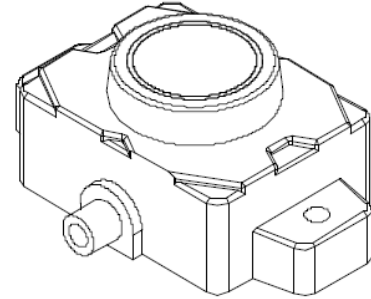


VU0010-002 Ultrasonic Ranging Sensor

Description

The VU0010-002 Ultrasonic Ranging Sensor measures the time interval between the emission of ultrasonic pulses and the reception of the echo to determine the distance to nearby objects. The distance value is indicated as a serial data value using a Modbus-based UART protocol. Advanced signal processing technique is used in this module to enhance the measurement reliability and the anti-interference ability.



Features

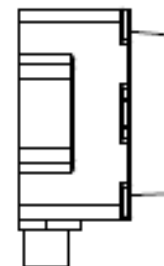
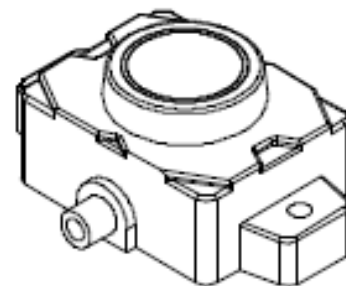
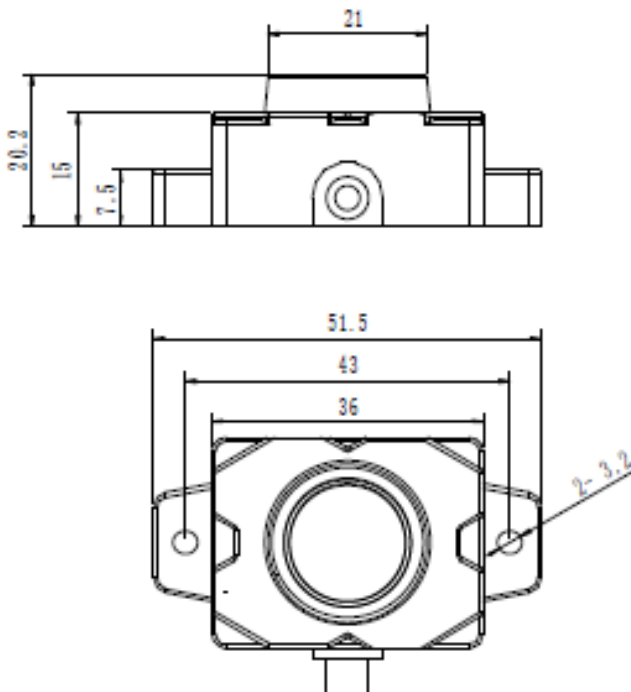
- Non-contact measurement
- Digital serial data output
- Small blind zone
- Short response time
- Dustproof design

Ordering Information

Part Number: VU0010-002

Model Number: U048KDCO-TR01C-F-VU0010-002

Appearance & Dimensions (Units: mm)

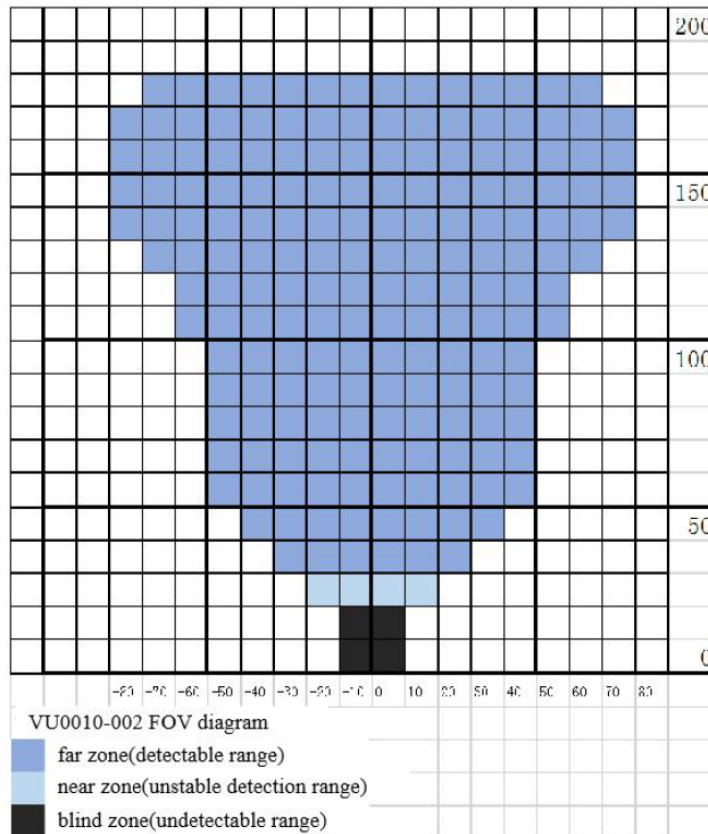


Electrical Specifications

Parameter	Specification
Sensor frequency	48 ±1 kHz
Detection range	30±5cm to 180±10cm
Measurement error	≤ ±5cm
Communication protocol	UART with Modbus Protocol (Distance Output in cm)
Refresh Interval	≥ 70ms
Baud rate	9600bps (default) / 115200bps (option)
Supply Voltage	+12V to +30V DC (24V TYPE)
Operating Current	≤ 30mA
Working temperature	-40°C to +85°C
Operating Temperature	-40°C to +85°C
Ingress Protection Rating	IP67

