Instructions for use of the human presence state sensor

XKC-LD002-INFO

Catalogue

1、Product overview

XKC-LD002 is mainly used in indoor scenes to perceive whether there is movement or micro human body in the area, and output the detection results in real time. The maximum induction distance can reach 3 meters (the detection distance is related to the sensor installation direction), and the distance resolution is 5cm. Can be widely used in various scenarios of AIoT, often used in human body induction light control, advertising screen and other devices of human body induction wake up, life safety protection, intelligent home appliances, intelligent security, corridor detection and so on.

2、Product features

1. In addition to the movement of the human body induction sensitive, for the traditional scheme can not identify the micro human body can also be sensitive induction;
2. Have good environmental adaptability, the induction effect is not affected by the temperature, brightness, humidity and light fluctuations and other surrounding environment;
3. Not easy to be affected by dirt, dust and other cover interference;
4. Can pass through the glass, plastic, ceramic, acrylic, rubber, wood board and other non-metallic materials;
5. The maximum induction distance is up to 3 meters;
6. Support the hanging roof, hanging the wall and other installation methods;
7. 57~64GHz ISM frequency band, can pass the FCC and CE spectrum regulatory certification;

3、Operational principle

The XKC-LD002 is a highly sensitive 57~64GHz human presence state sensor. Its working principle is to use FMCW frequency modulation continuous wave to detect the human body target in the set space. Combined with radar signal processing and accurate human body sensing algorithm, it can realize the highly sensitive human existence state sensing, can identify the human body in the motion and micro-motion state, and can calculate the distance of the target and other auxiliary information.

4、Product technical parameters

Project name	parameter	
Product specifications and models	XKC-LD002-NPN	XKC-LD002-V
Output method	NPN	High and low level
Output leakage current	-	1.2 mA (pull up 20K, input 24V)
Input voltage current	DC9V-24V/1A	
Power input reverse protection	have	
Work frequency band	57~64GHz	
Maximum operating current	≤800mA	
Output drive current	≤200mA	
Output short circuit protection	Output transient protection current 370, the output is closed, output current 4A / 24V, protection failure.	
Detection range	1 gear-low (0-1m), 2 gear-medium (0-2m), 3 gear-high (0-3m)	
Range resolution	50cm	
Response time	≤1500ms	
Target away from delay	30s (without duplicate detected target)	
The width of azimuth wave speed	+/-60°	
Pitch beam width	+/-60°	
Working temperature	-20 ~60℃	
Storage temperature	-20 ~80℃	
Wire length	500MM (± 10MM) (batch customizable)	
Line end definition	Brown (VCC), yellow (OUT), blue (GND), black (empty)	
Terminal specification	XH2.54-4P	
Material quality	PC	
Waterproof performance	IP67	
Safety standards certification	CE	
Environmental certification	ROHS-2.0	

5、Product types choosing

order number	model	Output method
1	XKC-LD002-NPN	NPN output
2	XKC-LD002-V	High and low level output

6、Installation environment requirements

The product needs to be installed in the suitable environment, if used in the following environment, the test effect will be affected:

1. There are non-human objects with continuous movement in the induction area, such as animals, curtains that keep swinging, and large green plants facing the air outlet
2. There is a large area of strong reflector in the induction area, which can cause interference to the radar antenna
3. When installing the hanging wall, it is necessary to consider the external interference factors such as the air conditioning and electric fan on the top of the room

7、Notes are required during the installation

1. Try to ensure that the radar antenna is facing the area to be detected, and the antenna is open without shielding

2. To ensure that the installation position of the sensor is firm and stable, the shaking of the radar itself will affect the detection effect

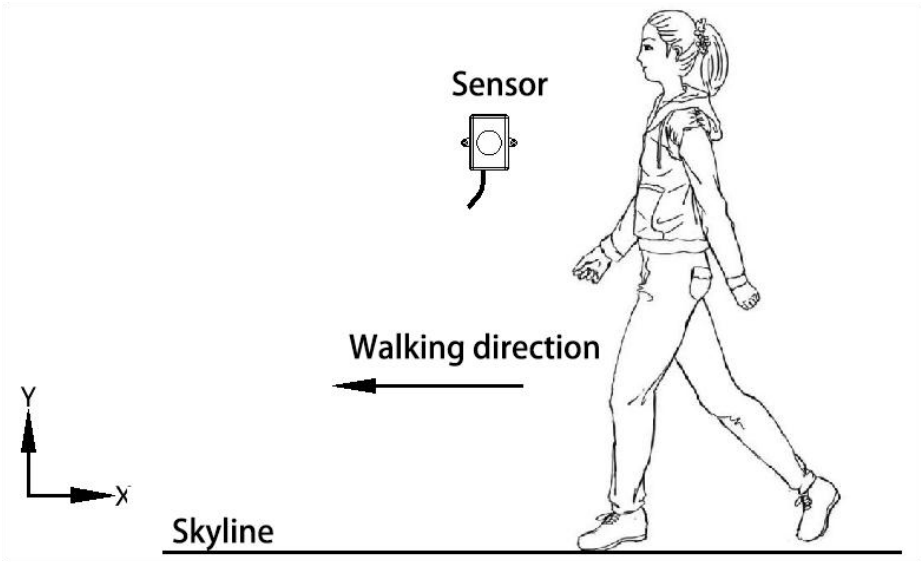
3. Make sure that there is no movement or vibration on the back of the radar. Due to the penetration of the radar waves, the antenna signal back flap may detect the radar back

The moving object of the surface. Metal shield or metal backplane can be used to shield the radar back flap and weaken the impact of the radar back object.

