

## Economical Ultrasonic Flowmeter

### Special Features:

- Compact and robust design
- High accuracy, better than  $\pm 1\%$
- No moving parts, maintenance-free
- No pressure drop
- Bi-directional
- Wide measurement range,  $\pm 16\text{m/s}$
- Built-in flow totalizers
- Large turn-down ratio
- Suitable for most pure liquids and liquids with minor particles
- Compatible with clamp-on, insertion and flow-cell transducers
- Pipe size selectable from DN10 to DN5000mm
- Automatically match transducer to liquid property with proprietary signal quality tracking and self-adaptation technology
- Local LCD display and 4 keys
- Optional PC Software for real-time data acquisition
- Isolated RS-485 interface with power surge protection. Supports MODBUS. Well suited for reliable flowmeter networking
- Optional input/output, such as isolated 4-20mA output, OCT output
- IP65 weather-proof enclosure
- Power supply 9~24VDC, less than 1.2Watt



### Description:

The S301 ultrasonic flowmeter is an economical but robust flowmeter. It utilizes cutting-edge technologies, such as balanced ultrasound transmission, digital signal processing, self adaptation, etc., to achieve high performance.

The S301 can be equipped with a pair of clamp-on transducers to measure liquid flow rate from outside of a pipe non-intrusively. It can also be equipped with a pair of insertion transducers or a flow-cell transducer to measure liquid flow with excellent long-term stability and high accuracy.

- S301B clamp-on flowmeter
- S301C insertion flowmeter
- S301G flow-cell flowmeter

Due to the proprietary signal quality tracking and self-adaptation algorithm, S301 is able to tune itself to the optimal condition when the liquid property changes or different transducer is connected

S301 is encapsulated in a heavy-duty weather-proof metal enclosure for best protection. In this compact unit, there are one LCD and 4 keys for results display and local programming.

The S301 has a surge-protected, isolated RS485 interface with the MODBUS support. This feature makes it suitable for reliable flowmeter networking.

S301 can be equipped versatile input/output interfaces upon request, such as batch controller, thermal energy measurement, analog input, digital OCT output and 4-20mA output. These can be easily used by a host computer or PLC for process monitoring and control.

S301 can be widely used in water distribution network, fuel consumption monitoring, and other liquid flow applications where zero maintenance and high accuracy are crucial.

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### Specifications:

#### MAIN UNIT

|                         |                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Repeatability           | : Better than 0.2%                                                                                                                                                                                                                                                                                                                                                           |
| Accuracy                | : $\pm 1\%$ of reading, plus $\pm 0.006\text{m/s}$ in velocity when working with Omicron's transducers. Could be better for flow-cell transducer                                                                                                                                                                                                                             |
| Response Time           | : 0.5s. Programmable up to 99s                                                                                                                                                                                                                                                                                                                                               |
| Velocity                | : $-16 \sim +16\text{m/s}$ ( $-52 \sim +52\text{ ft/s}$ ), 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%<br><br>OCT output (optional): one channel, 0.1A/24VDC.<br>Relay (optional): 1A/125VAC or 2A/30VDC.<br>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, etc. |
| Signal Inputs           | : Analog inputs (optional): 2 channels, 12bit. Can be used for signals such as temperature, pressure, liquid level, etc. These channels can be used as digital channels                                                                                                                                                                                                      |
| Recording               | : Automatically record the totalizer data of the last 64 days / 32 months<br>Optional SD data logger (2GB space) or external USB data logger                                                                                                                                                                                                                                 |
| Communication Interface | : RS-485 port. Support MODBUS protocol<br>PC software (optional): software for real-time data acquisition<br>RS485-USB converter (optional)<br>RS485-Ether Converter (optional)                                                                                                                                                                                              |
| Enclosure               | : Robust, NEMA4X (IP65) weather-proof metal enclosure                                                                                                                                                                                                                                                                                                                        |

#### LIQUIDS

|                          |                                                                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Liquid Types             | : Virtually all commonly used liquids (full pipe)                                                                                 |
| Liquid Temp              | : $-20^{\circ}\text{C} \sim 100^{\circ}\text{C}$ or $-20^{\circ}\text{C} \sim 155^{\circ}\text{C}$ , depending on transducer type |
| Suspension concentration | : $< 20,000\text{ppm}$ , or, $< 2\%$ , particle size smaller than $100\mu\text{m}$ .                                              |

#### PIPES

|                       |                                                                                                                                           |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Pipe Size             | : DN10~ DN6,000mm ( $3/8" \sim 240"$ ), 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 $> 30D$ . |

#### CABLES

Shielded transducer cable. Standard length 15' (5m). Can be extended to 330' (100m). Contact the manufacturer for longer cable requirement.

