



HANDHOLD ULTRASONIC FLOWMETER(TDS-100H)

1. Introduction

1.1 Preface

Welcome to the TDS-100 (Version 8.xx) series ultrasonic flow meter that has been manufactured with patent technologies and is equipped with more functions and advanced performance than our previous versions.

The Version 8.xx series ultrasonic flow meter has been upgraded based on the Version 7.xx series ultrasonic flow meter, which is still the main product line of the company. The new Version 8.xx retains most of the excellent features and functions of the previous versions: the pulse measurement technology, the ultrasonic igniting and the small signal receiving circuits etc. The main improvements are made on the battery supply circuit and on the transmitting circuits. All other circuits are simply integrated into this new version without major modifications, due to the fact that we have already applied the most advanced measurement technologies and attained a more reliable model of ultrasonic flow meter.

The TDS-100 Series flow meter incorporates the latest ICs manufactured from the famous semiconductor manufacturers like Philips, Maxim, TI, Winbond, and Xilinx. The hardware features the ease of operation, high accuracy and outstanding reliability, while the software provides a very user-friendly interface and much more functions. It employs a patent balanced lower voltage multi-pulse igniting circuit which increases the anti-interference ability magnificently so that the flow meter will work properly even in demanding industrial environments such as those which power frequency transverter working nearby.

Other outstanding features:

- the signal receiving circuits feature self-adapting performance so as to ensure that the user can easily operate the instrument without any adjustment.
- the built-in rechargeable Ni-H battery can work continuously for more than 12 hours without recharge.

The advanced circuit design, the integration of the latest semiconductors, the user-friendly software interface both in English and Chinese languages and small-sized PCB board, all these features combine to make the TDS-100 series ultrasonic flow meter the best and the biggest seller on the Chinese market. Moreover, it is gaining more and more recognition on the international flow meter market.

1.2 Feature

- | | |
|---|--------------------------------------|
| * 0.5% of linearity | * 0.2% of repeatability |
| * Bilingual interface in Chinese and English | * flow totalizers |
| * Patent balanced lower-voltage multi-pulse ultrasonic igniting | * built-in date totalizers |
| * built-in data-logger | * Working properly near transverters |
| * 100 Pico-second resolution of time measurement | * 0.5 second totalizing period |

1.3 Principle of Measurement

The TDS-100 ultrasonic flow meter is designed to measure the fluid velocity of liquid within a closed conduit. The transducers are a non-contacting, clamp-on type, which will provide benefits of non-fouling operation and easy installation.

The TDS-100 transit time flow meter 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 flow meter 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 liquid in the pipe, as shown in Figure 1.

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$$Q = K \frac{D}{\sin 2\theta} \frac{1}{(T_0 - \tau)^2} \Delta T$$

$$\Delta T = T_2 - T_1$$

where

θ is the include angle to the flow direction

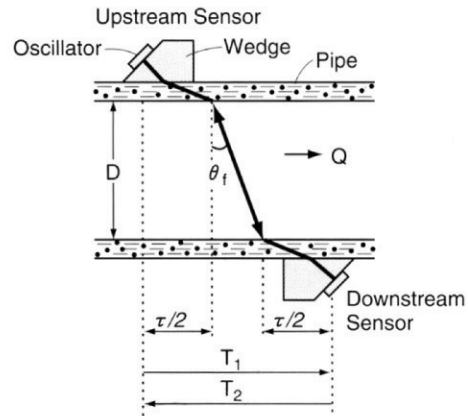
M is the travel times of the ultrasonic beam

D is the pipe diameter

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

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

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



1. 4 Parts Identification

Converter :



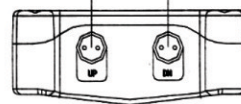
TDS-100H



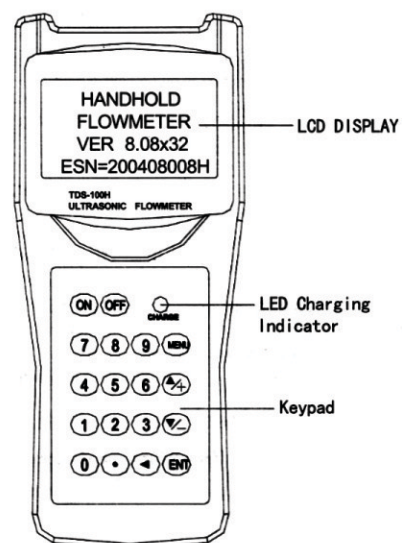
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upstream transducer socket downstream transducer socket

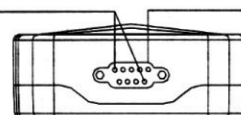
Top view ⇒



Front view ⇒



Bottom view ⇒

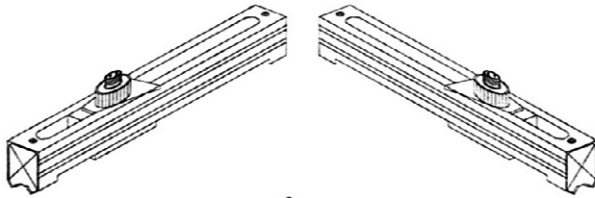


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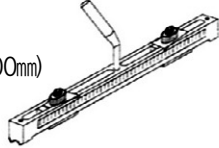
**Transducers :**

Standard-HM (50mm-700mm)

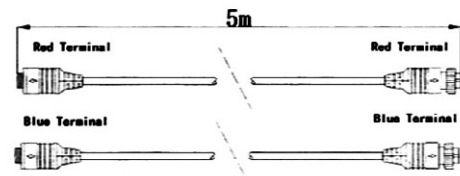


Standard-HS (20mm-100mm)

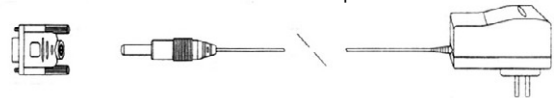
(Optional Accessories)



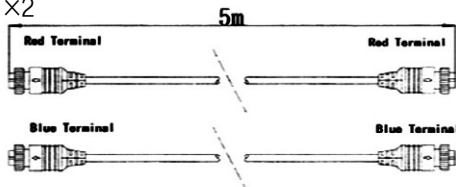
Extended Cable 5m ×2 (Optional accessories)



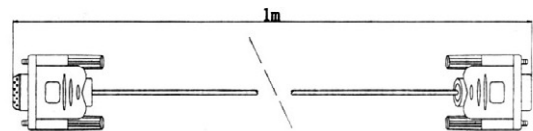
Converted Terminal and AC/DC Adapter



Cable 5m ×2



Cable of RS-232C interface

**1. 5 Typical Applications**

The TDS-100 flow meter can be virtually applied to a wide range of measurements. The measured pipe ranges 20-6000mm [0.5-200inch]. A variety of liquid applications can be accommodated : ultra-pure liquides, potable water, chemicals, raw sewage, reclaimed water, cooling water, river water, plant effluent, etc. Because the instrument and transducers are non-contacting and have no moving parts, the flow meter can not be affected by system pressure, fouling or wear. Standard transducers are rated to 110°C. Higher temperatures can be accommodated. For further information, please consult the manufacturer for assistance.

1. 6 Data Integrity and Built-in Time-Keeper

All user-inputted configuration values are retained in the built-in non-volatile flash memory that can store them for over 100 years, even if power is lost or turned off. Password protection is provided to avoid inadvertent configuration changes or totalizer resets.

A time-keeper is integrated in the flow meter for the index of date totalizing and works as the time base of flow accumulation. It keeps operating as long as the abttery's terminal voltage is over 1.5V. In case of battery failure, the time-keeper will not keep running and it will lose proper time values. The user must re-enter proper time values in case the battery becomes totally exhausted. An improper time value affects no other functions but the date totalizer.

1. 7 Product Identification

Each set of the TDS-100 series flow meter has a unique product identification or ESN written into the software that can only be modified with a special tool by the manufacturer. In case of any hardware faulure, please provide this number which is located on menu window number M61 when contacting the manufacture.

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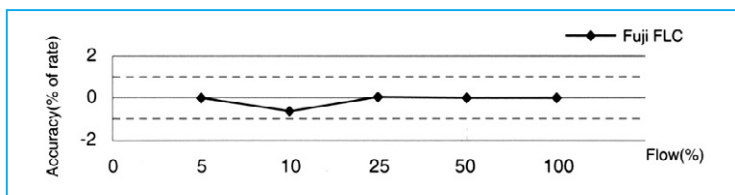


