RS485 750cm Ultrasonic Level Sensor

version: V1.0

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1. Product Introduction

1.1. Overview

A01 integrated waterproof module is a module that uses ultrasonic sensing technology for distance measurement. The module adopts high-performance processor and high-quality components, the product is stable and reliable, and has a long service life. The module uses a waterproof ultrasonic transducer, which is highly adaptable to the working environment. The module is equipped with a special bell mouth, which is suitable for larger detection range requirements. This series has a variety of different output methods, is a simple operation high-performance, high-reliability commercial-grade functional module.

1.2. Product features

- 5V～12V power supply
- Standby current can be lower than 10uA
- One-piece enclosed waterproof probe
- Temperature compensation
- Working temperature -15℃ to +60℃
- Storage temperature -25℃ to +80℃
- Measurement accuracy ±(1cm+S*0.3%) (S is the measured value)
- Electrostatic protection design, the probe shell and I/O lead are added with electrostatic protection devices, in line with IEC61000-4-2.

1.3. Product advantages

- High protection level
- Strong anti-interference
- Stable and reliable data output
- Low power consumption
- Strong antistatic
- High measurement accuracy
- Small size, easy installation
- There is an automatic output mode to release the user processor

1.4. Scope of application

- Horizontal ranging
- Liquid level measurement
- Parking management system
- Object proximity and presence awareness
- Intelligent trash can management system
- Robot avoidance and automatic control
- Sewer, bottom water level monitoring

1.5. Basic parameters

| Parameter	A01A	Unit	Remarks
Operating voltage	5~12	V	DC
Average current	＜10	mA	(1)
Blind area distance	≤28	cm	
Without bell mouth range	28～450	cm	(2)
With bell mouth range	28～750	cm	(2)
Without bell mouth angle	-	°	(3)
With bell mouth angle	≈40	°	(3)
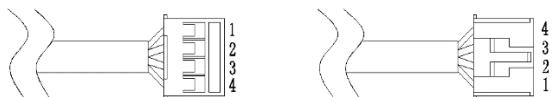
Remarks:

(1) Typical data obtained by testing under normal temperature, power supply 5.0V, 100ms duty cycle.

(2) At room temperature, the measured object is a 50cm*60cm flat carton, and the detection direction should be as perpendicular to the measured object as possible.

(3) At room temperature, the measured object is the reference data obtained from the test of a φ7.5cm*100cm white PVC pipe with a distance of 100cm. The measurement distance differs at different angles.
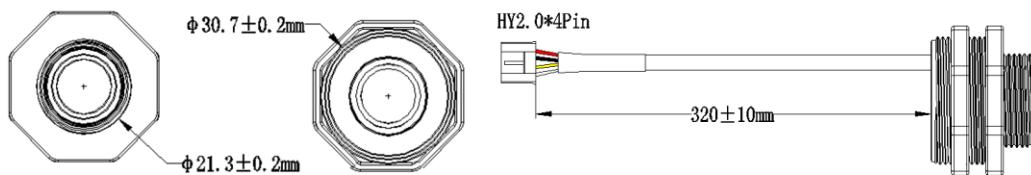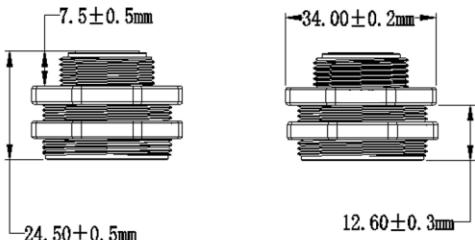
1.6. PIN definition
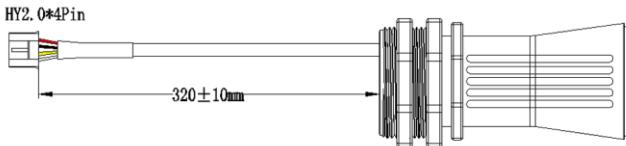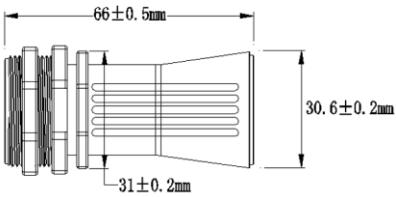
PIN #	Color	PIN name	Description
1	Red	VCC	5~12V power input
2	Black	GND	Ground
3	Yellow	B	RS485 B
4	White	A	RS485 A

