Ultrasonic Flowmeters
FMU Series

Flow Computers:

Handheld
(FMU-HA)

Portable
(FMU-PO)

Wall Mount
(FMU-WA)

Panel Mount
(FMU-PA)

Transducers:

Clamp-On

Insertion

Full Bore

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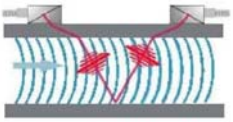
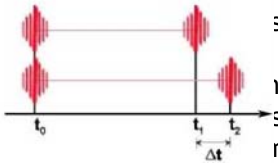
Transit-Time Technology

The flowmeter technology employed by our FMU series is called "Transit-time" ultrasonic technology. It is also called "time-of-flight" or "time-difference" ultrasonic technology. In this technology, one of the keys to the precision performance is its transmission and reception technology. Transit-time provides an innovative direct ultrasonic transmission technique that ensures reliable and accurate signal detection for a wide range of processes.

Working Principle of Transit-Time Technology



For the measurement, two ultrasonic pulses are sent through the medium, one in ction, and the gainst it. The s are ly working as d receiver.



sit time of the signal g in flow s shorter than the ne of the signal propagating against flow direction. The transit-time difference Δt is measured and allows the determination of the average flow velocity on the propagation path of the ultrasonic signals. A profile correction is performed to obtain the average flow velocity on the cross-section of the pipe, which is proportional to the volume flow.

Non-Invasive, Clamp-on Transducers

Since ultrasounds propagate in solids, the transducers can be mounted onto the pipe. The measurement is therefore non-invasive, and no cutting of pipes is necessary for the installation of the transducers. Because with just 3 sets of transducers, pipes ranging from 15mm to 6000mm can be covered, the ownership cost doesn't increase as the pipe size increases, which is the decisive cost saving factor as compared to traditional flowmeters.

Single-Board Solution – A Decisive Cost Saver

All the main elements such as power supply, transducer, computation, communication, etc. are integrated into one single board. This allows FMU series much more accessible to users that are sensitive about purchase and maintenance budgets.

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Dedicated/Fixed Configuration

Continuous Accuracy, Verifiable Confidence

(FMU-WA)

FMU series flow computers are configured flexibly to cater to various application needs. The Wall Mount (FMU-WA) and the Panel Mount (FMU-PA) are full function, permanently mounted non-intrusive (clamp-on) or intrusive (insertion and full-bore) ultrasonic flowmeters that provide all the benefits of ultrasonic technology combined with the performance of traditional meters

FMU series provides various input and output interfaces. When the site is remote and you have many other sensors like temperature, humidity, wind speed, etc. values to communicate to a remote center, you can do so using the versatile input interfaces and the communication interface. So, it's no longer a mere flow meter but also a complete remote station.

Ex-Proof Enclosure

FMU series offers many advantages in capabilities and application versatility that cannot be matched by any other single metering technology. From high performance to ease of installation, FMU series are the best choice when faced with application that require:

FMU-WA wall mount can be housed in explosion proof enclosure for operations in hazardous areas

Panel Mount
(FMU-PA)

- High precision
- High reliability combined with low maintenance
- Low ownership cost
- No pressure drop
- Low power consumption
- Diverse interfaces

Ultrasonic meter are quickly becoming the meter technology of choice in today's marketplace. We, at Flokal, offer a product portfolio to meet the demands of virtually every major industry. We have the right product for applications where traditional meters have limitations, or where the many benefits offered by ultrasonic meters are required.

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Versatility in Function

You have the flowmeter but that's not all!

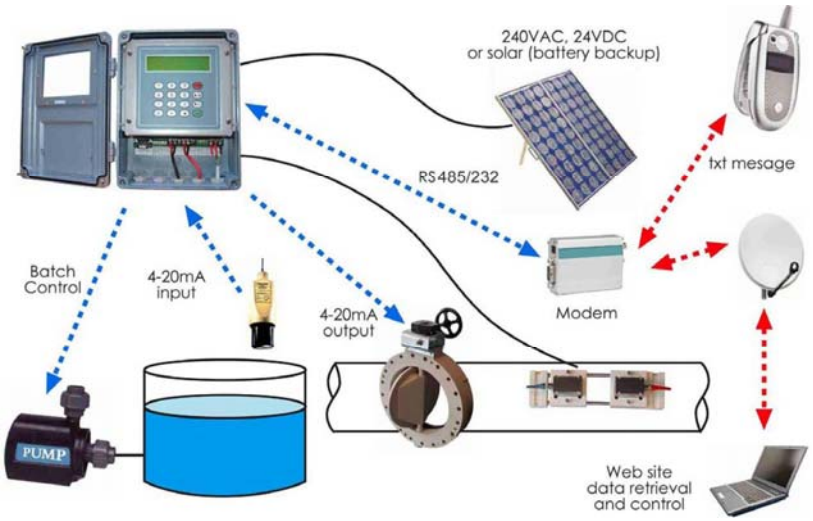
FMU-WA has standard RS-485 interface. Using this interface, multiple meters at remote sites can be monitored or controlled almost at real time. Therefore the user can have the real time awareness of all of his meters out in the field at the comfort of his desk.