Test condition: T=25±3°C, H=60%±10 R.H

Detection Range



Test Object: 75mm standard PVC tube units: cm

Pin Description

Pin No.	Pin Name	Wire Color	Description
1	VCC	Brown	DC 24V Type
2	GND	Black	Ground
3	485-B	Blue	485-B
4	485-A	White	485-A

Communication Protocol

1. Modbus communication Protocol (RTU mode frame data format):

Start bit	Device Address	Function Code	Data	CRC Verification	Stop bit
T1-T2-T3-T4	8bit	8bit	n multiply 8bit	16bit	T1-T2-T3-T4

The distribution of every byte (RTU mode):

Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Bit9	Bit10
Start bit	Data bits								Stop bit

Default baud rate: 9600 bps

2. General Instruction Format

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
00	06	2B	00	00	01	40	3F
Initial device address	Input function code	<i>Address to be written (Unchangeable)</i>		<i>Self-defined device address</i>		CRC verification code	

Response: If the instruction is received correctly, a response will be sent back to the host. If it is received incorrectly, no response is returned.

3. Measure Distance Instruction

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
01	03	00	00	00	01	84	0A
Defined device address	Read function code	Read the first address of the data register (unchangeable)		Read the amount of register (unchangeable)		CRC Verification Code	

Response: If the Measure Distance Instruction is received correctly, the device will perform a distance measurement and respond with the result shown below:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
01	03	02	00	00	FA	33
Defined device address	Read function code	Read the amount of data bytes	The figure of measured distance (hexadecimal)		CRC verification code	

- Response:
- a) Measured distance in normal detection range: Calculated and showed in byte 4 to 5, (units: cm).
 - b) Measured distance in blind zone: Message shows "00 0F"
 - c) Measured distance exceeding normal range or no detected target: Message shows "01 2D"

4. Restore initial device address 00:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF	FF	2B	00	00	00	09	E4

Response: If the address needs to be changed, the address needs to be restored initially. Afterwards, it can be used normally after reallocating the new address. In addition, all the samples are configured with the address "00 01" when they leave the factory.

5. Switch between active and passive mode:

The device includes active and passive mode, which can be switched flexibly.

Byte 1	Byte 2	Byte 3	Byte 4
55	1A	01	E4
55	1A	00	E5
Frame header		Function code: 00-active; 01-passive	Verification code

Because 485 only supports half duplex working, when the active mode changes to passive mode, the instruction input needs to be done for a few times to ensure success.

6. Baud rate modification:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF	FF	EE	EE	EE	XX	F1	F2
byte6: 00--115200bps; 01--9600bps <i>Please do not send other instructions and avoid to choose other baud rate. Although other baud rate is optional, this function is restricted.</i>							
If modified successfully, the inputted instruction will be returned once; Conversely, the instruction "FF FF EE EE EE EE F1 F2" will be returned.							

Method Of Use

1. The device needs to be initialized for about 1s when powered on. During initialization, please make sure that there is no obstacle within 20cm in front of the probe. Additionally, when debugged, please connect 485 interface well before powered on. Lastly, when receive message "C0 FF 3F", initialization of powering on is completed.
2. The default address of the product is 01. If you need to change the address of the device, please refer to "communication protocol" - "Restore initial device address 00". when change the address, you must restore the address to 00 before executing the new address instruction. For example, execute the instruction "00 06 2B 00 01 40 3F" to change the address to 01. After the address is changed successfully, the inputted instruction will be returned once and the subsequent address instruction will not be responded. Additionally, when the address is 00, the device cannot work as normal.

SEND → ◇01 03 00 00 00 01 84 0A □

RECEIVE ← ◆01 03 02 00 20 B9 9C

3. In passive mode, measuring distance instruction needs to be sent to start measurement, please refer to "Communication Protocol"-"The instruction of reading data". For example: according to the above example, when the default address is set to "00 01", the instruction "01 03 00 00 00 01 84 0A" needs to be sent, and the collected content refers to the correct format. Certainly, when calculating the distance, switch the hexadecimal message to decimal message.
4. If the baud rate needs to be modified, please refer to "communication protocol" - "baud rate modification". Moreover, the default baud rate is 115200 bps and after modification, the modified baud rate is set up for communication.

Revision History

Revision Number	Revision Date	Description	Pages Changed
A0	4-13-2020	Preliminary Version	

Contacts


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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
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