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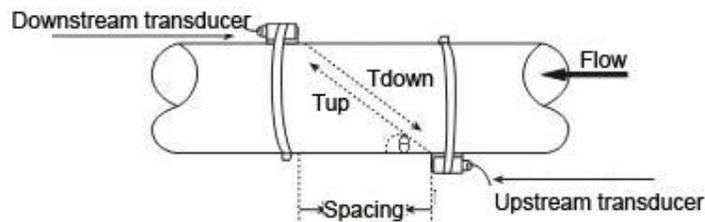
**Quality Assurance**

## Principle of Measurement

The Ultrasonic Flowmeter is designed to measure the fluid velocity of liquid within a closed conduit. The transducers are a non-contacting, clam-on type, which will provide benefits of non-fouling operation and easy installation .

The transit time flowmeter utilizes two transducers that function as both ultrasonic transmitters and receivers. The transducers are clamped on the outside of a closed pipe at a specific distance from each other. The transducers can be mounted in V-method where the sound transverses the pipe twice, or W-method where the sound transverses the pipe four times, or in Z-method where the transducers are mounted on opposite sides of the pipe and the sound crosses the pipe once. This selection of the mounting method depends on pipe and liquid characteristics. The flowmeter operates by alternately transmitting and receiving a frequency modulated burst of sound energy between the two transducers and measuring the transit time that it takes for sound to travel between the two transducers. The difference in the transit time measured is directly and exactly related to the velocity of the liquid in the pipe, as shown following,

$$V = \frac{MD}{\sin 2\theta} \times \frac{\Delta T}{T_{up} \cdot T_{down}}$$



Where

$\theta$  is the include angle to the flow direction

M is the travel times of the ultrasonic beam

D is the pipe diameter

$T_{up}$  is the time for the beam from upstream transducer to the downstream one

$T_{down}$  is the time for the beam from downstream transducer to the upstream one

$\Delta T = T_{up} - T_{down}$

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### Hand Held Ultrasonic Flow Meter



The handheld ultrasonic flowmeter is a battery-powered ultrasonic flowmeter with the capability of a full-size flow meter. It is designed for portability and easy to use.

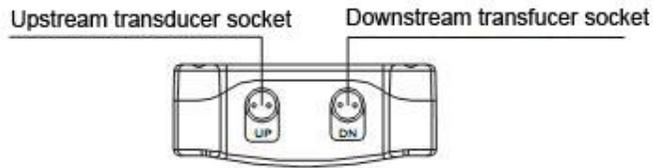
The built-in rechargeable Ni-MH battery can work continuously for more than 12 hours without recharge.

### Specifications

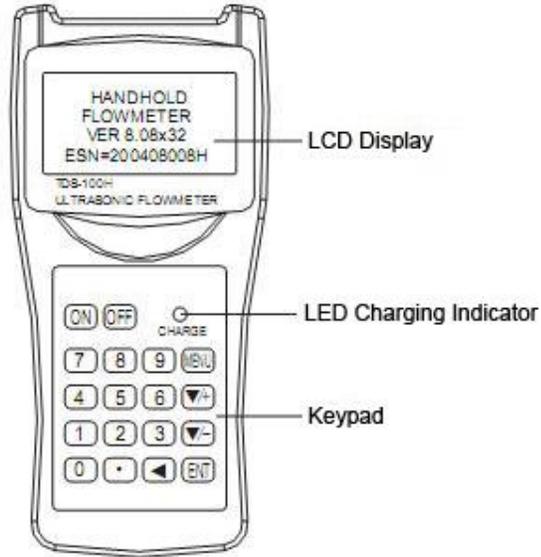
<b>Linearity</b>	0.5%
<b>Repeatability</b>	0.2%
<b>Accuracy</b>	±1% of reading at rates>0.6 ft/s. ±0.5% with on-site calibration
<b>Response Time</b>	0-999 seconds, user-configurable
<b>Velocity</b>	±0.03 ~ ±105 ft/s (±0.01 ~ ±30 m/s), bi-directional
<b>Pipe Size</b>	0.5" ~ 240" (15 ~ 6,000mm)
<b>Rate Units</b>	Meter, Feet, Cubic Meter, Liter, Cubic Feet, USA Gallon, Imperial Gallon, Oil Barrel, USA Liquid Barrel, Imperial Liquid Barrel, Million USA Gallons. User configurable.
<b>Totaliser</b>	7-digit totals for net, positive and negative flow
<b>Liquid Types</b>	Virtually all liquids
<b>Security</b>	Setup lockout. Access code needed for unlocking
<b>Display</b>	4x16 English letters
<b>Communication Interface</b>	RS-232C, baud-rate: from 75 to 115,200 bps. Protocol made by the manufacturer. User protocols can be made on enquiry.
<b>Transducers</b>	Model HM for standard, other models for optional
<b>Transducer Cable</b>	Standard 5mx2, optional 2x1,500' (500m)
<b>Power Supply</b>	3 AAA Ni-H built-in batteries. When fully charged it will last over 12 hours of operation. 90-230VAC for the charger
<b>Data Logger</b>	Built-in data logger can store over 2,000 lines of data
<b>Manual Totalizer</b>	7-digit press-key-to-go totalizer for calibration
<b>Housing Material</b>	ABS. Aluminum alloy protective case
<b>Case Size</b>	3.9"x2.6"x0.8" (100x66x20mm)
<b>Handset Weight</b>	1.2 lbs (514g) with batteries

