Audiowell International

Product Specification

FS0009-000 Ultrasonic Flow Meter Module

Description

The FS0009 Ultrasonic Flow Meter Module uses ultrasonic waves to measure liquid flow rate and reports digital flow results using a serial UART interface. It consists of a lead-free composite flow tube and a pair of master-slave connected ultrasonic sensors.

The FS0009 measures the flow rate of liquid by calculating the transit time difference between upstream and downstream ultrasonic pulses. It contains no moving part in the pipe section, and therefore has lower pressure loss and higher accuracy than traditional flow meters.

The circuit integrated in the sensor can calculate instantaneous flow rate and accumulated water usage with the time-of-flight method and monitors the status of fluid and pipe. The flow data are transmitted by serial communication for further processing or development using a simple protocol.

Features

- Fully calibrated water meter module with embedded measurement electronics
- DN20 composite (non-leaded) flow tube
- UART TTL-Level Serial Output
- Simple communications protocol
- +3.3V Operation
- Operating Temperature 0.1°C to 50°C
- Flow Range: 1.5 to 4500 L/h
- Accuracy: ≤ ±2% from 25°C to 35°C
- Repeatability: ≤ ±1%

Benefits

- No moving parts
- Low power consumption
- Active alert for abnormal status such as pipe dripping, transducer failure, etc.
- Water-contact materials conform with drinking water standards

Applications

- Smart irrigation systems
- Intelligent water management systems
- Industrial flow measurement / control equipment
- Intelligent water management and leakage prevention
- Tankless water heaters

Ordering Information

Part Number: FS0009-000

Model Number: DN20-US0024-L561-01

Pin Functions

Wire Color	Function
RED	VCC (+3.3V)
BLACK	GROUND
WHITE	RXD (Write from Host)
YELLOW	TXD (Read from Host)

FS0009-000 (Model # DN20-US0024-L561-01)

Basic Performance Characteristics

No.	Item	Specification	Remarks
1	Nominal Diameter	DN20	
2	Power Supply	3.1 - 3.7 V	Powered by DC power supply
3	Operating Temp	0.1 to +50℃	
4	Interface	TTL UART Serial port	
5	Protocol		See Appendix for details
6	Default Baud Rate	115200	
8	Battery Life	≥ 6 years	(Typical)
9	Weight	140g	

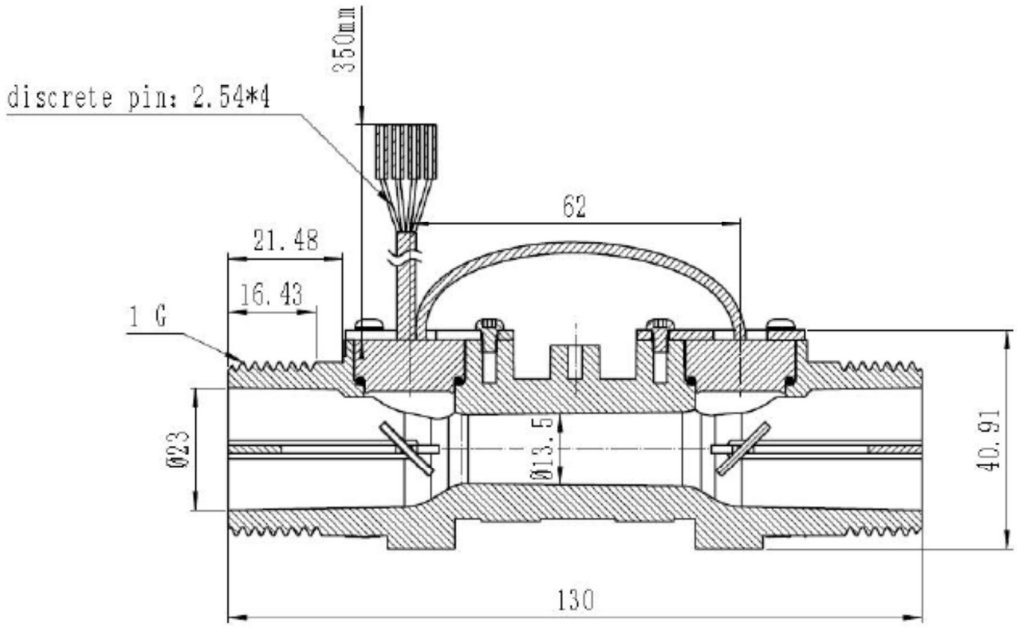
Measurement Performance Characteristics

No.	Item	Specification	Conditions / Remarks
1	Accuracy	25℃ to 35℃：≤ ±2% Other Temperatures：≤ ±3%	15 to 60L/h only meets ≤ ±5% accuracy No accuracy guarantee from 1 to 15L/h
2	Flow Range	1.5 to 4500 L/h	