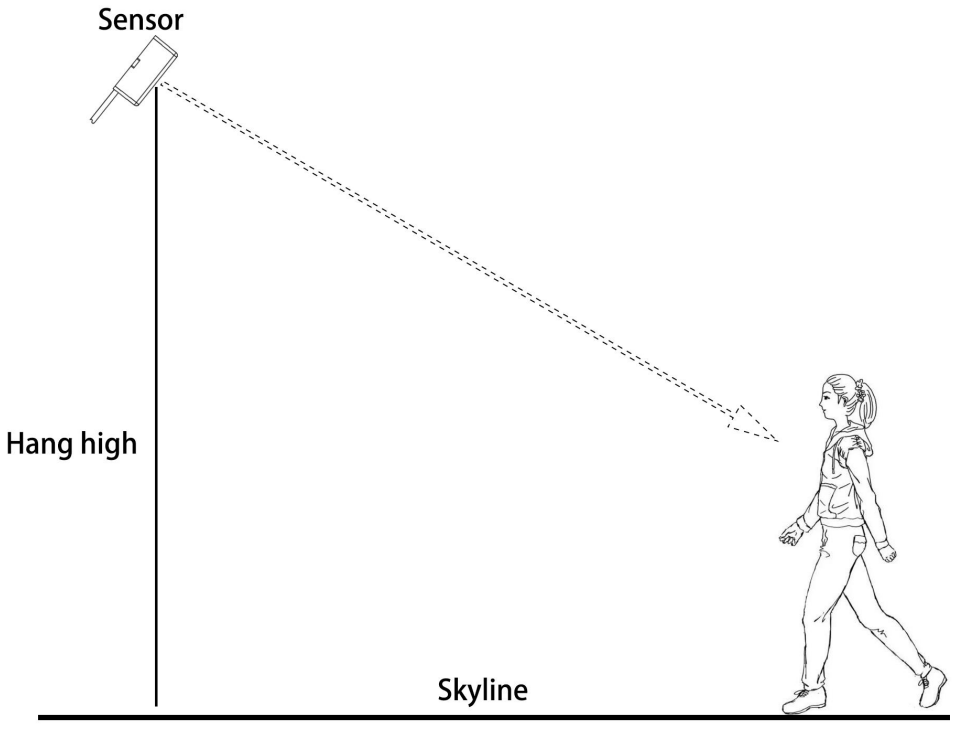
4. Radar theoretical distance accuracy is the result of a physical resolution of 5cm; Due to the size of the target, Different states, RCS, the target distance accuracy can fluctuate; the longest distance can also fluctuate slightly.

8、Recommended installation method

1. As side assembly detection: it is recommended to take the outlet direction up or down (Y axis) and X axis as the direction of human body walking. See the following figure for details:

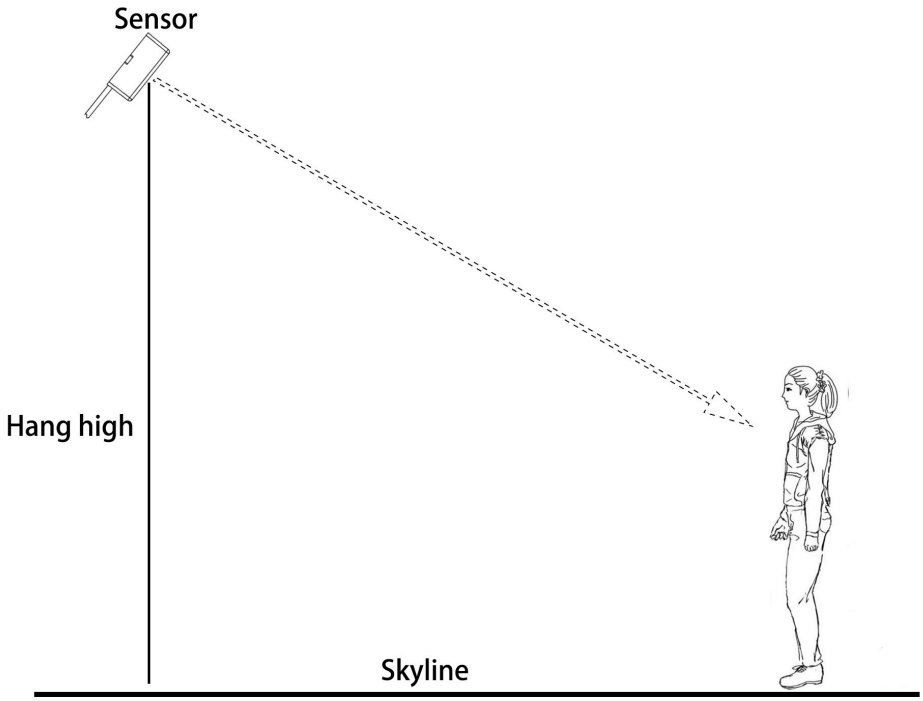


2. Top dynamic detection: the mode is recommended to set the holding time to smaller (such as 1S, sensitivity setting medium or low), the presence state sensor of the human body slightly tilted, so that the induction surface is facing the chest and abdomen of the human body in the detection area, to ensure that the sensor installation is stable and not shaking, so as to better detect the existence of the human body. The sensor hanging height and inclination angle can be adjusted accordingly according to the actual use scenario. See the following figure for details:



3. As the top static detection: it is recommended that the retention time is set to the maximum (such as 30S, sensitivity set high-grade), the human body existence state sensor slightly tilt Angle, so that the induction surface is on the chest and abdomen of the human body in the detection area, to ensure that the installation of the sensor is stable and not

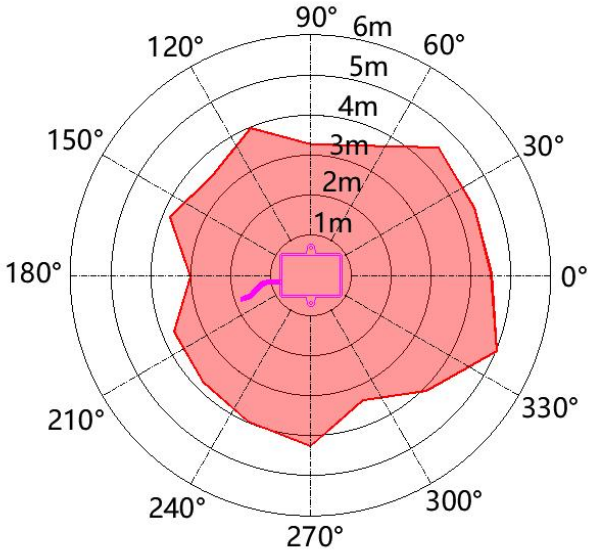
shaking, so as to better detect the existence of the human body. The sensor hanging height and inclination angle can be adjusted accordingly according to the actual use scenario. See the following figure for details:



9、Search coverage

The direction induction sensitivity of the product sensor is relatively weak (look at the direction of the outlet below), the distance is shorter than other directions, and the judgment time of leaving is relatively longer. The best induction direction can be adjusted according to the field situation during installation.

The sensor is hung at a height of 2.75m,and the sensor outlet wire is pointed at 180°