outline Drawing

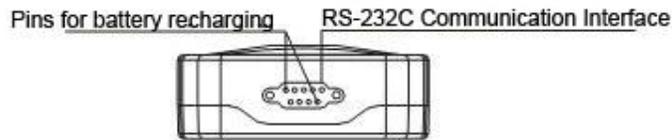
Top View



Front View



Bottom View



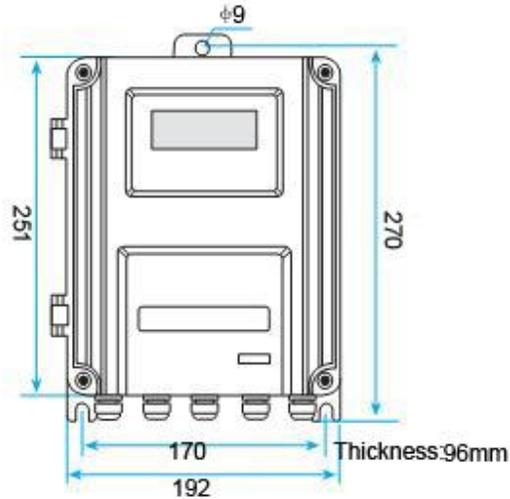
standard Features



Main Unit (0.538kg) + Special Cable for Transducer (5Mx2) + HM Type Clam-on Transducer for middle pipe + Aluminum Alloy Protective Case.

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## wall mounted type ultrasonic flow meter



