ARMSTRONG ULTRASONIC PORTABLE FLOWMETER

Convenience on the Go

Introduction

The Armstrong Ultrasonic Portable Flowmeter hand held unit is the most compact yet powerful flow / BTU meter on the market. The utilization of our proprietary technologies, such as ultrasonic signal processing, signal quality tracking, and self-adaptation as well as high density electronic design, allows the device to measure liquid flow, temperature and thermal energy from outside of a pipe reliably and accurately.

The meter is completely portable and utilizes clamp-on sensors to effectively perform non-invasive flow and thermal energy measurements. This yields major advantages. For example, there are no pipeline disturbances, no pressure losses, and most importantly no process interruptions.

Using the patented signal processing technology that has demonstrated its robustness and data measurement repeatability, the portable meter offers highly accurate and reliable measurements. The meter user inter face is self-explanatory and simple to follow. The unique strap-on fixtures for both the ultrasonic transducers and the temperature sensors make the installation hassle free. No special skills or tools are required.

The portable ultrasonic handheld unit has a rechargeable battery allowing the user to measure flow and energy for more than 8 hours. A built-in data logger memory of up to 2GB gives the user the flexibility of using the meter for data-logging and data-analysis. The Armstrong ultrasonic portable flowmeter is the best choice for flow survey, meter verification, pump checking, HVAC and energy balancing, energy auditing, facility management and other demanding flow and energy monitoring applications.

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Measurement Principle

Armstrong ultrasonic portable flow and energy meters are based on the transit-time measurement principle, where the system utilizes a pair of sensors (Figures 1 and 2) that function as both ultrasonic transmitter and receiver. The sensors are installed on the pipe wall, either clamped on the outside of the pipe or inserted into the pipe at a specific distance from each other. The flowmeter operates by alternately transmitting and receiving a coded burst of sound energy between the two sensors and measuring the transit time it takes for sound to travel between the two sensors. The difference in the transit time is directly related to the velocity of the liquid in the pipe. The flowrate is then calculated based on the transit-time difference, the geometry of the pipe and the fluid dynamics formula.

The sensors are commonly mounted with the Direct-method (Figure 1) or the Reflect-method (Figure 2). With the Direct-method, the two sensors are installed on opposite sides of a pipe. This method offers a shorter sound path, thus, better signal strength. It is often used for large size pipes where signal strength is more important. With the Reflect-method, the two sensors are installed on the same side of a pipe. The sound path is doubled; thus, the measurement accuracy is better. This method is often used for small and medium size pipes.
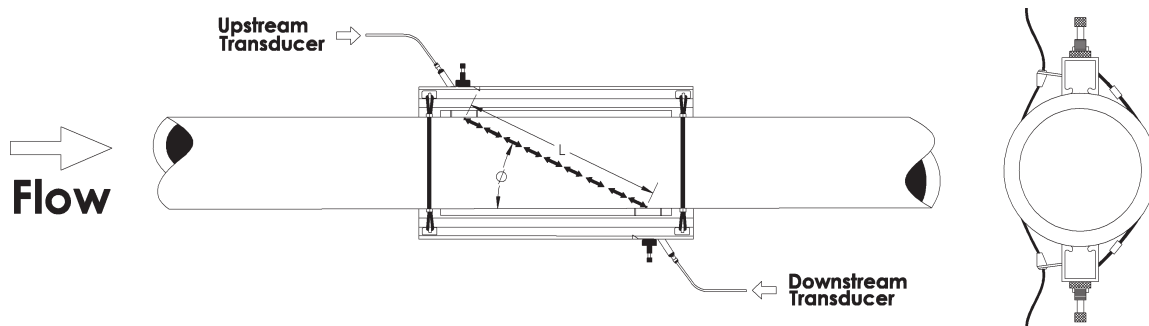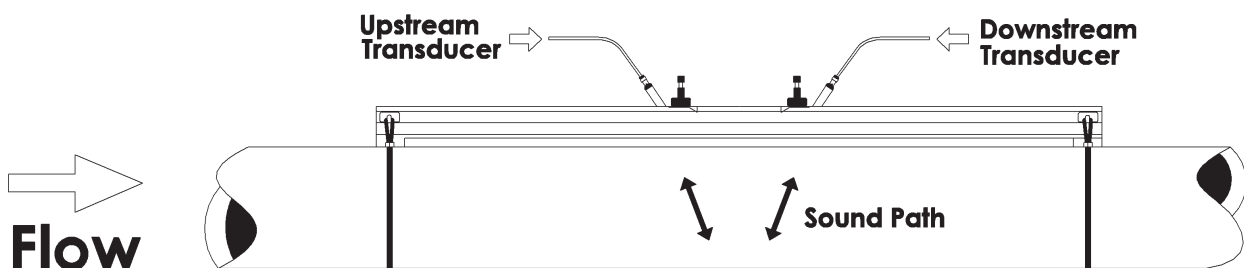
Figure 1. Direct Method