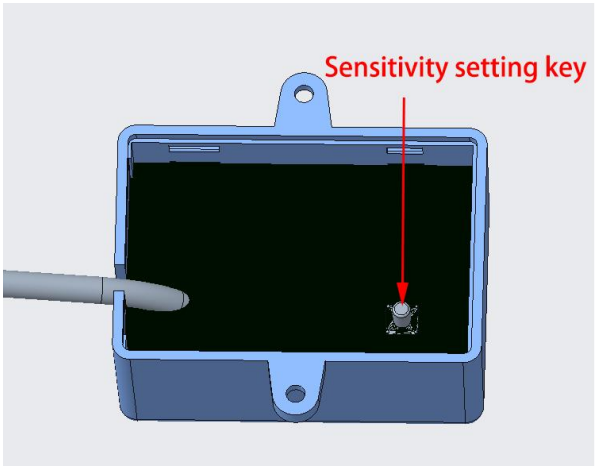


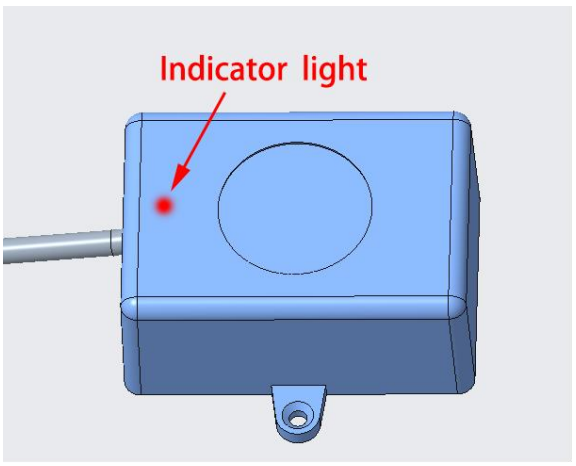
The red color is he sensing area

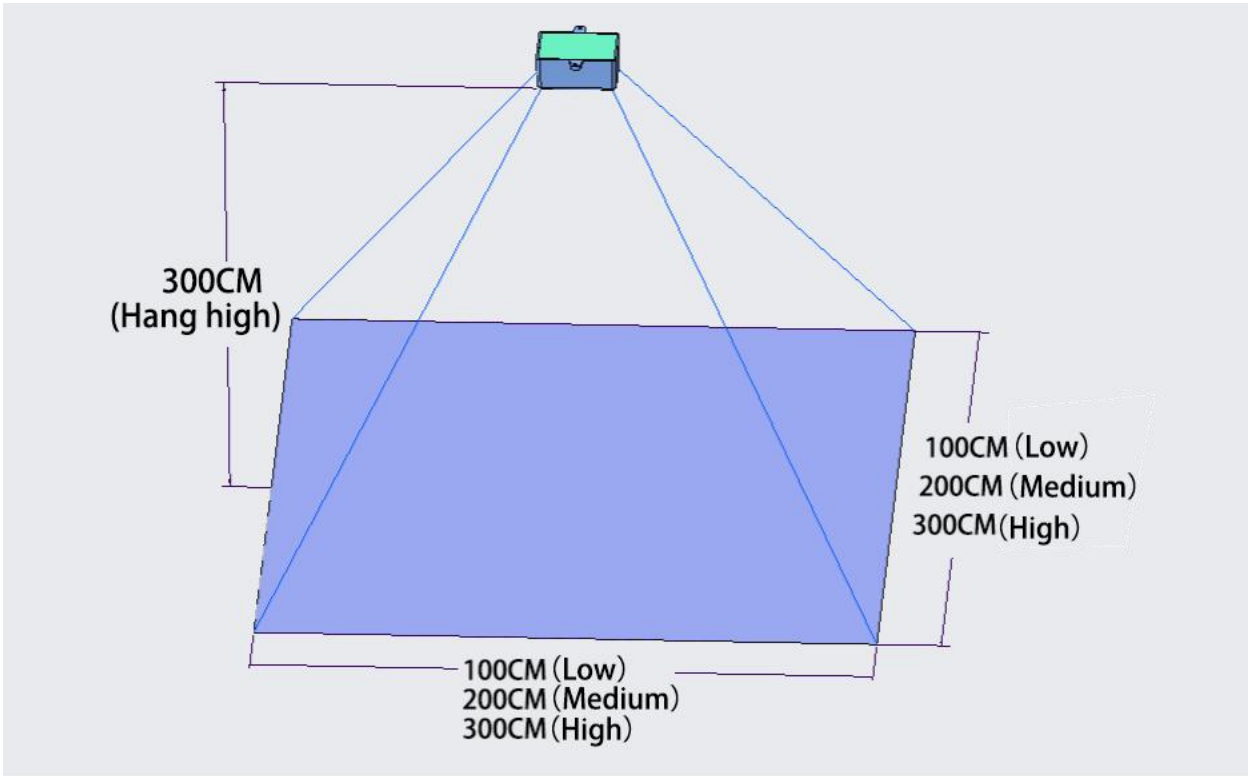
10、Sensitivity level adjustment

The default sensitivity of the sensor is medium, if the detection area environment is complex and false positives occur, the sensitivity can be adjusted to a lower level; If it is not detected or missed, the sensitivity can be adjusted to a higher gear. The sensitivity level can be adjusted through the serial port or by pressing a button.

The sensor is powered on and in normal working state, open the bottom cover and find the button, and then tap the button. If the indicator blinks once, it indicates that the setting is low sensitivity (the sensor is hung 3 meters high, and the detection range is projected to the ground in a square area of 1*1 meters); if the indicator blinks twice, it indicates that the setting is medium sensitivity (the sensor is hung 3 meters high, and the detection range is 1*1 meters square area). The detection range is projected to the ground as a 2*2 meter square area), the indicator light flashes 3 times to indicate that the setting is high sensitivity (the sensor is hung 3 meters high, and the detection range is projected to the ground as a 3*3 meter square area), and the three gear positions can be switched between cycles by pressing the button.