1.7. Mechanical characteristics

Mechanical characteristics without bell mouth:

Mechanical characteristics with bell mouth:

2. RS485 Output

2.1. RS485 parameters

	data bit	stop bit	parity check	Baud rate
RS485	8	1	None	Default 9600bps

Protocol	Check	Slave Address	Function code-Read	Function code-Write
Modbus-RTU	CRC-16/MODBUS	Default 0x01	0x03	0x06

Read command:

	Address	0x03	Register address	Register number	CRC16 check
Byte	1	1	2	2	2

Response

	Address	0x03	Return byte	data	CRC16 check
Byte	1	1	1	N	2

Write command:

	Address	0x06	Register address	data	CRC16 check
Byte	1	1	2	2	2

Response

	Address	0x06	Register address	data	CRC16 check
Byte	1	1	2	2	2

2.2. Register List

Status	Register address	Description	Type of data	Details
Read	0x0100	The calculated value of distance	UINT16	After receiving the command, start ranging, after several ranging filtering processing, output distance value, unit: mm, response time is about 500ms
Read	0x0101	Real-time distance value	UINT16	After receiving the instruction, the module starts the ranging, and directly outputs the

				real-time distance value, unit: mm, and the response time is about 100ms
Read	0x0102	Temperature	INT16	Unit: 0.1℃, response time about 100ms
Read/Write	0x0200	Slave address	UINT16	The value ranges from 0x01 to 0xFE. The default value is 0x01. 0xFF indicates the broadcast address
Read/Write	0x0201	Baud rate	UINT16	Default 0x03，9600bps； 0x01-2400，0x02-4800， 0x03-9600，0x04-14400， 0x05-19200，0x06-38400， 0x07-57600，0x08-76800

Note: Register data is high byte first and low byte second.

2.3. Example

1. **Read the calculated value of distance**:
   Command: 01 03 01 00 00 01 85 F6
   Return: 01 03 02 02 F2 38 A1
   Description: The slave address is 0x01, the calculated value of distance is 0x02F2, convert to decimal is 754, the distance value = 754mm
2. **Read the real-time distance value:**
   Command: 01 03 01 01 00 01 D4 36
   Return: 01 03 02 02 EF F8 A8
   Description: The slave address is 0x01, the real-time distance value is 0x02EF, convert to decimal is 751, the distance value = 751mm
3. **Read the temperature value:**
   Command: 01 03 01 02 00 01 24 36
   Return: 01 03 02 01 2C B8 09
   Description: The slave address is 0x01, the temperature is 0x012C, convert to decimal is 300, the temperature value=30.0℃
4. **Modify the slave address:**
   Command: 01 06 02 00 00 05 48 71
   Return: 01 06 02 00 00 05 48 71
   Description: Change the address 0x01 to 0x05.
5. **Modify the baud rate:**
   Command: 05 06 02 01 00 01 19 F6
   Return: 05 06 02 01 00 01 19 F6
   Description: Slave address is 0x05, change the baud rate to 0x01 (2400bps).

6. Limit parameters

6.1. Rated environmental conditions

Item	Minimum	Typical value	Maximum	Unit	Remarks
Storage temperature	-25	25	80	°C	
Storage humidity		65%	90%	RH	(1)
Operating temperature	-15	25	60	°C	
Operating humidity		65%	80%	RH	(1)

Remarks:
(1) a. When the ambient temperature is 0-39℃, the maximum humidity is 90% (non-condensing)
    b. When the ambient temperature is 40-50℃, the highest humidity is the highest humidity in nature at the current temperature (no condensation)