Using the 2 FPt-100Ω RTD inputs as temperature inputs, the meter has the function as an energy meter.

Using the output interfaces such as 4-20mA, pulse, relay, batch control, etc., process equipments such as pumps or valves can be controlled automatically.

Using the 3 analog inputs and RS-485 interface, the meter can function as an independent station where it can collect other information such as ambient temperature, humidity, pressure, wind speed, level, etc. and forward it to a central monitoring station through RS-485 communication.

The meter circuit is composed of 1 main board and 1 display and keypad board and therefore has a roomy space inside in which the user can install accessories such as surge compressor, external data logger, pull-up resistors for pulse output, etc.



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Portable Clamp-on Flowmeters

The ideal solution for plant surveys

(FMU-HA)

Portable
(FMU-PO)

The handheld type is one of the most advanced portable ultrasonic flowmeters out there in the world. The size is a little bigger than a PDA but offers capability to measure all pipe ranges from 15mm to 6000mm.

The transducers are designed for maximum ease of operation and have magnets that make the transducer installation much easier.

They can also be easily moved from one job site to another. There is no need to cut the pipe or interrupt the flow.

16 site installation parameters are stored fore easy retrieval and quick setup and operation.

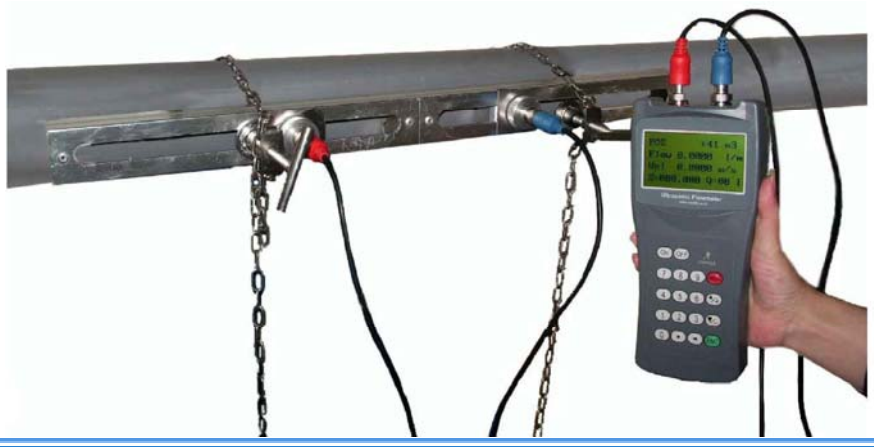
The meter uses Ni-H battery that runs about 10 hours under maximum load and is recharged full in 6 hours.

Utilizing the built-in data logger, process history can be recorded and stored or downloaded to a PC or laptop.

The legacy portable type is equipped with dot printer that prints out the measurement data at real time.

The portable ultrasonic flow-meters are ideal check meter for verification of your mechanical meters, and/or measurements in locations that are not currently being metered.

Many water service companies around the world are using these meters as their audit meters.



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Quick and Easy
A must-have for process validations

The portable types, handheld and portable, based on the same technology of wall-mount and panel mount feature significant size reduction. While attaining the same functionality and accuracy, they reduced the sizes and weights to increase the ease of use and increase the data logging capability.

The handheld type (FMU-HA)'s single-handed portability means difficult and challenging jobs located in narrow or high places can now be performed safely and easily.

We highly recommend picking up of the FMU-HA for use in flow measuring tasks that demand both portability and advanced performance.

The data can be stored on the built-in data logger (for FMU-HA) or add-in data logger module (for FMU-PO, FMU-WA & FMU-PA). The data so stored can be downloaded to a PC on a MicroSoft Excel spreadsheet with just a click of a mouse button.
We highly recommend picking up of the FMU-HA for use in flow measuring tasks that demand both portability and advanced performance.

The handheld kit and the portable kit including all their accessories are both housed in rugged and compact aluminum cases for easy and safe carry-around.

When the transducer sealant is used up, the customer can use normal grease that can be purchased at any gas station or oil shop. And the printer paper and ink tape can be purchased at a print shop easily. So, once the customer owns the meter, they don't need to rely on us for supply of those expendable or consumable items.

Clamp-on flowmeters are recommended if you need:

- easy/low cost installation
- no interruption in operation; no need to cut pipe
- no periodic cleaning and moving parts to wear or foul
- no contact with media
- large pipe diameters up to 6000 mm (240")
- media under high pressure
- minimal maintenance
- no pressure drop or energy loss
- wide turn-down ratio

Handheld
(FMU-HA)

Portable
(FMU-PO)

Ultrasonic Thickness Gauge

SD Memory card Module
(81 x 31 x 8 mm)

GUI for remote controlling/monitoring

GUI for Downloading of data to PC

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Energy (Heat) Meter Solution
Full-function ultrasonic energy metering

FPT-100Ω, 3-wire
film type RTD

FPT-100Ω RTD
Temperature Transmitter

The wall mount type comes with energy (heat) meter function as built-in function.

With the addition of 2 FPt-100Ω RTD sensors, you have a powerful energy (heat) meter and avoid the performance and reliability problems that afflict conventional intrusive thermal energy flowmeters. Almost all the engineering units for energy can be selected. And not only heat generation but also heat loss is calculated.

Its high accuracy, wide bidirectional rangeability, and high sensitivity prevent the loss of energy cost billing now suffered when flow rates fall below the operating range of intrusive meters. Absolutely no pressure drop means lowest operating costs.

Installation is quick and easy; shut down is never needed for installation, maintenance, or calibration check, saving additional cost and inconvenience.

Non-intrusive, clamp-on "no-wear" flow sensing delivers intrinsic high reliability.

Ideal for a wide range of district energy heating and cooling applications and for power plants. And with the addition of Ethernet based remote monitoring and controlling system, the energy flow can be monitored at real time anywhere from a web-based applications. And the data collected at real time can be reported to a remote place by wireless using cellular technology.

Cellular (CDMA) based RTU

Ethernet-based Controller/Server

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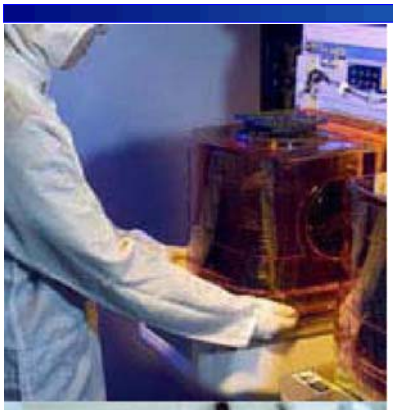
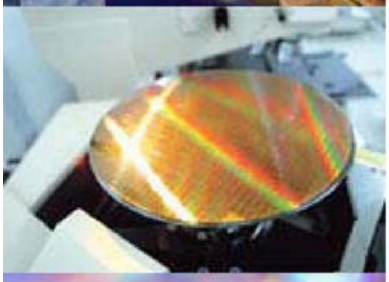
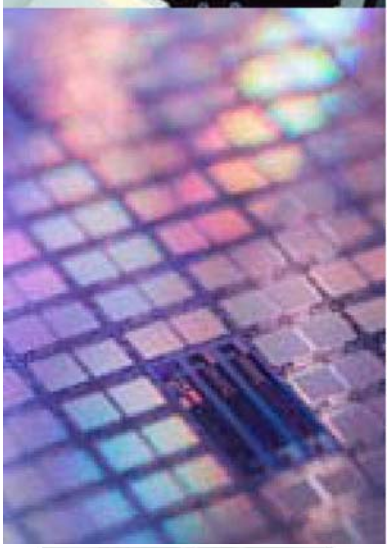




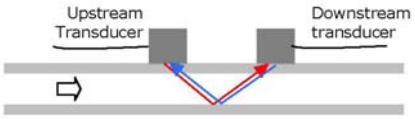


Semiconductor Industry Solution

Micro-flow and slurry sensing technology

Taking the advantage of the small size full-bore transducer technology, the micro-flow sensor is designed for low flow applications. Because the wetted materials are made of PFA material, this sensor makes an ideal choice for semiconductor industry, where the extreme cleanness of pipe inside is required.

The basic difference between this micro-flow transducer and the clamp-on transducer is that, while the sound signal travels diagonally with clamp-on transducers, it travels squarely with the micro-flow transducer. Therefore the signal travel path gets longer and the level of increase and decrease of the sound velocity gets bigger, thereby making the time difference calculation more accurate.



In the clamp-on transducers signal travels diagonally with regards to the flow and the travel distance is shorter.

In the micro-flow transducers signal travels squarely with regards to the flow and the travel distance is longer

Equipped with versatile user interface and digital signal processing technology, it features low flow measurements (as low as 5 ml/m) as well as significant reduction of adverse bubble or solid influence in the flow measurement. Besides, it retains the powerful capabilities of full-function flowmeter including communication, signal outputs, alarm, etc.