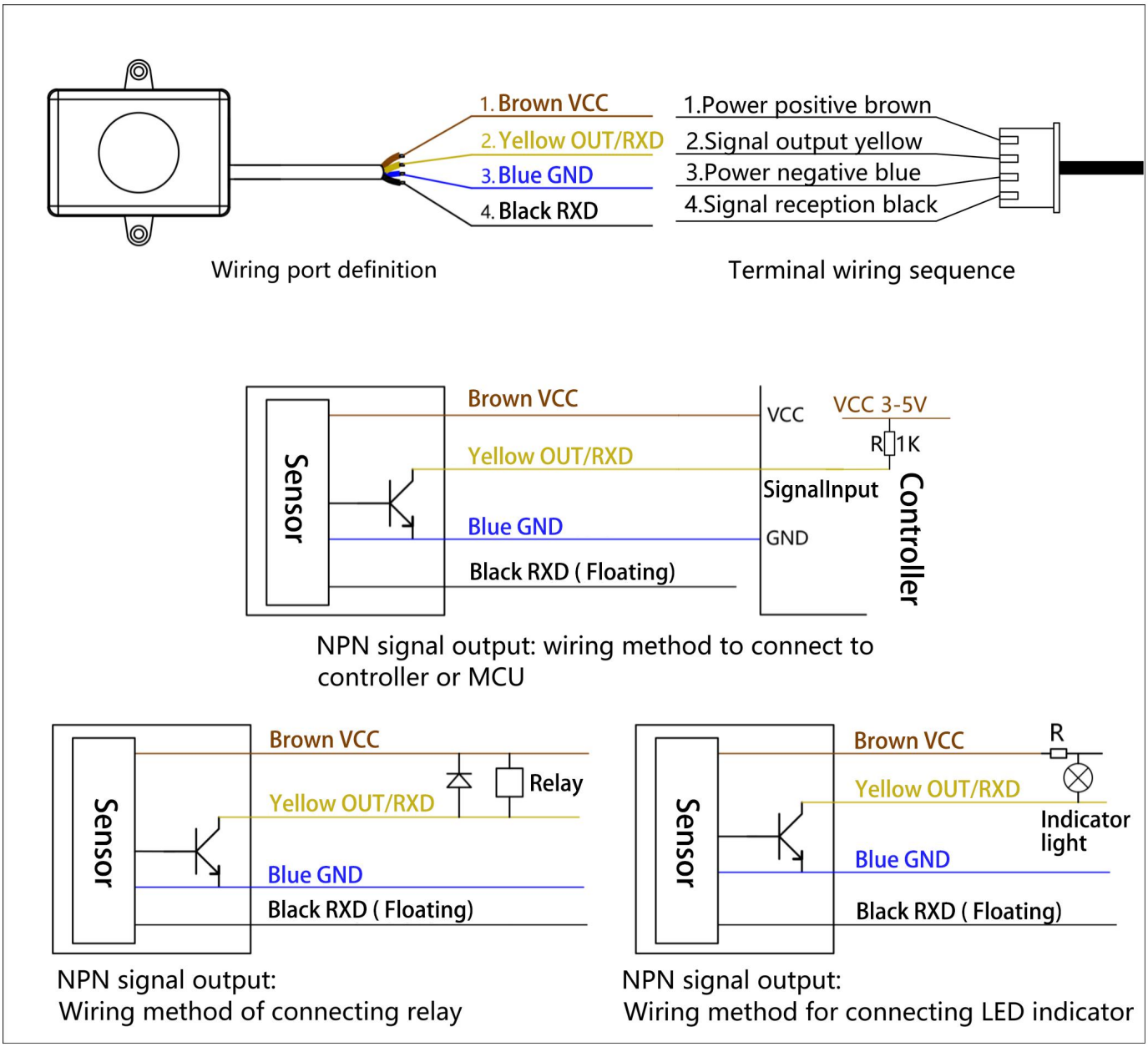






11、Output principle and recommended wiring method

(1) XKC-LD002-NPN wiring method

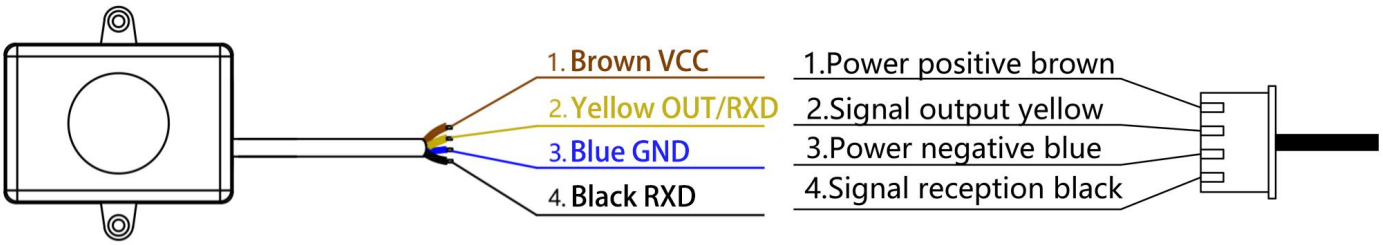


NPN type drive principle (relay drive current 200 mA)

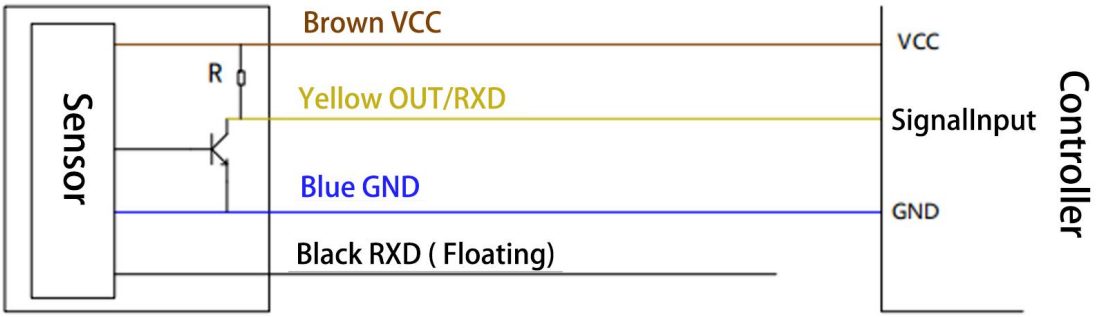
When the sensor senses the human body, the sensor yellow line (OUT) output low level, relay power suction;

When the sensor does not sense the human body, the yellow line of the sensor is high resistance, the relay power does not suction.

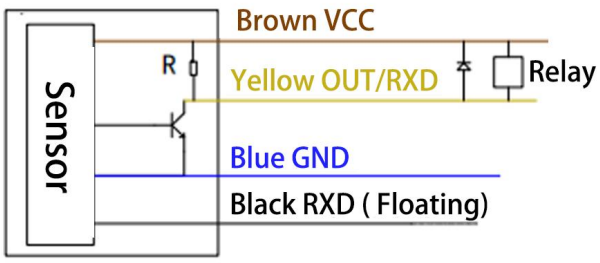
(2) XKC-LD002-V wiring method



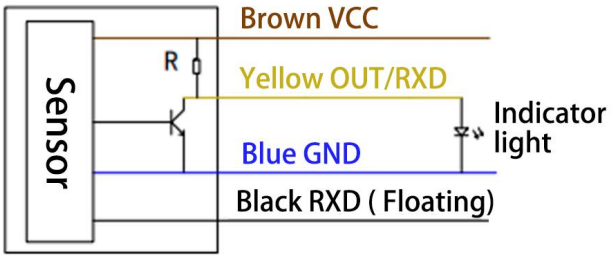
Wiring port definition　　Terminal wiring sequence