Reliability and Installation Parameters

No.	Item	Specification	Conditions / Remarks
1	Pressure loss	23 KPa	Test at 2500L/h
2	Maximum Operating Pressure	1.6 MPa	
3	Maximum Short-term Static Pressure	3.2 MPa for 1 min	
4	Thread Size	1 G	British standard
5	Operating Temperature	0.1 to +50℃	
6	Storage Temperature	-25 to +55℃	
7	Mounting Direction	(Follow the arrow)	

Dimensions (Units: mm)



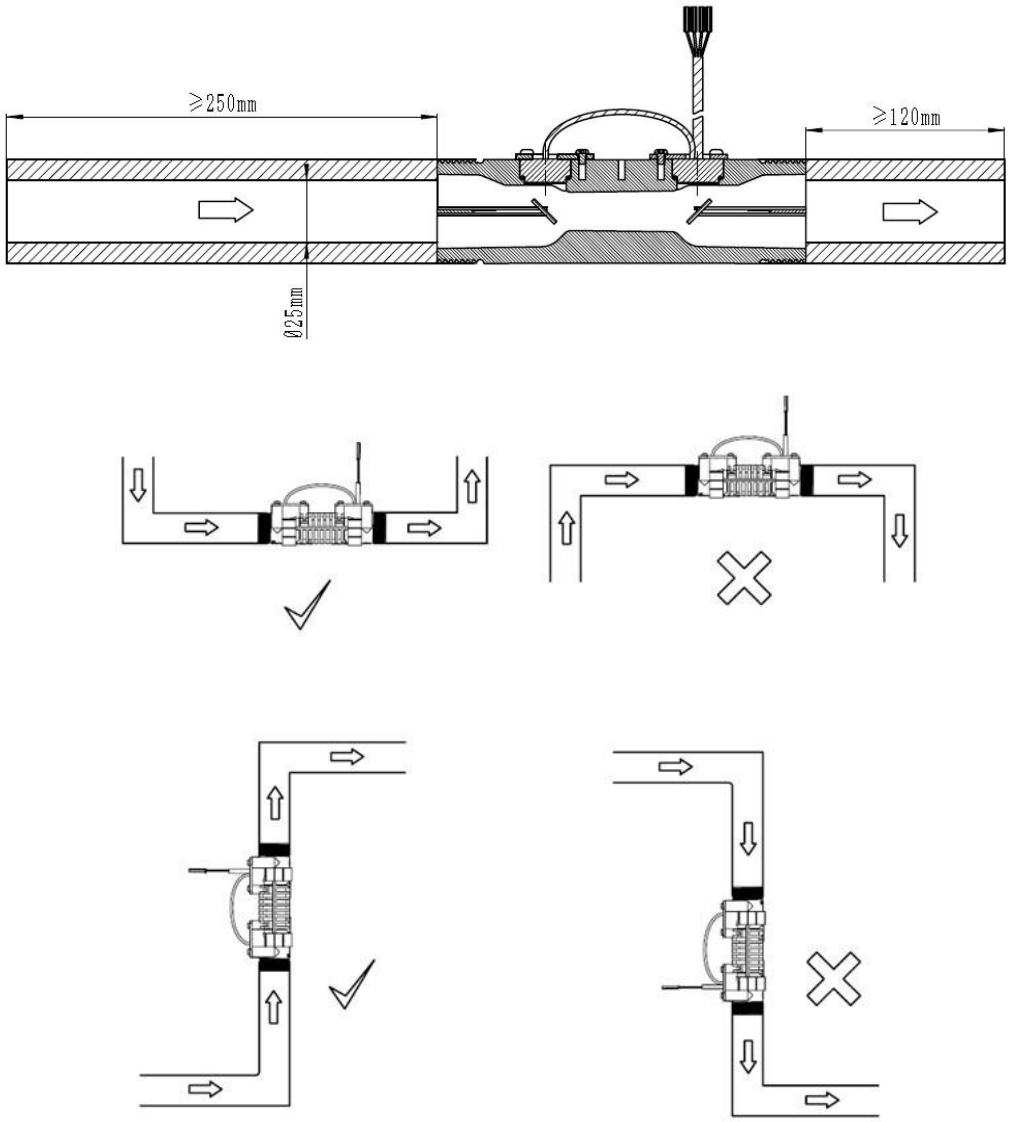
Wiring Instructions

Wire Color	Function
RED	VCC (+3.3V)
BLACK	GROUND
WHITE	RXD (Write from Host)
YELLOW	TXD (Read from Host)