#### ENVIRONMENT

|             |                                                                                                                                                        |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature | : Main unit: $-20^{\circ}\text{C} \sim 55^{\circ}\text{C}$<br>Transducer*: $-20^{\circ}\text{C} \sim 150^{\circ}\text{C}$ depending on transducer type |
| Humidity    | : Main unit: 95% RH<br>Transducer*: water-immersible, water depth less than 10' (3m)                                                                   |

#### POWER

9~24VDC, 1.2W

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### Applications:

The S301 economical ultrasonic flowmeter is ideal for process control and flow measurement at fixed locations. Its long-term stability, zero maintenance, high-accuracy and plug and play feature make it indispensable in applications such as chemical liquid processing, water treatment, municipal water distribution, and other challenging flow measurement applications. Benefited from our advanced self-adaptation and digital signal processing technologies, the flowmeter works reliably in both clean and opaque liquid flow.

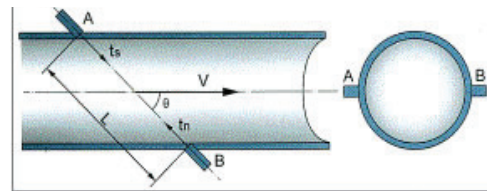
Applications include:

- Water management in buildings, metropolitans, water / wastewater treatment plants, irrigation systems, etc
- Liquid process control in chemical plants and industrial automation. Chemicals include alcohol, glycol, acids, solvents, etc.
- Oil/fuel transfer. Oil includes diesel oil, fuel oil, lubricating oil, hydraulic oil
- Efficiency monitoring and improvement of liquid-based heating / cooling systems, including solar/geothermal systems
- Beverage, food and pharmaceutical processors where non-contact is a must

### Measurement Principle:

The S301 flowmeter is based on transit-time measurement principle, as shown in the right figure.

A typical transit-time flow measurement system utilizes two transducers (A and B) that function as both ultrasonic transmitter and receiver. The two transducers are either clamped onto the outside of a pipe or inserted into the pipe wall 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 it takes for sound to travel between the two transducers. The difference in the transit time measured is directly related to the velocity of the liquid in the pipe. After the velocity is measured, the flowmeter calculates the flowrate by multiplying the velocity with the cross-section area of the pipe.



### Transducer Options:

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)



## Economical Ultrasonic Flowmeter

### HOW TO ORDER

|                                                                                    |                                                                                                                             |       |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------|
|    | <b>Basic Model :</b>                                                                                                        | S301  |
|    | <b>Transducer Type:</b>                                                                                                     | B     |
|                                                                                    | B    Clamp-on    C    Insertion    G    Flow-cell                                                                           |       |
| <hr/>                                                                              |                                                                                                                             |       |
|    | <b>Transducer Model:</b>                                                                                                    | IB    |
|                                                                                    | Clamp-on: HFX, S1x, S1HTx, M1, M1HT, L1, where x represents pipe material: 0-Copper, 1-Tubing, 2-ANSI Plastic, 3-ANSI Metal |       |
|                                                                                    | Insertion: IN                                                                                                               |       |
|                                                                                    | Insertion type with hot tapping tool: IN-HOTTAP                                                                             |       |
|                                                                                    | Flow-cell: 1B – Pi-type flow-cell transducer with BST thread joint                                                          |       |
|                                                                                    | 1N – Pi-type flow-cell transducer with NPT thread joint                                                                     |       |
|                                                                                    | 1F – Pi-type flow-cell transducer with flange joint                                                                         |       |
|                                                                                    | 2F – Standard-type flow-cell transducer with flange joint                                                                   |       |
| <hr/>                                                                              |                                                                                                                             |       |
|  | <b>Pipe Size:</b>                                                                                                           | DNxxx |
|                                                                                    | DNxxx (metric) or INxxx (English)                                                                                           |       |
| <hr/>                                                                              |                                                                                                                             |       |
|  | <b>Transducer Cable Length:</b>                                                                                             | Mxxx  |
|                                                                                    | Mxxx - Cable length in meters                                                                                               |       |
|                                                                                    | Fxxx – Cable length in ft                                                                                                   |       |
| <hr/>                                                                              |                                                                                                                             |       |
|  | <b>4-20mA Output:</b>                                                                                                       | AO    |
|                                                                                    | AO – with 4-20mA output                                                                                                     |       |
|                                                                                    | Absent or NAO – without 4-20mA output                                                                                       |       |
| <hr/>                                                                              |                                                                                                                             |       |
|  | <b>Other Options:</b>                                                                                                       | SW    |
|                                                                                    | DLUSB – USB data logger (external, 4-20mA input)                                                                            |       |
|                                                                                    | DLSD – SD data logger (2GB)                                                                                                 |       |
|                                                                                    | SW – StufManager™ PC software                                                                                               |       |
|                                                                                    | 485USB – RS485-USB converter                                                                                                |       |
|                                                                                    | 485E – RS485-Ethernet adapter                                                                                               |       |

Ordering Example : S301 - B - IB - DNxxx - Mxxx - AO - SW