High and low signal output: wiring method to connect to controller or MCU



High and low signal output:
Wiring method of connecting relay



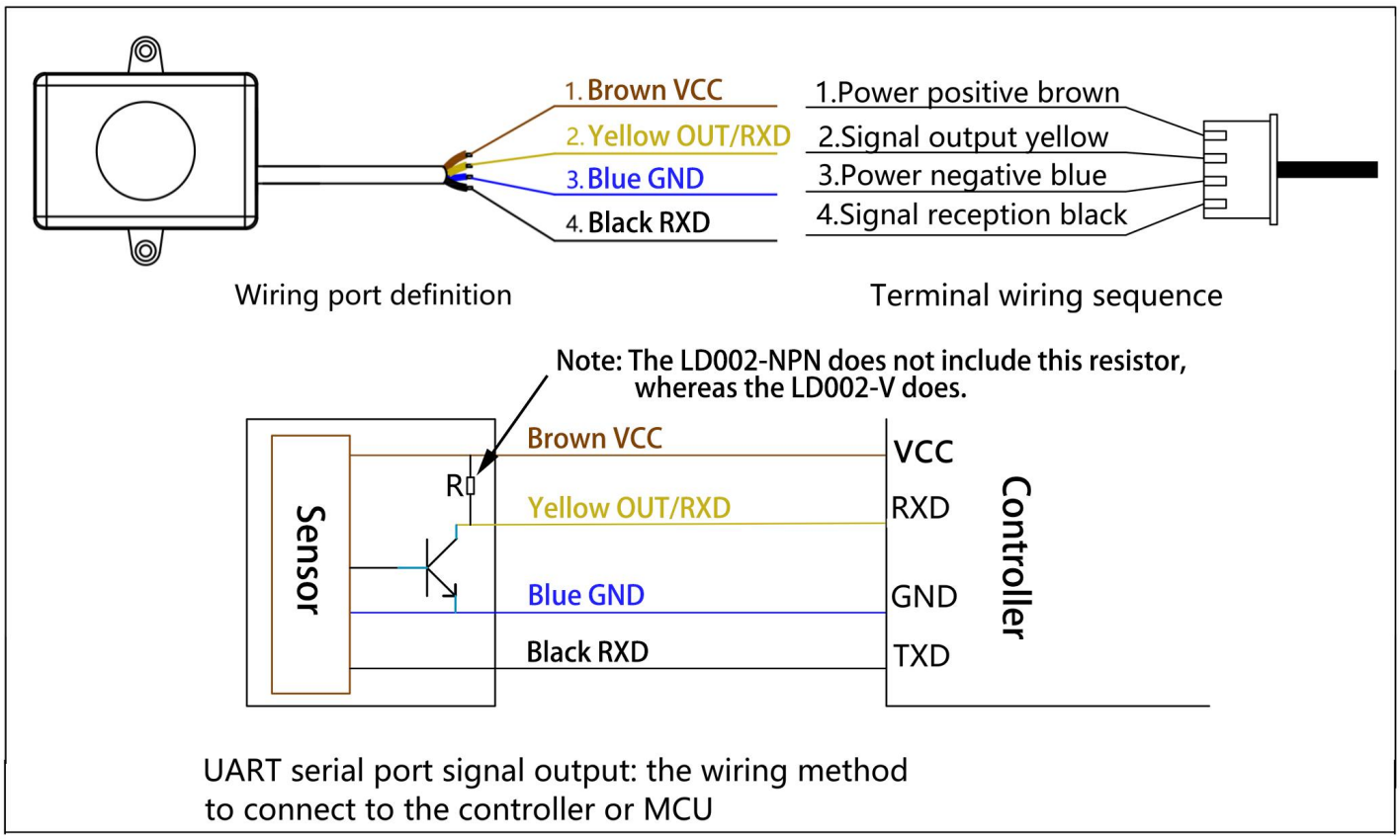
High and low signal output:
Wiring method for connecting LED indicator

High and low level drive principle (relay drive current 200 mA)

When the sensor senses the human body, the sensor yellow line (OUT) output high level, the relay is disconnected and not engaged;

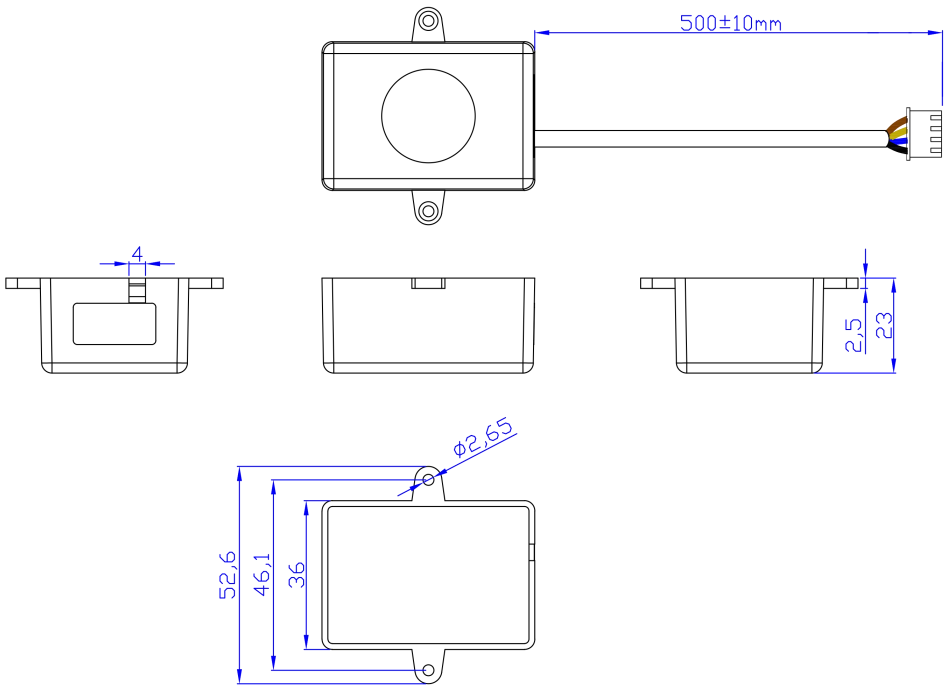
When the sensor does not sense the human body, the sensor yellow line output low level, the relay power suction.