Figure 2. Reflect-Method

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There are several types of transducers you may choose for your applications. AS, AM, and AL transducers have a mounting rail, thus, are easy to install. You may need to use a clamping strap to tie the mounting rail to the pipe if the magnet on the rail does not work with the pipe. All the other types of transducers do not feature mounting rails. Again, the supplied clamping strap can be used to mount the transducer.

The site of the transducer installation is very important. Below are some recommendations for selecting the right site:

- To achieve good accuracy, it is recommended to have 15D straight-pipe run: upstream 10D and downstream 5D, where D is pipe diameter.
- If there is a valve upstream and the valve is not fully open, it could generate flow disturbance. A longer upstream straight pipe run is recommended.
- If there is a pump upstream, we recommend having 25D straight pipe run.
- If pipe is vertical, make sure the flow is going upward, not downward. Downward flow could have air gaps if the flow is free fall
- If pipe is horizontal, make sure the pipe is FULL and ensure the transducer is installed on the side of the pipe, not on the top or bottom of the pipe.

Applications
- Energy consumption supervision and water conservation management
- Cooling system and air conditioning/glycol solutions
- Water, including hot water, chilled water, city water, sea water, and more
- Sewage and drainage water with small particle quantity
- Oil, including crude oil, lubricating oil, diesel oil, fuel oil, and more
- Chemicals, including alcohol, acids, and more
- Solvents
- Beverage and food processors
- Water and waste treatment
- Power plants (nuclear, thermal & hydropower) heat energy boiler feed water
- Metallurgy and mining applications (e.g., acid recovery)
- Marine operation and maintenance
- Pulp and paper
- Pipeline leak detection, inspection, tracking and collection
- Water distribution network monitoring

Features and Benefits
- Accurately measures energy and flow using non-intrusive technology
- Capability of measuring bi-directional flow/energy
- Ease of use and fast installation
- Able to measure on a very wide pipe size range, from 3/4" up to 120"
- Ergonomic design, allowing the main unit to be held and operated with one hand
- Signal quality tracking and self-adaptation for robust performance
- Suitable for pure liquids and liquids with some particles. No dependency on conductivity
- Suitable for all commonly used pipes
- Rechargeable battery for 8 hours of operation
- Self-explanatory user interface. Step-by-step Quick Start guidance
- Built-in large data logger
- PC software for data download and real-time data acquisition
- Serial interfaces for PC link

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Specifications

Design	Portable
Energy Measurement	Measure energy rate and energy total. Optional dual RTD is required
Flow Velocity Range	± 32 ft/s, bi-directional
Flow Accuracy	For pipe ≥6": ±1% of reading ±0.03 ft/s in velocity*
	For pipe <6": ±2% of reading ±0.03 ft/s in velocity*
Temperature Accuracy	Temp: ±1.8°F
	Delta Temp: ±0.18°F with matched RTD sensors
Repeatability	0.5%
Response Time	0.5s. Configurable between 0.5s and 99s
Display/Keypad	LCD with backlight. 4 x 16 letters. 5 x 4 tactile-feedback membrane keypad plus utility 4 keys. Displays instantaneous energy rate/total, flow rate/total (positive, negative and net), velocity.
Units	English (U.S.) or Metric
Physical Quantity	Volumetric flow rate, total flow, velocity, temperature, BTU
Totalizers	Positive totalizer, negative totalizer, net totalizer, manual totalizer
Output	4-20mA
	Optically isolated Open Collector Transistor (OCT) output for frequency and pulse.
Recording	Automatically records the daily total of the last 128 days, the monthly total of the last 64 months and the yearly total of the last 5 years.
	Built-in data logger (2GB space) for recording energy, velocity, flow, status, and more
Data Logger	>150,000 measured values
Communication Interface	RS232. Supports the MODBUS protocol
Software	PC software for data logger download and real-time data acquisition
Pipe Size Range	3/4" - 120", depending on transducer
Pipe Material	All metals, most plastics, some lined pipes
Liquid Type	Most liquids with fewer than 1% suspended particles < 75um in a full pipe
Battery	Ion-Li up type to 8 hours
Liquid Temperature	32°F - 176°F or 32°F - 312°F , depending on transducer type
Enclosure	Handset: Plastic with anti-shock protection	Carrying case: Aluminum alloy protective case. Suitable for normal and harsh environment
	1.2 lbs. with batteries	
Protection	IP54
Dimensions	For handset: 8"x4"x1.5"
	For carrying case: 21"x17"x6.5"
Weight	Weight Handset: 1.2 lbs. with batteries	Carrying case: 15 lbs. approximate
Power Source	3 AAA Ni-H built-in batteries. When fully recharged, it will last over 8 hours of operation.

* Note under reference condition and velocity should be above 1ft/sec. Flowrate is calculated by multiplying velocity with the inner cross section are of the pipe.

Designs, materials, weights and performance ratings are approximate and subject to change without notice. Visit **armstrong**international.com for up-to-date information.
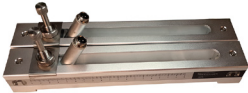
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Ordering Information

Model	Armstrong Ultrasonic Flowmeter	
AUP	Armstrong Ultrasonic Portable	
	Computer Type	
	F	Flow Only - NOTE: AUP base unit, AS (3/4" - 3") and AM (3" - 28") flow transducers, PC software, 2 year warranty, 3-point calibration certificate, carrying case, sonic couplant, battery pack/battery charger, clamping stretcher. NO temperature sensor and NO BTU feature
	B	Flow and BTU - NOTE: AUP base unit, AS (3/4" - 3") and AM (3" - 28") flow transducers, PC software, 2 year warranty, 3-point calibration certificate, carrying case, sonic couplant, battery pack/battery charger, clamping stretcher. PT100 clamp-on temperature sensors and BTU features
		For Large Transducers (12" to 120") – Please consult factory.
AUP	B	

Optional and Replacement Parts

Image	Description
	Small size transducer Pipe size: ¾" - 3" Temperature: 32°F - 312°F
	Medium size transducer Pipe size: 3" - 28" Temperature: 32°F - 312°F
	Large size transducer Pipe size: 12" - 120" Temperature: 32°F - 312°F
	Transducer cable Standard 15' cable for flow transducer
-	Thickness gauge - Ultrasonic thickness gauge for measuring pipe wall thickness on plastic and metal pipes, ranging from pipe size 1" – 120"
-	Battery pack - For replacement only
-	Battery charger - For replacement only
-	Hard Plastic carrying case
-	Acoustic couplant - Lithium grease acoustic couplant for transducer installation
-	Clamp - Clamping Stretcher for transducer mounting

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PC Software

ArmManager is a Windows-based PC software aimed to facilitate the use of and to explore the full potential of the Armstrong Ulstrasonic Portable Flowmeter.

ArmManager software makes it very easy to connect an Armstrong Ultrasonic Portable Flowmeter device to a PC USB connection. For those users with limited technical expertise, this software is essential as its ease of use saves both time and money.

ArmManager software, you can download data from the data logger inside the flowmeter directly to your computer. You can format the downloaded raw data into standard formats with a simple click of the mouse. You may then save the data to your computer hard drive and use Excel or other spreadsheet software to manipulate the data at a later point.

ArmManager software allows you to acquire the flowmeter data in real-time and display the data on a graphical interface. You can save the real-time data to your computer easily.

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