6.2. Rated electrical conditions

| Parameters	Specification			Unit	Remarks
	Minimum	Typical value	Maximum		
Operating voltage	3.1	5.0	5.25	V	
Peak current	50		75	mA	Peak to peak
Input ripple			50	mV	Peak to peak
Input noise			100	mV	Peak to peak
ESD			±200/±2K	V	(1)
ESD			±4K/±8K	V	(2)
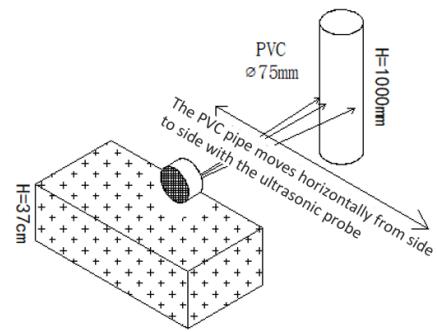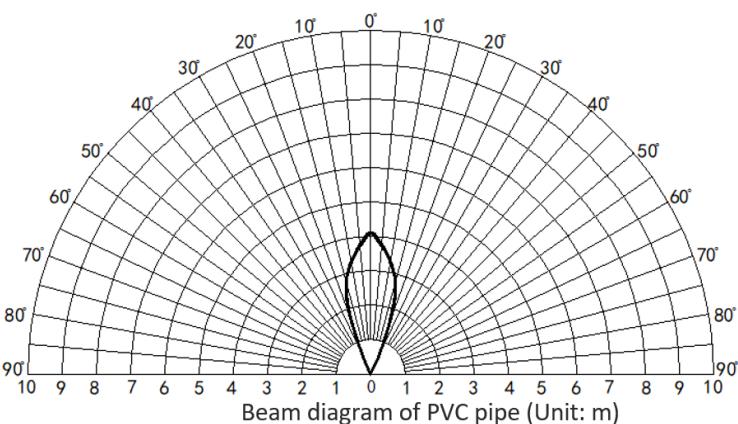
Remarks
(1) The static electricity specification of the assembly line body, contact static electricity should not be higher than ±200V, and air static electricity should not be higher than ±2KV.
(2) The probe shell and output lead comply with the IEC61000-4-2 standard.
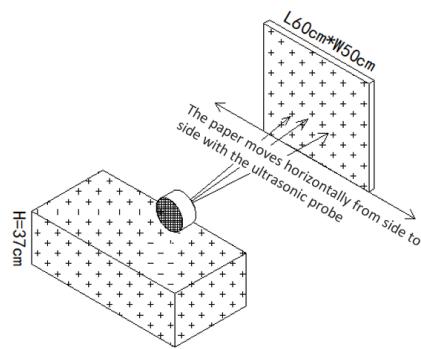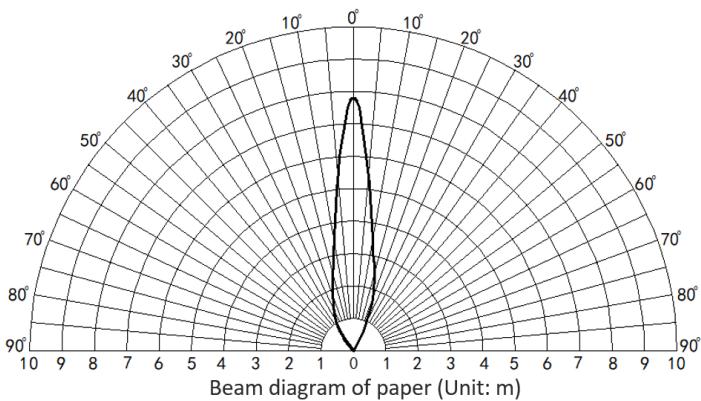
7. Effective measurement range reference beam patterns

7.1. Module reference beam diagram

① The tested object is a white cylindrical tube made of PVC material with a height of 100cm and a diameter of 7.5cm.

Beam diagram of PVC pipe (Unit: m)

② The tested object is a "corrugated box" perpendicular to the 0° central axis, with a length * width of 60cm*50cm.

Beam diagram of paper (Unit: m)

8. Reliability test conditions

Item	Test items	Experimental condition	Samples	Remarks
1	High temperature and humidity work	65°C, 85%RH, Power ON@5V, 72hrs	3	
2	Low temperature work	-20°C, Power ON@5V, 72hrs	3	
3	High temperature and humidity storage	80°C, 80%RH, storage, 72hrs	3	
4	Low temperature storage	-30°C, storage, 72hrs	3	
5	Vibration test	10-200Hz, 15min, 2.0G, XYZ 3 axes, each axis 0.5 hours	3	
6	Drop test	1.2m free fall drop, 5 times at wooden floor.	3	

Remarks: After the test, the module is determined to be OK after the function test, and the performance degradation rate is ≤10%.

9. Matters needing attention

1. Please pay attention to the structural tolerances when designing. Unreasonable structural design may cause transient abnormalities in module functions.
2. Please pay attention to the electromagnetic compatibility evaluation when designing. Unreasonable system design may cause abnormal module function.
3. When the boundary application of the product limit parameter is involved, you can contact our FAE to confirm relevant precautions.

10. Packaging specifications

By default, electrostatic bag and bubble bag packaging, no independent box.