(3) Simplified schematic diagram of serial port setting connection principle



Note: wiring can not be charged operation, sensor black RXD signal receiving wire, can only be suspended or connected to the controller TXD, can not be directly connected to the positive or negative electrode of the power supply.

12、Product size



13、Communication protocol

（1）The hardware uses uart.

Brown (VCC), yellow (signal output TXD) blue (GND), black (RXD)

XKC-LD002 can set the parameters through the serial port.

（2）Default configuration of the serial port:

Baud rate: 1,15,200

Data bit: 8

Check position: no

Stop position: 1

（3） Frame structure, the fields in the frame are configured as follows:

form	Length (number of bytes)	Format meaning
SOF	1	Starting frame, usually fixed to 0x01.
ID	2	Frame ID, MSB pair, representing the sending packet order (from 0 to 65535).
LEN	2	Data frame length, representing the number of DATA bytes (but due to the specified total frame length limit, the specified DATA bit length cannot exceed 1024).
TYPE	2	Message type.
HEAD_CKSUM	1	Use TF _ CKSUM _ XOR (from SOF bit to TYPE bit).
DATA	N	Data bits of length to LEN.
DATA_CKSUM	1	Data checksum is calculated using TF _ CKSUM _ XOR (all bytes of DATA bits are first different and then reversed).

（4）Notes:

Frame arrangement

In the TF frame, the SOF bit ~ HEAD CKSUM bit with DATA CKSUM high bytes in front, low bytes in back, while the DATA bit with low bytes in front and high bytes in back.

For example, the DATA data type is uint32, its value is 0x12345678, and the small terminal order mode is 0x78 0x56 0x34 0x21. The data of the ID data type bit uint16, its value is 0x1234, and the large terminal order mode of transmission data, is 0x12 0x34.

The actual data range exceeds the specified data location

After HEAD CKSUM and DATA CKSUM bits, if more than 1 byte, the lowest 1 byte will be taken.

For example: the HEAD CKSUM bit is 0x1232, and finally take only 0x32.

special explanation

In this project, after all TF frames sent to the lower computer, the lower computer will first reply a data of the same TPYE type without DATA bit and tell the upper computer that it has received the data. If there is no reply, reissue the configuration message.

(5) Message type: control instruction 0x0201, which only supports one-way data transmission mode.

The upper position computer sends the data to the radar					
form	**Byte number**	**fundamental type**	frame structure	Example frames	The frame meaning
SOF	1 byte	uint8	Start frame	one	To setting the partial state of the radar.
ID	2 byte	uint16	frame ID	point zero zero	
LEN	2 byte	uint16	Data frame length	point zero four	
TYPE	2 byte	uint16	frame type	two hundred and one	
HEAD_CKSUM	1 byte	uint8	Head check and	F9	
DATA	4 byte	int32	[command]	one	
DATA_CKSUM	1 byte	uint8	Data verification and	FE	

The following is the role of command for the different values:

- **0x08: Open the target**
- **0x09: Close the target**
- **0x0A: Set up with low sensitivity**
- **0x0B: Set the sensitivity in**
- **0x0C: Set up with high sensitivity**
- **0x0E: Set slow**
- **0x0F: Set the trigger speed in**
- **0x10: Set the trigger speed fast**
- **0x13: Set up the installation mode**
- **0x14: Set the installation mode for side installation**
- **0x20: Switch the V output**
- **0x1E: Switch over the UART**
- **0x1F: Switch over the NPN**

for instance:

01 00 00 00 04 02 01 F9 08 00 00 00 F7 opens the target

01 00 00 00 04 02 01 F9 09 00 00 00 F6 Close the target

01 00 00 00 04 02 01 F9 0A 00 00 00 F5 was set with low sensitivity

01 00 00 00 04 02 01 F9 0B 00 00 00 F4 Set Sensitivity in

01 00 00 00 04 02 01 F9 0C 00 00 00 F3 is set with high sensitivity

01 00 00 00 04 02 01 F9 0E 00 00 00 F1 Set the trigger speed is slow

01 00 00 00 04 02 01 F9 0F 00 00 00 F0 Set the trigger speed in

01 00 00 00 04 02 01 F9 10 00 00 00 EF Set the trigger speed is fast

01 00 00 00 04 02 01 F9 13 00 00 00 EC Set up installation mode

01 00 00 00 04 02 01 F9 14 00 00 00 EB Set the installation mode side installation

01 00 00 00 04 02 01 F9 20 00 00 00 DF switch V output

01 00 00 00 04 02 01 F9 1E 00 00 00 E1 Switch UART

01 00 00 00 04 02 01 F9 1F 00 00 00 E0 Switch NPN

（6） Message type: set the maintenance delay time 0x0203, and only support one-way data transmission mode.

The upper position computer sends the data to the radar					
form	**Byte number**	**fundamental type**	frame structure	Example frames	The frame meaning
SOF	1 byte	uint8	Start frame	one	Used to set the hold-delay time.
ID	2 byte	uint16	frame ID	point zero zero	
LEN	2 byte	uint16	Data frame length	four	
TYPE	2 byte	uint16	frame type	two hundred and three	
HEAD_CKSUM	1 byte	uint8	Head check and	/	
DATA	4 byte	int32	[pwm_delay]	1E	
DATA_CKSUM	1 byte	uint8	Data verification and	FE	

The following is the role of the DATA for the different values:

- **[pwm delay]: Set up to keep the delay time, data type uint32, unit: seconds (s).**
- **Note: The default is 30s.**

for instance:

01 00 00 00 04 02 03 FB 1E 00 00 00 E1 Set the module detection hold time for 30s

01 00 00 00 04 02 03 FB 0A 00 00 00 F5 Set the module detection hold time for 10s

01 00 00 00 04 02 03 FB 05 00 00 00 FA Set the module detection hold time for 5s

01 00 00 00 04 02 03 FB 01 00 00 00 FE Set the module detection hold time for 1s

（7）Message Type: Set up the module induction area.

