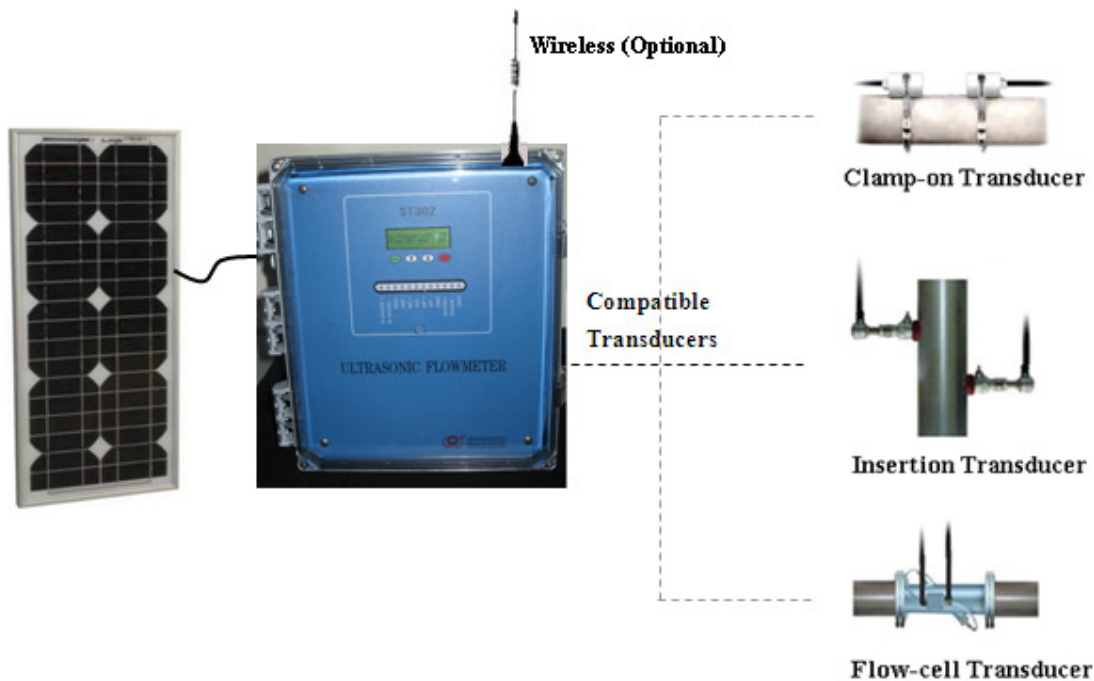


SOLAR POWERED WIRELESS ULTRASONIC FLOWMETER

- Advanced Transit-time Technology for Accurate Flow Measurement

For applications in rural area where electrical power is not accessible, our ST302 solar-powered ultrasonic flowmeter provides an ideal solution for accurate flow measurement. This unique product has a 20W solar panel, a 17AH re-chargeable battery, a low-power consumption GSM/GPRS modem, and a high-performance ultrasonic flowmeter. All the components, except the solar panel and transducers, are housed in a weather-proof robust enclosure.



Depending on transducer used, the ST302 product family comes as three varieties:

- (1) ST302B clamp-on ultrasonic flowmeter.
- (2) ST302C insertion ultrasonic flowmeter.
- (3) ST302G flow-cell ultrasonic flowmeter.

All of them have better than 1% accuracy. Clamp-on version (ST302B) is non intrusive and easy to install. Insertion version (ST302C) has excellent long-term stability and better accuracy. Flow-cell version (ST302G) has the best accuracy amount the three. It is also pre-programmed in factory, thus, it is actually a play & play device.

