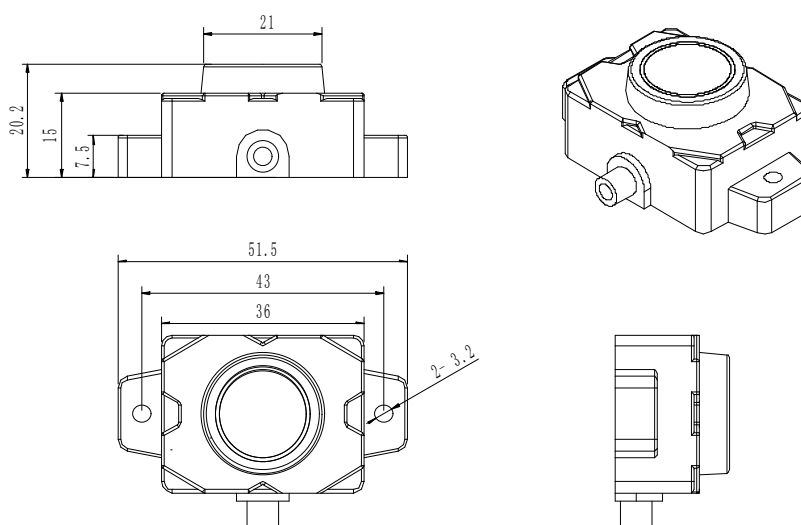# VU0010-002 SPECIFICATION

■ **Product Name: Ultrasonic Digital Sensor**

■ **Product Number: U048KDCO-TR01C-F-VU0010-002**

■ **Appearance and Dimensions:**
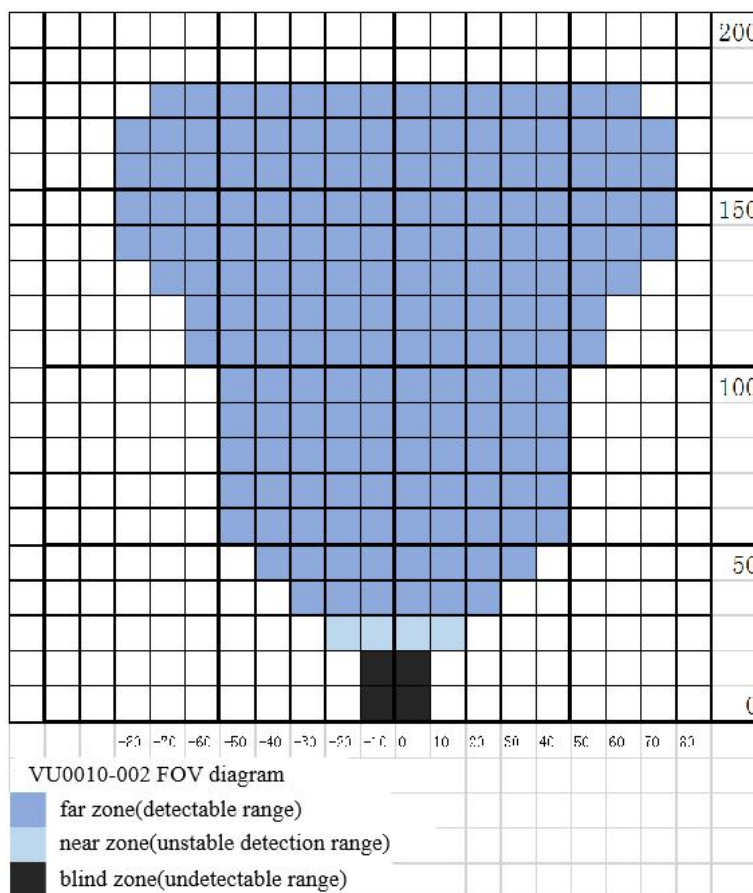
Exterior Diagram unit:mm

■ **Electrical Specification**

Sensor frequency	48 ± 1 kHz
Detection range	30±5cm ～ 180±10cm
Measurement error	≤ ±5cm
Communication protocol	Based on the Modbus protocol，output the distance(cm)
the refresh interval	≥ 70ms
Baud rate	9600bps/115200bps
Input voltage	12V～30V, (24V TYPE)
Working current	≤ 30mA
Working temperature	-40℃ ～ +85℃
Storage temperature	-40℃ ～ +85℃
Ingress Protection Rating	IP67

Test condition：T=25±3℃，H=60%±10 R.H

■ **Detection Range**

VU0010-002 FOV diagram

far zone(detectable range)

near zone(unstable detection range)

blind zone(undetectable range)

test object：75mm standard PVC tube   unit：cm

■ **Connection Setting**

Pin Number	Pin Function	Wire Colour	Note
1	VCC	brown	DC 24V TYPE
2	GND	black	GND
3	485-B	blue	485-B
4	485-A	white	485-A

广东奥迪威传感科技股份有限公司
Audiowell Electronics(Guangdong)Co.,Ltd.

Tel: +86-20-84802041
Fax: +86-20-84665207
Hotline: +86-20-87371363

总部地址：广州市番禺区沙头街银平路3街4号
子公司地址：肇庆市高新区沙沥园区和平路2号
公司网址：Http://www.audiowell.com

■ **Communication Protocol**

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

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	bit 4	bit 5	bit 6	bit 7	bit 8	bit 9	bit 10
Start bit	Data bit								Stop bit
Default baud rate：9600 bps									

2. The instruction of addressing:

byte1	byte2	byte3	bytet4	byte5	byte 6	byte7	byte8
00	06	2B	00	00	01	40	3F
Initial device address	Input function code	Address to be written（Unchangeable）		Self-defined device address		CRC verification code	
Response	If the instruction is correct, the instruction will be sent and if it is wrong, the instruction will not be sent.						

3. The instruction of reading data:

Measuring distance instruction:

byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
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	

The device will respond the reading data instruction (The device will receive the data after the reading instruction is sent):

If the instruction is wrong, no data will be sent;

If the instruction is correct, the data will be sent in the correct format:

byte1	byte2	byte3	byte4	byte5	byte 6	byte7
01	03	02	00	00	FA	33
Defined device address	Read data instruction	Read the amount of data bytes	The figure of measured distance （hexadecimal）		CRC verification code	

Measurd distance in normal extent: Calculated and showed in byte 4 to 5, unit is cm

Measured distance in blind zone extent: Message shows "00 0F"

Measured distance exceeding normal extent or no detected target: Message shows "01 2D"

4. Restore initial device address 00:

byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
FF	FF	2B	00	00	00	09	E4

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. The switch between active and passive mode:

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

byte1	byte2	byte3	byte4
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:

byte1	byte2	byte3	byte4	byte5	byte6	byte7	byte8
FF	FF	EE	EE	EE	XX	F1	F2

byte6：00--115200bps；01--9600bps

Please do not send other instructions and avoid to choose other baud rate. Although other baud rate are optional, this function is restricted.

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 can not 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.

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公司网址：Http://www.audiowell.com