zero calibration resulting from long-term meter drift associated with some clamp-on meters. Flexim has unmatched zero stability, which is made possible by the diligence that is put into the transducer and DSP signal processing. Flexim may be the only clamp-on meter that has embedded RTD's in the transducers, which makes it possible to have a "drift free" clamp-on meter.

Condensate Metering

Condensate is often metered in mass units, like pounds. This makes it easy to equate steam consumption as 1 pound of condensate = 1 pound of steam. Like most flowmeters, Flexim technologies measure velocity and converts velocity to volume. Volume can be converted to mass if the density of the liquid is known. Flexim has built in density tables for many liquids and with the addition of temperature measurement the meter can provide a mass measurement; pounds of condensate.

Calibration Requirements

BTU meters often have calibration requirements. These can still be attended to even though the meters have no drift and require no maintenance. Emerson offers many types of calibration services, an in-house calibration laboratory and field calibration services. We can also train your staff to perform calibrations on Flexim meters.

Emerson meets the requirements set by accreditors in terms of accurate and reliable monitoring and control of HVAC installations. Flexim BTU calculations and temperature measurement meet EN 1434 BTU meter standards.

Application fields for FLUXUS® Energy

- HVAC tasks
- District Energy
- Chilled and hot water plants in:
 - Universities
 - Corporate and governmental complexes
 - Shopping malls
 - Hospitals
 - Sport arenas
 - Airports and more
- Industrial cooling and heating
- Industrial facilities

Benefiting from Governmental Programs

Governmental initiatives, certifications and programs, such as LEED, Energy Star, AASHE STARS, Local Law 87, Executive Order 88 and many others are often linked to monetary incentives like tax exemptions or subsidies.

Besides these direct savings or incomes, accredited buildings also prove to be more attractive to tenants in their pursuit of savings variable costs associated with energy usage.



Advantages

- High accuracy on low and high flow rates
- Easy retrofitting on existing pipes without any pipe work
- High turndown and quick response rate for total flow control

AstraZeneca R&D Lab Achieves Energy Star Rating with Flexim Ultrasonic Meters

As one of the world's five largest pharmaceutical companies, AstraZeneca researchers pride themselves on their spirit of innovation. Nowhere can this spirit be better seen than at the company's American research and development (R&D) facilities in Waltham, Massachusetts. One of the team's most recent innovations was the launch of a new BioHub in Waltham Massachusetts. The central utility plant houses the steam boilers, chillers, compressed air, fire pump, emergency/ backup electrical generator and main electrical distribution panels. Facilities Systems Specialist Bruce MacGregor was tasked with qualifying the facility for an Energy Star rating.

Looking for a Metering Solution

"We were generally pleased with the accuracy of the mag meters," said MacGregor. "But they have some problems that eliminated them as a choice for submetering. Because they are intrusive, they cost us a lot to maintain. They would collect particulates from direct contact with the water, which degraded accuracy over time, and they would need to be extracted and cleaned regularly, a time-consuming procedure. The idea of retrofitting magmeters as submeters eliminated them from consideration. Not only were they a problem to maintain, but we couldn't afford the downtime for our hot and chilled water systems, particularly those used in our R&D processes. Our search kept indicating that ultrasonic flowmeters came closest to meeting our criteria, but we were reluctant to move in that direction because we had had some bad experience with ultrasonics in the past and because most of ultrasonic meters we found were not good at low-flow measurements. Most, but not all. We found a manufacturer, Flexim, whose website claimed great accuracy across a wide range, including low flow," said MacGregor. "We identified their local rep firm and arranged for a demonstration."

After getting empirical proof on the effectiveness of ultrasonic flowmetering on the office building for Energy Star certification, the meters were added to the other buildings in the R&D complex to provide empirical data that MacGregor's team met the 30 percent energy reduction goal set by corporate management. They exceeded that goal and achieved the Energy Star certification for the office complex.

Industrial Energy Efficiency

According to the International Energy Association, industry (including power generation) accounts for 70% of CO2 emissions. The industrial sector is becoming more focused on the environmental and carbon emission impacts of their facilities. Regulatory, environmental concern, savings from energy initiatives, tax rebates, help create incentives to encourage industry to maximize energy efficiency and reduce carbon footprint. International standards such as ISO 50001 provide the framework for public and private sector organizations to implement management strategies to increase energy efficiency, reduce costs, and improve energy performance. Engagement in this process will often result in the need for more and better flow measurement. Flexim clamp-on measurement can satisfy this need without any process shutdown, over the widest application range possible. Whether the need is for reducing water usage, cooling tower and heat exchange optimization, compressed air optimization & leak detection, optimizing steam and cooling efficiency, Emerson has the meter for the measurement. The retrofit and portable attributes, coupled with the high level of support you will receive, make Emerson the perfect partner for your energy audit.

UMD Tries a new Approach to Steam Measurement

The Challenge

The University of Minnesota Duluth (UMD) always had an issue with the measurement of the main steam line exiting the boiler. This line feeds approximately 1/3 of the campus, or rather all the campus dorms. They could never get a good balance between the boiler output and submeters in the buildings. The meter was a DP transmitter, and it was challenged to pick up the low demand — low flow rates — during the summers. They allocated funds to create a metering location on the condensate return, and then they heard about Flexim's new steam meter.