Transducer Selection Guide:

For high accuracy → ST302G

For pipe ≤ DN25 (1") → ST302G

For long-term stability and zero maintenance → ST302C or ST302G

For non-intrusive and pipe ≥ DN25 → ST302B

Features and Benefits:

- Solar powered. No other power supply is needed. Solar panel rated at 20Watts
- Built-in rechargeable battery (17AH) and charging circuit able to maintain 7 days of operation without sunshine
- Robust, NEMA/UL-50 Type 4X weather-proof enclosure
- Optional low-power consumption GSM/GPRS modem
- High accuracy. Normally $\pm 1\%$. Could be 0.5% when in-situ calibration is available
- No moving parts to worn out, thus, long life-span.
- Maintenance-free, thus, low operation cost
- No pressure drop, no flow disturbance. Big savings on high pressure pipes
- Excellent long-term stability. System accuracy does not degrade over time
- Bi-directional
- Wide flow range. Large turn-down ratio
- Suitable for all commonly used pipe materials
- Suitable for most pure liquids and liquids with minor particles
- Robust performance due to proprietary signal quality tracking and self-adaptation technology
- Built-in flow totalizers
- Internal data logger: last 512 daily net flow values and last 128 monthly net flow values
- External data logger (optional): 32,000 data capacity. USB interface
- Optional StufManager™ PC software for data collection
- LCD with backlight. 2 x 20 letters. 4 tactile-feedback membrane keypad.
- RS-485 interface with MODBUS support. Well suited for reliable networking
- Environment: For main unit: $-10^{\circ}\text{C} \sim 70^{\circ}\text{C}$. For transducers: $-20^{\circ}\text{C} \sim 80^{\circ}\text{C}$ or $-20^{\circ}\text{C} \sim 150^{\circ}\text{C}$ depending on transducer selected

GSM/GPRS Modem Specifications

Note: GSM/GPRS modem is optional.

- Support GSM900/1800M dual band or GSM850/1900M dual band
- Transmitting power: 2W (900MHz) or 1W (1.8GHz)
- Receiving sensitivity: $< -102\text{dBm}$
- Frequency error: $< \pm 0.1\text{ppm}$
- Low power consumption
- International standard interface
- Standard RS-232 interface
- Provide SMS services , meet GSM07.05 standard
- DTU device for transparent communication
- Auto reset after power off or manual reset

Hardware

- Weight : 10 kg

Interface

- Configuration interface for PC : RS-232, baud rate: 600~9600bps, data bits: 7-8, stop bits: 1-2, odd/even/none
- Data package length: If Hexadecimal format, < 75bytes; if ASCII format, <150bytes
- Antenna interface : SMA (Female)
- SIM room : Drawer-structured, easy to install SIM card

Temperature

- Operation temperature : From -20°C to +55°C
- Storage temperature: From -25°C to +75°C

Operating schedule

- Time period for working mode: 0 ~ 31,536,000 seconds programmable
- Time period for sleeping mode: 0 ~ 31,536,000 seconds programmable
- Time period for flowmeter data reading: 0 ~ 65,535 seconds programmable

Solar Panel Specifications

- Power: 20W
- Voc: 21.5V
- Isc: 1.28A
- Vmp: 17.3V
- Imp: 1.15A
- Dimensions : 639mm*294mm*23mm
- Weight : 2.4kg

Specifications:

Main Unit	Repeatability	Better than 0.2%
	Accuracy	±1% of reading, plus ±0.006m/s in velocity when working with Shenitech transducers. Could be better for flow-cell transducer
	Response Time	0.5s. Programmable up to 99s
	Velocity	-16 ~ +16m/s (-52 ~ +52 ft/s), bi-directional.
	Display	LCD with backlight. 2 x 20 letters. 4 tactile-feedback membrane keypad., displaying flow rate, totalizer values, velocity, time, analog inputs, temperature, thermal energy, etc.
	Units	English (U.S.) or metric
	Signal Outputs	Current output (optional): 4-20mA for flowrate, velocity or sound speed. Impedance 0-1k. Accuracy 0.1%
		OCT output: two channels. Can be programmed as pulse signal for flow totalization (positive, negative and net rates); ON/OFF signal for relay drive or alarm drive; batch control
	Signal Inputs	RTD interface (optional): two temperature channels to accommodate two PT100 3-wire temperature sensors. Analog inputs: three channels, 12bit. Can be used for signals such as temperature, pressure, liquid level, etc. Note that these channels can be used as digital channels
	Recording	Automatically record the totalizer data of the last 64 days / 32 months
Communication Interface	RS-485 port. Support MODBUS protocol PC software (optional): StufManager™ software for real-time data acquisition RS485-USB converter (optional) or RS485-Ether Converter (optional) GSM/GPRS module (optional) for wireless communication	
Enclosure	Robust, NEMA/UL-50 Type 4X weather-proof enclosure 356mm*293mm*132mm	
Liquids	Liquid Types	Virtually all commonly used liquids (full pipe)
	Liquid Temp	-20°C ~ 100°C or -20°C ~ 155°C, depending on transducer type
	Suspension concentration	<20,000ppm, or, < 2%, particle size smaller than 100um.
Pipe	Pipe Size	DN10~ DN6,000mm (3/8" ~ 240"), depending on transducer type
	Pipe Material	All metals, most plastics, fiber glass, etc. Allow pipe liner
	Straight Pipe Section	Longer than 15D, where D is pipe diameter. If a pump is near upstream, the straight pipe section following the pump should be > 30D.
Cable	Shielded transducer cable. Standard length 15' (5m). Can be extended to 330' (100m). Contact the manufacturer for longer cable requirement.	
Environment	Temperature	Main unit: -20°C ~ 55°C
		Transducer*: -20°C ~ 150°C depending on transducer type
	Humidity	Main unit: 85% RH
		Transducer: water-immersible, water depth less than 10' (3m)
Power	20W Solar Power Panel, 12V/17AH rechargeable battery. Both are already built-in	
Weight	12kg	

Applications:

ST302 flowmeter is designed for remote applications where solar power is the only option to power up the system. With proper transducers, the flowmeter is able to measure liquid flow in a closed pipe accurately and reliably. Unlike traditional mechanical flowmeters, ST302 based flowmeter does not have moving parts, thus, it has long life span and need almost no maintenance. This technology measures both conductive and non-conductive liquids.

Application examples are:

- Irrigation system monitoring
- Remote pipe line monitoring
- Water, including hot water, chilled water, city water, sea water, etc.
- Sewage, waste treatment, etc.
- Oil, including crude oil, diesel oil, fuel oil, lubricating oil, etc.
- Chemicals, including alcohol, acids, etc.
- Solvents
- Beverage, food and pharmaceutical processors
- HVAC, energy measurement system, etc.

Measurement Principle:

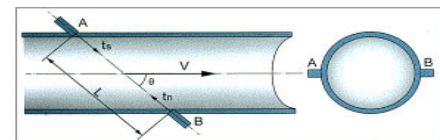
The ST302 flowmeter is based on transit-time measurement principle, as shown in the following figure.

A typical transit-time flow measurement system utilizes two transducers (A and B) that function as both ultrasonic transmitter and receiver. The transducers are clamped on the outside of a closed pipe at a specific distance from each other. The flow meter operates by alternately transmitting and receiving a coded 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.

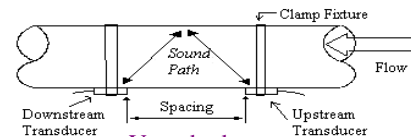
Three types of transducers can be used with ST302 main unit: clamp-on type, insertion type and flow-cell type. All of them do not have moving parts to wear out, thus, virtually no maintenance is needed. They do not block the flow neither, thus, do not generate flow disturbance or cause pressure drop.

The transducers can be mounted with three methods, Z-method, V-method and W-method, depending on pipe size. Z-method is used for large pipe. The two transducers are installed on opposite sides of the pipe. V-method is used for medium size pipe. The two transducers are on the same side, thus, the sound transverses the flow twice. W-method is usually used for small pipe. The sound transverses across the flow four times.

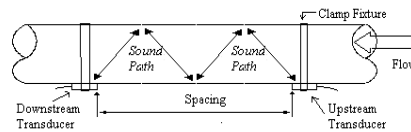
For pi-type flow-cell transducer, the two transducers are mounted to face each other rather than the three methods mentioned above. Please contact Shenitech for more details.



Z-method



V-method



W-method

Transducer Options:

Shenitech offers three types of standard ultrasonic transducers which match ST302 main unit.