1. 8 Specifications

| | |
|------------------------|--|
| Linearity | 0.5% |
| Repeatability | 0.2% |
| Accuracy | ±1% of reading at rates > 0.2mps |
| Response Time | 0-999 seconds, user-configurable |
| Velocity | ±32 m/s |
| Pipe Size | 20mm-6000mm |
| Rate Units | Meter, Feet, Cubic Meter, Liter, Cubic Feet, USA Gallon, Imperial Gallon, Oil Barrel, USA Liquid Barrel, Imperial Liquid Barrel, Million USA Gallons, User configurable. |
| Totalizer | 7-digit totals for net, positive and negative and negative flow respectively |
| Liquid Types | Virtually all liquids |
| Security | Setup values Modification Lockout, Access code needs unlocking |
| Display | 4x8 Chinese characters or 4x16 English letters |
| Communication | RS-232C, baud-rate : from 75 to 57600. Protocol made by the |
| Interface | manufacturer and compatible with that of the FUJI ultrasonic flow meter. User protocols can be made on enquiry. |
| Transducers | Model M1 for standard, other 3 models for optional |
| Transducer Cord Length | Standard 2x10 meters, optional 2x500 meters |
| Power Supply | 3 AAA Ni-H built-in batteries. When fully recharged it will last over 10 hours of operation 100V-240V AC for the charger |
| Data Logger | Built-in data logger can store over 2000 lines of data |
| Manual Totalizer | 7-digit press-key-to-go totalizer for calibration |
| Housing Material | ABS |
| Case Size | 100x66x20mm |
| Handset Weight | 514g (1.2 lbs) with batteries |

our technical breakthrough based on years of experience and the adoption of the latest digital processor (32bit MPU), enabled AUTOFLOW Ultrasonic flowmeters to provide remarkable features ;

► **High Accuracy : typically ± 0.5 to 1% of reading**



► **Repeatability : ± 0.2 to 0.5% full scale**

► **Quick Response : 0.5 to 1sec**

► **Broad Measuring Range**

Temperature : -40 to +200°C

Rangeability : 0.02 to 32m/s (1600 : 1)

Pipe diameter : 13mm to 6000mm

► **New Sound Velocity Measurement SystemPAT.**

– Auto Calculation of unknown sound velocity

– Auto-temp./Press. Compensation

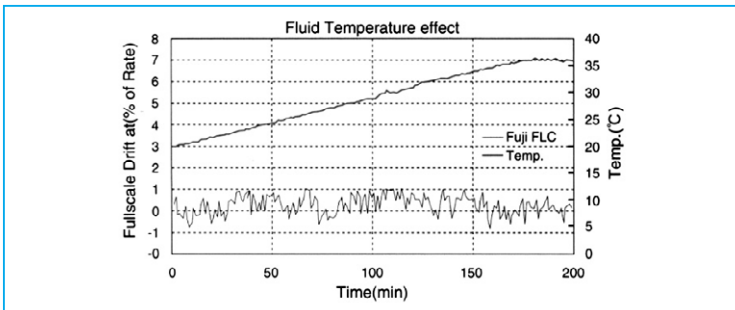
Sound velocity of measured fluid is influenced while pressure and temperature change. "New Sound Velocity Measurement SystemPAT." realizes temp./press. compensation which is essential for precise flow velocity measurement, by measuring sound velocity of measured fluid at every measuring cycle.

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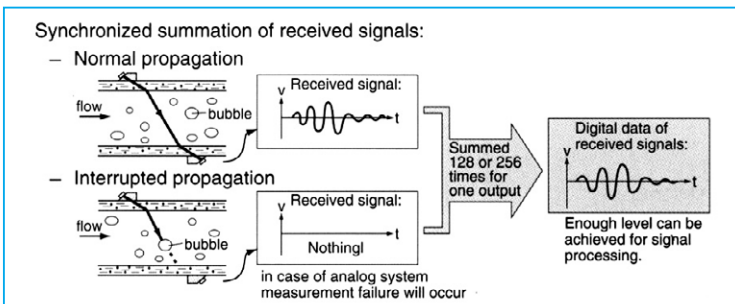
► Auto-Temp./Press. Compensation function



► Advanced Anti Bubble Measurement : ABM

(No problem up to 12% vol. bubble in flow fluid at 1m/s)

※ See Note 1



Thanks to the Non-intrusiveness of clamp-on sensors, we can offer the ideal solution to the users of ordinary intrusive of spool-piece type flowmeters

(ex. Differential Pressure, Electromagnetic, Turbine, etc.)

The advantages of Clamp-on mounting are ;

- Easy installation (No Pipe Work required)
- Simple maintenance thanks to no moving parts
- Free from Pressure Loss, Choking and Corrosion and Leakage.

These features of Clamp-on sensors result the reduction of the total ownership cost.

Comparison of TOTAL OWNERSHIP COST with major rivals