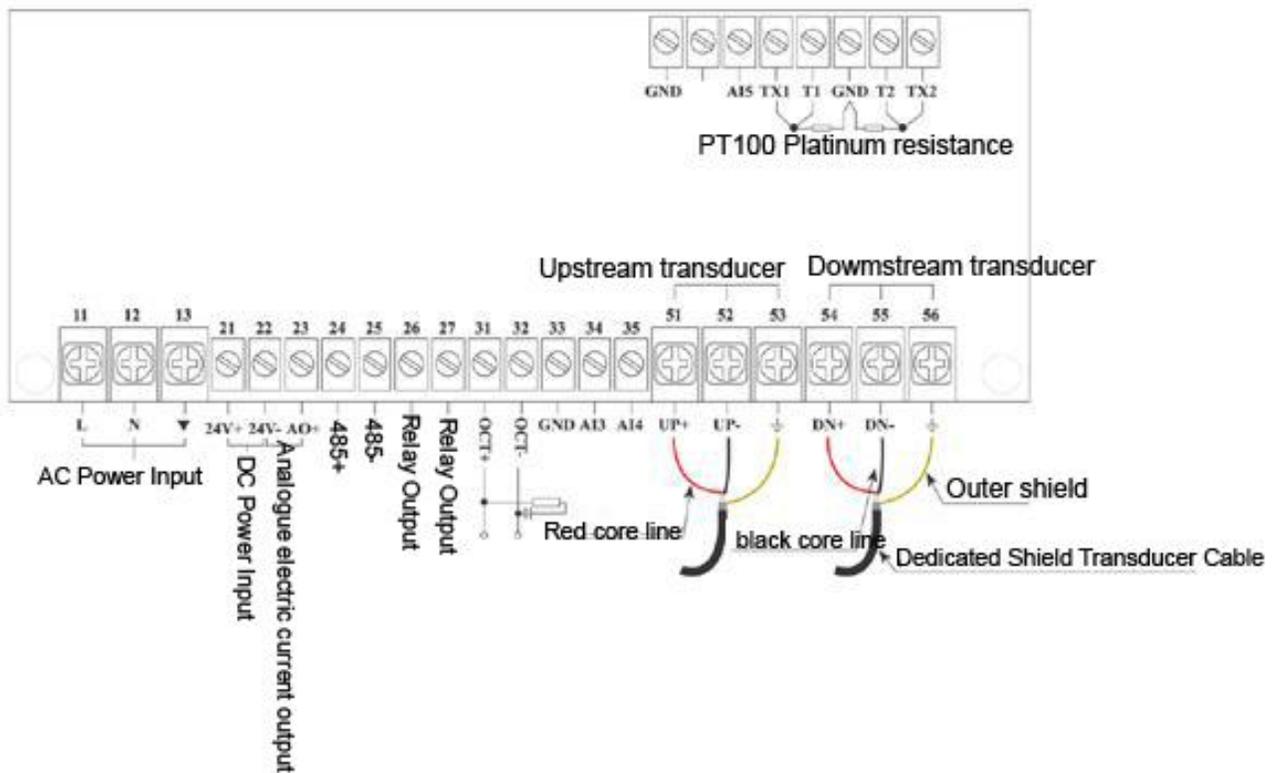
### Specifications

Items	Performance&Parameters
Accuracy	Better than $\pm 1.0\%$
Repeatability	0.2%
Velocity	$\pm 0 \sim 32\text{m/s}$
Measurement Period	500mS
Measurement Principle	Transit-time measurement principle
Display	LCD with back light, 2x20 letter
Keypad	4x4 key membrane keypad with tactile feedback
Unit	English(US.) or metric
Input	Five channel 4-20mA current for signals such as temperature, pressure, liquid level, and etc. Accuracy 0.1%. Two of the five input channels are wired to terminal blocks. The remaining three channels are optional.
Output	Analogue output: 4-20mA or 0-20mA current output. Impedance 01k $\Omega$ Isolated OCT output for frequency output (0-9.999Hz), alarm driver, or totaliser pulse output, ON/OFF control, etc. Relay output 1A@125VAC or 2A@30VDC. For ON/OFF control, alarm driver, totaliser output, etc. Internal Alarm (Buzzer): user programmable. External Alarm Driver: alarm signal can be transmitted to Relay or OCT output terminals to drive an external alarm.
	RS232 serial port
Others	Capable of offline compensation for flow totaliser, automatic/ manual selectable. Self-diagnosis. Automatically record the following information: The first 64 days/ 64 months/ 5 years totaliser data. The first 64 times power on/off and flow rate. Allow manual or automatic flow loss compensation.

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	The 64 days working status.
Pipe material	All metal, most of plastic, fiber glass, etc. Allow the pipe liner.
Pipe Size	1/2-240" (DN15mm-6000mm)
Power	AC:110V/220V, DC:24V
Power consumption	Less than 2W
Working time	continuous
Environment Humidity	85% RH
Environment Temperature	-30-80 Centigrade
Weight	Main unit: 3kg (6.6lb)
Enclosure	Die-cast alluminum enclosure Protective class: IP65 (NAME 4X) Size: 9.88x7.56x3.15" (251x192x80mm) for standard version
Clamp-on type sensor	S1 type: for pipe size DN15-100mm M1 type: for pipe size DN50-700mm L1 type: for pipe size DN300-6000mm S1H type: for pipe size DN15-400mm M1H type: for pipe size DN50-700mm

### Wiring Diagram



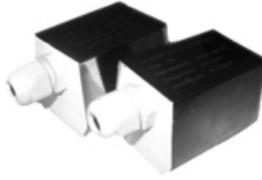
### MODULAR TYPE ULTRASONIC FLOW METER

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## CLAMP ON TRANSDUCERS



S1 Type



M1 Type



L1 Type



HS Type



HM Type



S1H Type



M1H Type

Parameters	HS type	HM type	S1 type	M1 type	L1 type	S1H type	M1H type
Pipe Size(mm)	DN15-100	DN50-700	DN15-100	DN50-700	DN300-6000	DN15-100	DN50-700
Pipe Size(inch)	1/2-4"	2-28"	1/2-4"	2-28"	12-240"	1/2-4"	2-28"
Material	Aluminum Alloy		ABS			Special High temperature material	
Frequency	1MHZ						
Installation method	V(N,W)	V, Z	V(N,W)	V, Z	Z	V(N,W)	V, Z
Calibration	Calibrate with the main unit						
Magnetism	Magnetic					No magnetic	
Temperature	32°F-320°F(0°C-160°C)					32°F-320°F(0°C-160°C)	
Protection class	IP65						
Dimension(mm)	200x25x25	280x40x40	45x30x30	60x45x45	80x70x55	90x85x24	90x82x29
Weight(g)	250	1080	75	250	650	94	150
Liquid types	Water, sea water, waste water, chemical liquids, oil, crude oil, alcohol, beer, etc.						
Suspension concentration	≤20000ppm, may contain very small amount of air bubbles.						
Pipe material	All metals, most plastics, fiber glass,etc.						
Dedicated shielded transducer cable	Standard length 5 meter x2, can be extended to 10 meterx2 or 15 meterx2						