The typical application in the semiconductor industry is in the wafer polishing process using CMP slurry. The meter constantly measures flow and keeps the constant flow by controlling the pump using 4-20mA output signal of the meter.

Main features are summarized below;

- Extremely low flow: 5 ml/m
- All wetted parts made of PFA
- Miniaturized flow computer to fit into small spaces
- A wide selection of outputs
- Chemical resistance
- Corrosion resistance
- Various sizes to choose from

Flow Computer for Micro-flow Transducer

Micro-flow transducer

Applications

- Chemical mechanical polishing (CMP) slurries
- Pure water and ultras-pure water in semiconductor manufacturing plants
- Chemical feeds
- Highly corrosive chemicals
- Chemical dosing applications
- Ultra-low flow and low flow velocity measurements

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Flow Computers

	Wall Mount	Panel Mount	Handheld	Portable
Model Denominator	FMU-WA	FMU-PA	FMU-HA	FMU-PO
	Full functionality using all types of sensors and the widest selection of output and input interfaces	Housed in panel to work as part of a whole system for monitoring and controlling a process	Light-weight and the most advanced portable version with internal data logging capability	Legacy portable type with dot printer capability
Pipes Measured	Steel, stainless, cast iron, plastics, concrete or any pipes with known sound velocity property			
Pipe Sizes	15 ~ 6000 mm			
Fluid	Water, sea water and other clean liquids without high level of suspended particles			
Fluid Turbidity	Smaller than 10,000ppm (mg/l) with a low level of air bubble content			
Flow Velocity	-30 ~ +30 m/s			
Accuracy	±1.0% of Reading			
Repeatability	±0.2% ~ 0.5%			
Linearity	0.5%			
Ambient Temp.	-20 ~ +70℃			
Ambient Humidity	85% RH Max.			
IP Rating	IP-65			
Power	DC 24V AC 110 ~ 250V	DC 24V	Internal Battery AC 110 ~ 250V charger	Internal Battery AC 110 ~ 250V charger
Output	4-20 mA Pulse Batch Control Relay RS-485	4-20 mA Pulse Batch Control Relay RS-485	RS-232	RS-485 Optionally 4-20 mA, Pulse Batch Control Relay
External Inputs	2 x RTD Inputs 3 x 4-20 mA Inputs	2 x RTD Inputs 3 x 4-20 mA Inputs		Optionally 2 x RTD Inputs
Data Logger	Add-in SD Memory Card Module	Add-in SD Memory Card Module	Built-in Data Logger	Add-in SD Memory Card Module
Max. Transducer Cable Length	400 m			
Dimension	251 x 92 x 80 mm	90 x 90 x 34 mm	200 x 85 x 30 mm	258 x 180 x 100mm
Weight	5.5 kgs	5 kgs	9 kgs including transit case	9 kgs including transit case

Transducers

	Clamp-on		High Temp.	Insertion	Full-Bore	
Pipe Ranges	S	15~100 mm		> 80 mm	π Shape	10~40 mm
	M	50~700 mm			H Shape	> 50 mm
	L	300~6000 mm				
Operating Temperature	-20 ~ +120℃		-20 ~ +160℃	-20 ~ +130℃	-20 ~ +120℃	
IP Rating	IP 68		IP-68	IP-68	IP 65	
Cable Length	5 m by standard (optionally, can be up to 400 m)					

Temperature Sensors

Sensor Type	PT-100 ohm RTD, 3-wire, film-type
Accuracy	0.1℃
Accuracy of Temperature Sensing Circuitary	0.5%

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Model Selection Guide

FMU-##-##-##			Code
Flow Computer	Wall Mount		**WA**
	Panel Mount		**PA**
	Portable		**PO**
	Handheld		**HA**
Transducer	Clamp-On	Small (for 15~100mm pipes)	**CS**
		Medium (for 50~700mm pipes)	**CM**
		Large (for 300~6000mm pipes)	**CL**
	Insertion	45-degree Tip	**ID**
		Flat Tip	**IF**
	Full Bore		**F*DN***
	Ultra-Clean Micro-Flow Sensor	3 mm	**U3**
		6 mm	**U6**
Power		100~250 VAC (Wall Mount, Portable, Handheld)	**P1**
		24 VDC (Wall Mount, Panel Mount)	**P2**
Options		Data Logger (SD Memory Card Module)	**SD**
		Ultrasonic Thickness Gauge	**UT**
		Explosion Proof Enclosure	**EX**
		High-Temperature Sensor	**HT**
		Special Cable Length (Standard 5m)	**C___**
		RS-232 Converter	**RS232**
		Hot-Tapping Drill Tool	**DR**

Example:

FMU-WA-CM-P2-EX: *Explosion-proof wall mount ultrasonic flowmeter with M size clamp-on sensor powered by DC power.*

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