The Solution

A local sales representative, Kirk Running with Advanced Process Solutions, identified Flexim as the solution. "UMD was already using Flexim clamp-on meters and decided to give the steam meter a try," Running said. "The meter was installed by a Flexim field engineer; the entire installation took less than one day to complete. With the installation complete, the university for the first time had reliable measurement of the boiler, and they saved money in the process."

The Flexim installation was done on a 6-inch schedule 40 carbon steel pipe that is measuring steam at 350°F and 111 psig. The steam meter uses the transit time or "time of flight" principle, which should be familiar to those who use ultrasonic flowmeters. The new 721 platform offers enhanced programming software and a faster processor that reduces the effect of noise on the meter. The FLUXUS® G721 ST permanent steam meter has a built-in data logger that will store all meter diagnostics that are examined in order to verify a good flow signal as well as operating parameters such as mass flow, flow velocity, flow totals and other important operational data and diagnostics. The installed meter also uses BACnet communication to connect and communicate to the university's building automation system. This provides real-time data to the university and allows the facility and power plant personnel to monitor steam usage. "The UMD operations manager was excited to have the more accurate steam flow measurement online with minimal effort," Running said.

UMD is in the process of linking up all the energy and water flow data to an HMI that will display real-time usage. There is also student involvement with monitors in the student engineering building, revealing real-time water and energy usage. This will allow students to see the results of conservation projects on campus. For example, they can have a contest to see which campus building can reduce water consumption the most.

The meter can improve the accuracy and reliability of steam measurement, all without any process interruption.

Flow Control Innovation Awards 2020

**Winner: FLUXUS® ST -
1st Clamp-on Ultrasonic
Steam Meter**

Steam is a commodity necessity for many industries in the world. Clamp-on flow measurement for liquids with the transit-time principle has been around for over 40 years. Fifteen years ago, non-intrusive gas flow measurement was introduced, but measuring steam with clamp-on ultrasonics remained elusive.

Non-intrusive Steam Meter improves Accuracy and Reliability of Steam Measurement

Flexim's Clamp-on ultrasonic steam meter is available in both permanent and portable versions. Flexim offers excellent low flow sensitivity — an aspect of steam measurement that challenges most meter technologies. Anyone who needs to measure steam consumption knows their steam meters may not pick up the low flow rates associated with off-peak times.

The Flexim steam meter is for saturated steam measurement with a maximum temperature of 356°F and a minimum pressure of 44 psig. The pressure and temperature range allow this meter to be used in HVAC applications as well as some industrial heating applications. A second type of non-intrusive steam flow meter is available for higher temperature and pressure applications, up to 750°F for saturated and super-heated steam.

Flexim Products

Rental Options Available

- Renting includes 1 week - 1 month options
- End of rental term options available
- FLEXSource and Equipment warranty provided with all plans

FLEXSource includes:

- Walk-through
- Site survey
- Commissioning
- On-site training

Renting Benefits:

- Allows for 100% financing
- Prevents technological obsolescence
- Budget saving payment plans
- Preserves cash flow and credit lines
- Tax advantages through leasing – receive tax write-offs via Section 179 deduction
- Simple application process

Features and Advantages:

- Certified traceable accuracy of both flow and temperature measurements
- Extremely high turndown range, ability to measure low flow rates
- High accuracy of temperature measurements (4-wire clamp-on RTDs, 0.03°F with matched RTDs)
- Drift-free
- No wear mechanism
- Permanent coupling pads (no grease) requiring zero maintenance
- Strong technical support and know-how
- High temperature “maintenance free” measurement capability for hot water lines with optional WaveInjector® mounting fixture
- Large internal data logger; failsafe data retrieval in case of communication failure



F/G601
2 channel portable
BTU or steam meter



F/G721
2 channel BTU or steam meter
– can measure 2 independent
pipes, for example; chilled
water and hot water BTU
measurement.



G532 ST-LT
Single channel
(low temperature)
steam meter



F532 TE
Single channel BTU meter



G532 CA
Single channel
compressed air
meter

FLUXUS® Energy



Technical Data

FLUXUS® Energy / BTU:	Fully integrated permanent or portable thermal energy metering system. BTU Calculation per EN1434 (ultrasonic clamp-on transit-time flow measurement, temperature measurement with clamp-on or insert temperature sensors)
Quantities of measurement:	Instantaneous thermal power output (BTU Calculation as per EN1434), totalized thermal energy, volume and mass flow, temperature T_s , T_r , ΔT , flow velocity, liquid's sound speed, signal strength
Units:	BTU, Tons, J, Wh, etc.
Flow velocity:	0.02 to 80 ft/s
Repeatability:	0.15% of reading \pm 0.03 ft/s
Accuracy, volume flow*:	Standard 5 point NIST traceable wet flow calibration: sub 1% of reading with process calibration: 0.5% of reading**
Temperature measurement:	Calibrated accuracy: \pm 0.03°F with matched RTDs (EN1434 compliant with NIST Certification) Types: 1000 Ohm clamp-on and insert sensors, Construction: 4-wire Platinum RTD
Integrated data logger:	Typically stores 2 years data at 10 min storage rate
Outputs types:	Analog: 4-20 mA, 0-10 V, pulse, frequency
Communication:	RS485 (RS232 - USB for portable unit), Modbus RTU/485, Modbus/TCP, BACnet/IP, MSTP, HART (other protocols available on request)

*Under reference conditions and with $v > 0.45$ ft/s ** If reference uncertainty better than 0.2%
For more information, see the corresponding technical specifications.



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BUS-SUSTAINABILITY-V3-1US 0424

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