The upper position computer sends the data to the radar					
form	**Byte number**	**fundamental type**	frame structure	Example frames	The frame meaning
SOF	1 byte	uint8	Start frame	one	Used to set the hold-delay time.
ID	2 byte	uint16	frame ID	point zero zero	
LEN	2 byte	uint16	Data frame length	four	
TYPE	2 byte	uint16	frame type	two hundred and three	
HEAD_CKSUM	1 byte	uint8	Head check and	/	
DATA	4 byte	int32	[area_id]	/	
DATA	4 byte	int32	[x_min]	/	
DATA	4 byte	int32	[x_max]	/	
DATA	4 byte	int32	[y_min]	/	
DATA	4 byte	int32	[y_max]	/	
DATA	4 byte	int32	[z_min]	/	
DATA	4 byte	int32	[z_max]	/	
DATA_CKSUM	1 byte	uint8	Data verification and	/	

The following is the role of the DATA data as different values:

[Area _ id]: ID of setting area, data type int32, setting area to 0;.

[x_min]: Set the minimum value of region x coordinates, data type float, in m (m).

[x_max]: Set the maximum value of region x coordinate, data type float, in m (m).

[y_min]: Set the minimum value of the area y coordinate, data type float, in m (m).

[y_max]: Set the maximum value of the area y coordinate, data type float, in m (m).

Note: Set 0 in the area as the starting area, currently only one detection area is supported.

for instance:

01 00 00 00 18 02 02 e6 00 00 00 bf 00 00 00 3f 00 00 00 bf 00 00 00 3f 00 00 00 00 00 00 40 40 ff

The detection area of the setting module is shown in the figure, the area range is 1m * 1m, the detection height is 3m, the map area is the reference range diagram, the actual induction range will deviate:

14、Product warranty terms and description

(1) Warranty service

1. Warranty maintenance: from the date of purchase, the product host is free of charge. The Company has the right to decide to repair or replace the faulty parts. If the replacement parts are replaced, the replacement parts may be new equipment or repair goods with the same category, function and quality. The replaced faulty parts shall be owned by the Company; the resale and maintenance of the products shall not affect the warranty period, and the products repaired or replaced shall continue to enjoy the original remaining warranty period; if less than three months after the end of the warranty period, the repaired or replaced products shall be repaired by customers.

2. Loss upon arrival (DOA) replacement: from the date of purchase, you can enjoy within 7 days of free replacement service of the equipment. Products with the following problems are defined as DOA equipment after the first unpacking; part or all of the components after the first opening (surface scratches or other defects that do not affect the function of the equipment are not included); other hardware faults identified by remote or local inspection by the engineers of the Company.

(2) Limtions of application of warranty

The Company does not assume any warranty liability for:

1. The product exceeds the warranty period; the product surface is easily broken and damaged; the product appearance is seriously damaged, installation / use in abnormal environment, unauthorized disassembly, repair / modification, external power supply injury and other abnormal damage;

2. Damage caused by the wrong installation and use of the product if the user fails to follow the requirements of

the manual;

3. Damage caused by natural disasters and man-made negligence (fire, lightning strike, water flooding, impact, etc.).

(3) The accessories and consumables are not covered by the warranty.

(4) Non-free warranty service

Within two years of the purchase of the product, for the products (including parts) not under warranty, you can choose the paid maintenance service (free of labor cost), and we will charge the transportation cost of the parts and accessories of the repair product according to the actual situation.

(5) Access to warranty services

Recommend you to contact the dealer to buy this product for warranty service, warranty please show valid warranty card (dealer stamp effect) or purchase invoice / receipt: if not show, the product free warranty period to product 12 months from the date of delivery, the latest DOA application period, to 7 days from the date of delivery.

(6) Statement

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2. Without the written permission of the Company, no unit or individual shall copy or copy part or all of the contents of this manual, and shall not disseminate them in any form.

3. Customers agree that the design and production purposes of the Company's products do not involve their use in the products related to life security or in other systems or products used in other dangerous activities or in the environment. Personal injury, property or environmental damage due to product failure (collectively referred to as high-risk activities). The Company shall not provide warranty for the use of our products in high-risk activities and shall not be liable to customers or a third party

4. The contents of this manual may be changed due to the product version upgrade or other reasons. XingKechuang reserves the right to modify the contents of this manual without any notice or prompt. This manual is only used as a guide for use, and StarKechuang tries its best to provide accurate information in this manual. However, XingKechuang does not ensure that the contents of the manual are completely free of errors, and all statements, information and suggestions in this manual do not constitute any express or implied guarantee.

5. Not all models are available in all countries

Please keep this instruction properly. Before using the product, please read the manual carefully. When using the product, please be sure to follow the manual. The company will not be responsible for any injuries and accidents caused by it.

(7) Environmental protection

The product meets the design requirements for environmental protection, and the storage, use and disposal of the product shall be conducted in accordance with the relevant national laws and regulations.

15、Instructions Manual version

version number	date of issue
V11	2025-03-18