1. Clamp-on type:

-HFx: for pipe size DN15-DN25 (1/2"~1", 2MHz) *

- S1x: for pipe size DN25-DN100 (1”~4”) *
 - S1HTx: for pipe size DN25-DN100 (1”~4”) with temperature up to 150°C *
 - M1: for pipe size DN50-DN700 (2”~28”)
 - M1HT: for pipe size DN50-DN700 (2”~28”) with temperature up to 150°C
 - L1: for pipe size DN300-DN6,000 (11”~240”)
- * x represents pipe material: 0-Copper, 1-Tubing, 2-ANSI Plastic, 3-ANSI Metal

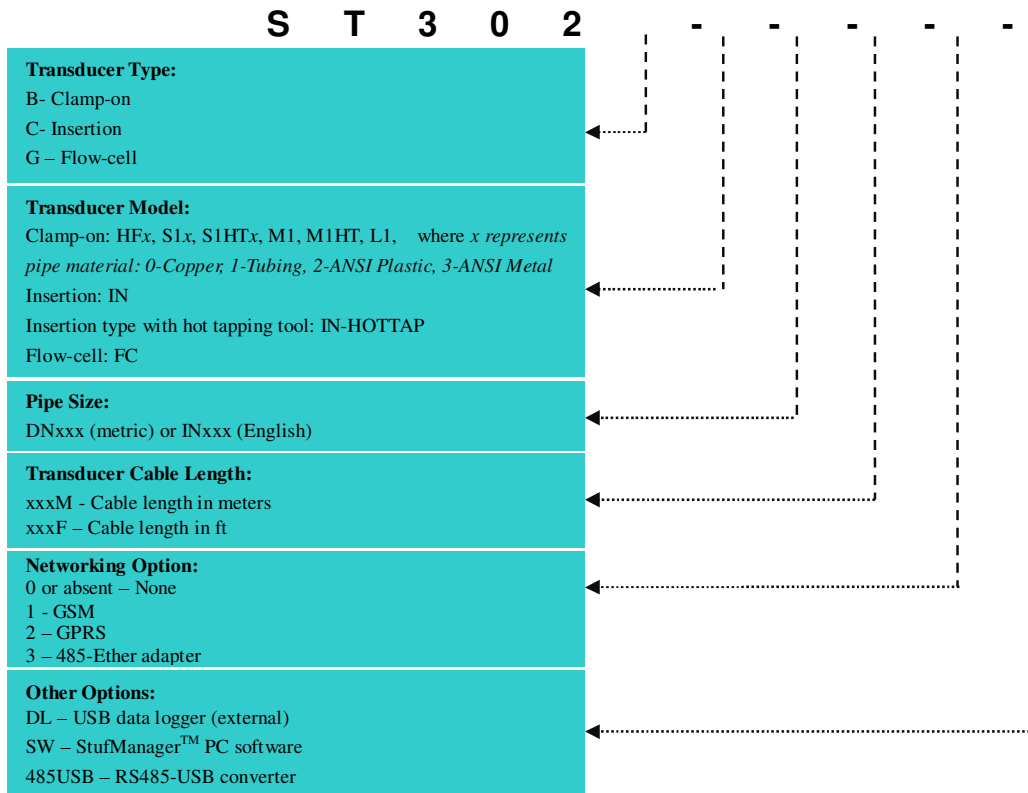
2. Insertion type:

- IN: for pipe size of DN80 (3”) and above
- HOTTAP: hot-tapping tool for insertion transducer installation

3. Flow-cell type:

- FC-DNxx: flow-cell transducer for pipe size DNxx (in mm)
- FC-INxx: flow-cell transducer for pipe size INxx (in inch)

Model Selection:



Example:

Model# ST302G-FC-DN50-5M-1 stands for standard solar-powered flowmeter, flow-cell type transducer for pipe size DN50mm, 5 meter transducer cable, GSM wireless.

Note: if you prefer to work with English system for the model number, please put “IN” (for inch) or “F” (for feet) right before the dimension values. For example, the above model# in English system will be:

ST302G-FC-IN2-15F-1.

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