Mounting Instructions

- The flow meter can be mounted horizontally, vertically, or obliquely. But the pipe should be ensured 100% full when it is in operation. Air in the pipe could affect its measurement and should be avoided.
- Try to avoid mounting the flow meter near any elbow, pump, tapered tube or changing straight pipes upstream and downstream. A straight pipe with internal diameter of 20mm and length not less than 200mm must be installed at the upstream side of the flow meter. Another straight pipe with the same internal diameter and length not less than 12mm must be installed at the downstream side.
- The meter body and the straight pipes at upstream and downstream sides should be mounted coaxially. The seals should not be stuck into the pipe. Make sure that no leakage or seepage occurs after installation to prevent air from being sucked into the pipe.

- To ensure the sensor pipe is full of water during flow meter operation, please refer to diagrams below when installing the flow meter module:



PACKAGING

Pcs / Box	Outer Carton Size (cm)	Packing Box Size (cm)	Gross Weight (kg)	Net Weight (kg)
100	Carton 139 24x14x3.9	Box161 25x15.5x5.5	12.0	11.0

PRECAUTIONS FOR USE

1. This product should only be used for water. Do not use the product for air or other liquid.
2. To avoid accidents caused by product failure, the design of secondary products should include
3. failure protection.
4. To prevent fault, failure and performance degradation of the sensors, avoid use this product in the following or similar conditions:
   a. Intense shock or vibration;
   b. In the environments that contain dissolved organic matter
   c. The input voltage exceeds the rated maximum input voltage.

APPENDIX: FS0009 / FS0010 COMMUNICATION PROTOCOL

1. Default Baud Rate

115200 bps

2. UART Serial Port Configuration

1 Start bit (0)， 8 Data Bits， 1 Even Parity Bit, 1 Stop Bit (0)． A total of 11 bits, as shown in Figure 1.1 below.

Figure 1.1: Serial Port Configuration

3. Command Set

Table 3.1: Command Send from Host Computer

Host Instruction	Hexadecimal Character					Sensor Response	Functional Description
	Start	Command	Data	Checksum	Stop		
Reset Flow	10	5A	FD	57	16	E5	Clear accumulated traffic.
Read Flow	4HZ Proactively Sending Packets					Response Message	Read instantaneous flow, cumulative flow, working time, and measure media temperature

Checksum = Command + Data Character (Lower 8 bits)

Table 3.2: Response Format from FS0009 / FS0010

Byte Number(s)	Frame Data (Hex)	Description	Remark
1	42	Starter 1	
2	4d	Starter 2	
3 - 6	78 56 34 12	Device ID	
7	0A	Flow Data Header	
8 - 13	Example: 78 56 34 12 00 00	Example: 000012345.678 L	Accumulated Flow (BCD) Units: 0.001 Liters (L)
14 - 17	Example: 78 56 34 12	Example: 123456.78 L/h	Instantaneous Flow (BCD) Units: 0.01 Liters / Hour (L/h)
18, 19	00 0C	Run Time Data Header	
20 – 23	Example: 78 56 34 12	Example: 12345678 Hours	Flow Meter Module Running Time (BCD) Units: Hours (h)
24	0D	Flow Medium Temperature Data Header	
25 – 27	Example: 45 23 00	Example: 23.45 °C	Flow Medium Temperature (BCD) Units: Degrees Celsius (°C)

Table 3.2: FS0009 / FS0010 Ultrasonic Meter Module Response Format (cont'd)

Byte Number(s)	Frame Data (Hex)	Description	Remark
28	Example: 00	Operating Status	Status Byte (refer to table 3.3 for details)
29	(CS)	Checksum	The checksum is calculated as the lowest 8 bits of the sum of the start character (Byte 1) to the Run Character (Byte 26)
30	16	Stop Character	

Table 3.3: Status Byte Description

Bit #	D0	D1	D2	D3	D4	D5	D6	D7
Definition	Reserved	Reserved	Pipe Status	Fluid State		Reserved	Reserved	
Description	Reserved	Reserved	0：Normal 1：Empty	00：Static 01：Positive 10：Negative		0：Normal 1：Leakage	Reserved	

Revision History

Revision Number	Revision Date	Description	Pages Changed
A1	8-11-2017	First Release Version	

Contacts

For pricing, delivery, and detailed ordering information please contact:

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Tentative Release

This specification is based on design objectives and is strictly Preliminary and subject to change. Test data may exist, but this specification is subject to change based on the results of additional testing and evaluation. Application specific specifications will be produced for approval prior to production product being released.

⚠ WARNING

This product can expose you to chemicals including Lead, Chromium (hexavalent compounds) and Phthalates (DEHP) which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov