DYP

Smart Sensor

L07 SERIES
SENSOR MODULE

DATASHEET

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1. Product introduction

1.1 Overview

The L07-module is an ultrasonic liquid level sensor designed for liquid level detection applications. The design focuses on the problems of large blind area, large measurement angle, long response time and poor installation adaptability of ultrasonic sensor modules .

The L07-module has a series of advantages such as small blind area, small measurement angle, short response time, small size, high installation adaptability, dustproof and waterproof, long life and high reliability.

L07-Module is referred to as "Module" " to explain.

1.2 Feature Summary

- The L07 modules are available in the following models: L07A Standard Series, L07B Food Grade Series, and L07C Anti-Nutrient Solution Corrosion Series.
- Wide voltage supply, working voltage 3.3～12V;
- 1.5 cm Standard blind area (the minimum blind area of the product can reach 0.8cm);
- The maximum range can be set to any value between 30 cm and 300 cm using commands;
- Multiple output modes available, UART automatic/controlled, PWM Controlled, switch TTL level, RS485, IIC, etc.;
- The default baud rate is 115200, which can be modified to 4800, 9600, 14400, 19200, 38400, 57600, or 76800;
- Ms Level response time, data output time can reach 13ms;
- Six algorithm modes can be set, including built-in liquid surface fluctuation filtering, small step filtering, high sensitivity, and other modes to suit different application scenarios.
- 9 signal levels can be set to meet the needs of different ranges and angles;
- Built-in noise reduction function, supporting 5 levels of noise reduction settings, suitable for battery power supply, short/long distance USB power supply, switch power supply, and large noise power supply.
- Waterproof structure design, waterproof level IP67;
- Strong installation adaptability, simple, stable and reliable installation method;
- Ultra-wide temperature design, operating temperature -25℃ to +65℃;
- Electrostatic protection design, with electrostatic protection devices added to the input and output interfaces, in compliance with the IEC61000-4-2 standard.

1.3 Product Advantages

- Multiple series models are available according to different application scenarios
- Wide supply voltage
- Small blind spot
- Output mode optional
- Support range modification
- Support baud rate modification
- Support address modification
- Support algorithm mode setting
- Support signal level setting
- Support power supply noise reduction level setting
- High waterproof level
- Small size, easy installation
- Wide operating temperature range
- Strong anti-static
- High measurement accuracy
- Stable and reliable measurement data

1.4 Scope of application

- Top mounted level detection

1.5 Basic parameters

Parameters	UART automatic	UART controlled	Switch	IIC	RS485	PWM	Remark
Operating voltage	3.3～12V						DC
Standby current	-	≤5uA	-	-	-	≤5uA	(1)
Average operating current	≤9mA			≤10mA		≤9mA	(2)
Blind zone distance	≤1.5cm						
Flat object range	1.5～200cm						(3)
Response time	≥2000ms	8～42ms	≥2000ms	8～42ms	15～230ms	<8ms	(4)

Power-on working time	≤650ms				
Working Cycle	100ms	Controlled	100ms	Controlled	
Output method	Automatic	Controlled	Automatic	Controlled	
Accuracy	0.5+(S*0.3%)cm			1+(S*0.5%)cm	(3)
Temperature compensation	Compensate				
Beam Angle	10～50°				(5)

Remarks：

(1)If the module does not receive any commands for more than 5 seconds, it will enter a low-power sleep state, at which point the power consumption current will be the standby power consumption current.

Note: The TX and RX pins of the module operate at a communication voltage level of 3.3V. If the user's TX and RX pins operate at a communication voltage level greater than 3.3V, this may affect the first measurement value after waking from sleep mode. Users may choose to discard this measurement value or convert the communication voltage level to 3.3V. If the user does not need to enter low-power sleep mode, there will be no impact.

(2)Typical data obtained from testing at a temperature of 25° C, humidity of 65% RH, power supply of 12V, and a 100ms duty cycle.

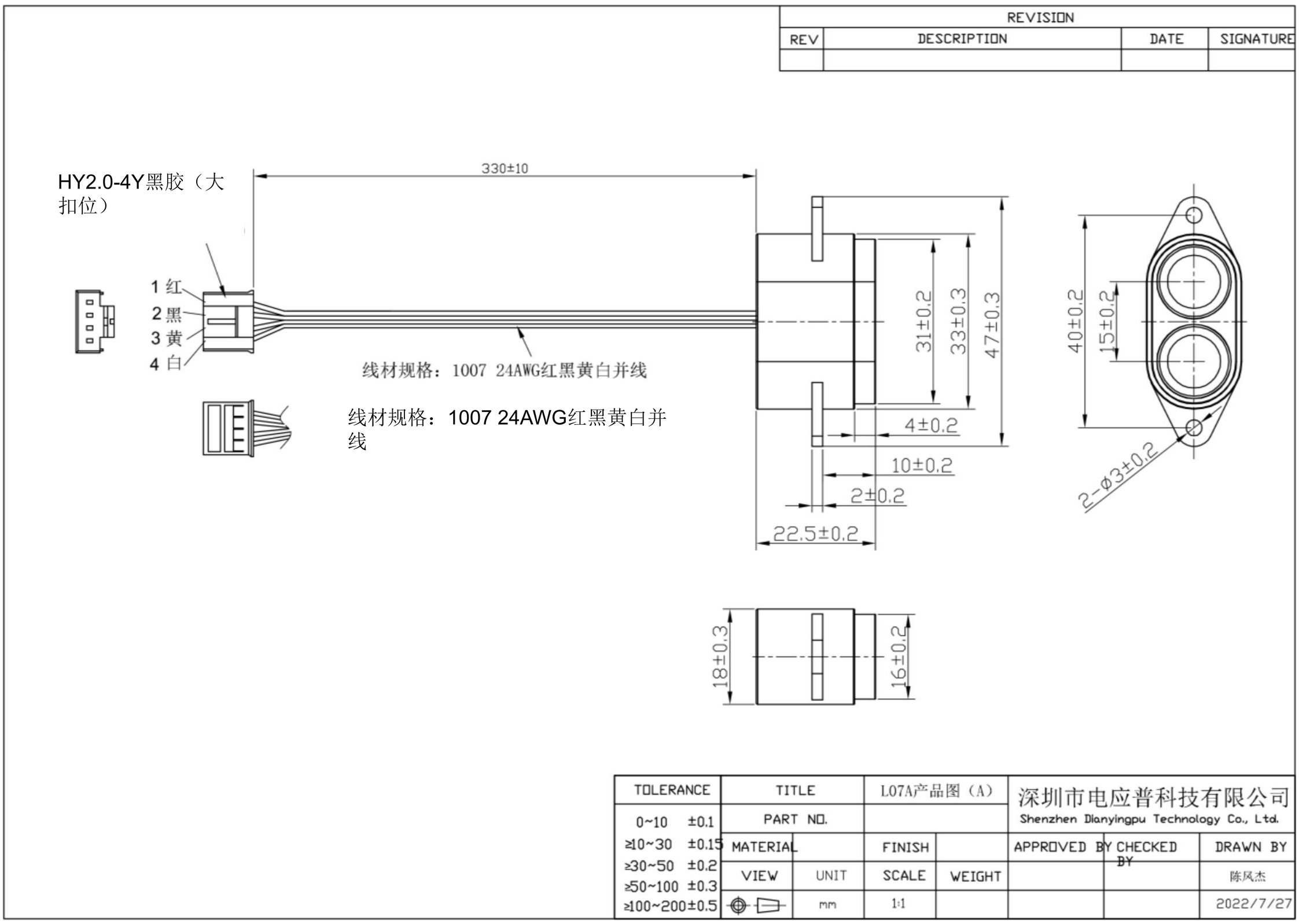
(3)At a temperature of 25° C, humidity of 65% RH, signal level 5, and a measured object of 50cm × 60cm flat cardboard box, the transducer should be as vertical as possible to the measured object, with S representing the measurement distance. For signal levels other than 5, the accuracy is 1 + (S × 0.5%) cm.

(4)Tested under default algorithm mode with an output response time of 0.5 to 3 meters range; the shorter the range, the faster the response time.

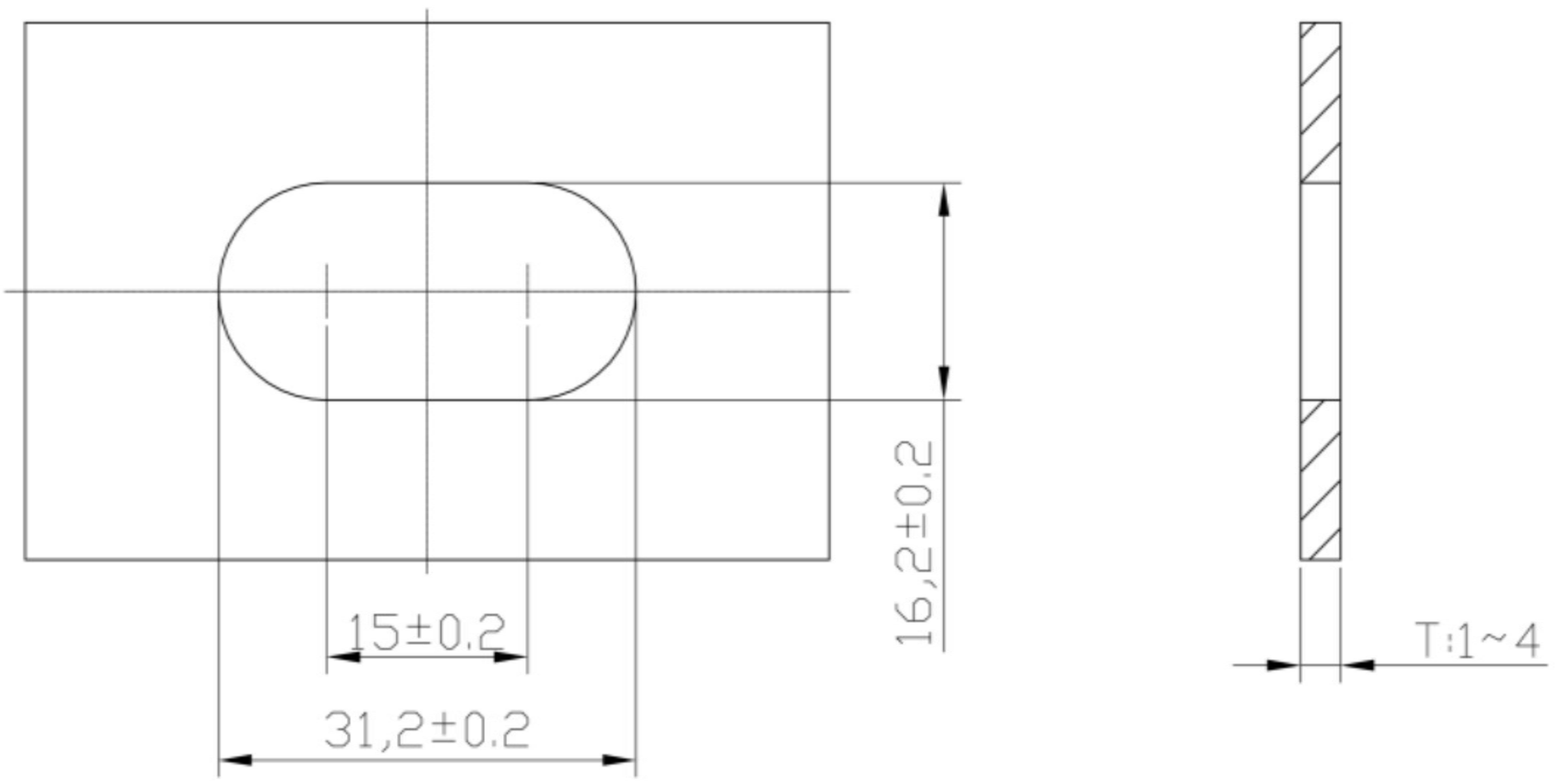
(5)The module's test data is based on a φ7.5 × 100cm white PVC pipe with a distance of 100cm.

1.6 Mechanical characteristics

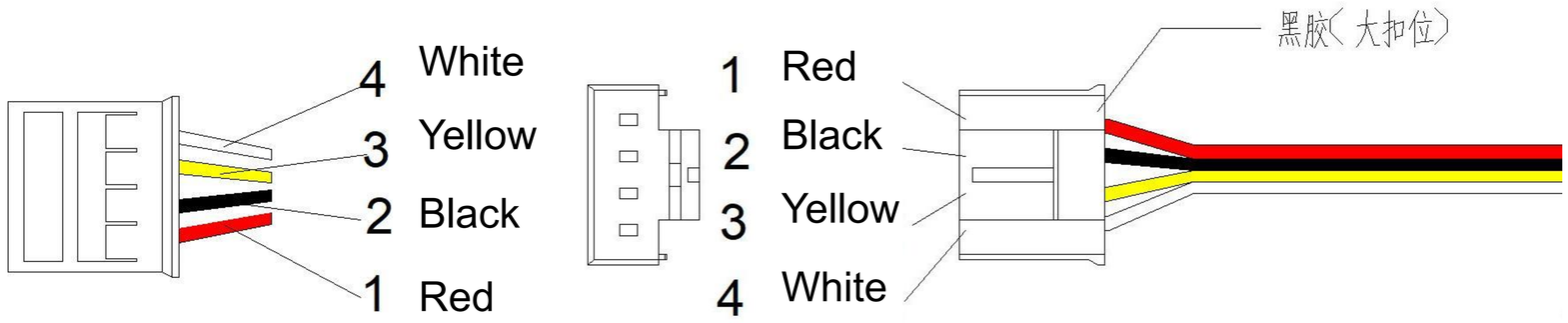
Product structure size (mm-inch) :



Installation hole recommendations (mm-inch) :



1.7 Interface Definitions



PIN No.	PIN Name	PIN Description	Remark
1	VCC	Power input	
2	GND	Power ground	
3	RX /B	Function PIN	(1)
4	TX /A	Function PIN	(1)

Remark:

(1)The output methods for lead wires, pin functions, and product models correspond one-to-one and cannot coexist with other output methods. The communication voltage is typically 0V to 3.3V.

2.Limit parameters

2.1.Rated environment conditions

Item	Minimum	Typical Value	Maximum	Unit	Remark
Storage temperature	-30	25	80	℃	
Storage humidity		65%	90%	RH	(1)
Operating temperature	-25	25	65	℃	
Operating humidity		65%	80%	RH	(1)

Remark:

(1) a. When the ambient temperature is 0-39° C, the maximum humidity is 90% (non-condensing) ;

b. When the ambient temperature is 40-50° C, the highest humidity is the highest humidity in nature at the current temperature (no condensation).

2.2.Rated electrical conditions

Parameters	Specification			Unit	Remark
	Minimum	Typical Value	Maximum		
Operating voltage	3.3	5	12	V	
Peak current			150	mA	
Input ripple			50	mV	Peak-to-Peak
Input Noise			100	mV	Peak-to-Peak
ESD			±4K/±8K	V	(1)

Remark: (1) Connection leads and pins are in accordance with IEC61000-4-2 standard.

3. Output Interface

3.1 UART Automatic Output Instructions

3.1.1 Pin Definition

PIN No.	PIN Name	PIN Description	Remark
1	VCC	Power Input	
2	GND	Power Ground	
3	RX	UART Input	(1)
4	TX	UART Output	(1)

Remark: (1) The output methods for lead wires, pin functions, and product models correspond one-to-one and cannot coexist with other output methods.

3.1.2 UART Communication Description

The module operates automatically in 100ms cycles. The algorithm mode can be set by writing to the Modbus protocol's 0x228 register. Algorithm modes 0, 4, and 5 output real-time values, while algorithm modes 1, 2, and 3 output processed values. Real-time value output has a response time of 100ms; processed value output provides more stable data with a response time of ≥2s. The module defaults to algorithm mode 1.

When co-frequency interference is detected in the detection environment, 0xFFFE data is output as a prompt. When no object is detected, 0xFFFD is output.

Note: For a detailed explanation of the algorithm mode, please refer to the 0x228 register section in “3.6.3 Modbus Registers”.

UART	Data Bit	Stop Bit	Parity Bit	Baud Rate
TTL Level	8	1	NO	115200bps

3.1.3 UART Output Format

Frame data	Description	Byte
Frame Header	Fixed to 0XFF	1 byte
Data_H	High 8 distance value	1 byte
Data_L	Low 8 distance value	1 byte
SUM	Communication checksum	1 byte

Note: According to the parameter value of Modbus register 0x0209, the data output units differ, either mm or us units.

3.1.4 UART Output example

Frame Header	Data_H	Data_L	SUM
0XFF	0X07	0XA1	0XA7

Note: The checksum only retains the lower 8 bits of the accumulated value;

SUM = (frame header + Data _H + Data_L) &0x00FF

=(0xFF + 0x07 + 0 XA1)&0x00 FF

=0XA7;

Distance value = Data _H*256+ Data _L=0X07A1;

Converted to decimal it equals 1953;

When the parameter value of Modbus register 0x0209 is 0x00, the unit is mm, indicating that the currently measured distance value is 1953 mm;

When the parameter value of Modbus register 0x0209 is 0x01, the unit is microseconds (us), indicating that the current measured distance echo time value is 1953 us. This value divided by 5.75 yields the distance value in millimeters (mm) = 1953/5.75 ≈ 340 mm.

3.2 UART Controlled Output Description

3.2.1 Pin Definition

PIN No.	PIN Name	PIN Description	Remark
1	VCC	Power input	
2	GND	Power ground	
3	RX	Trigger input PIN	(1)
4	TX	UART OutputPIN	(1)

Remark: (1) The output modes of leads, pin functions and product models correspond one to one and cannot coexist with other output modes.

3.2.2 UART Communication Description

When the trigger input PIN “RX” receives a trigger pulse with a falling edge or any serial port data, the falling edge will trigger the module to operate once, and the output PIN “TX” will output the measured data once.

When no trigger pulse is received on the “RX” pin for more than 5 seconds, the module will enter sleep mode with the lowest power consumption. When a trigger pulse is received on the “RX” pin while in sleep mode, the module will immediately wake up and resume operation, but the response time will increase by 12 ms compared to when not in sleep mode.

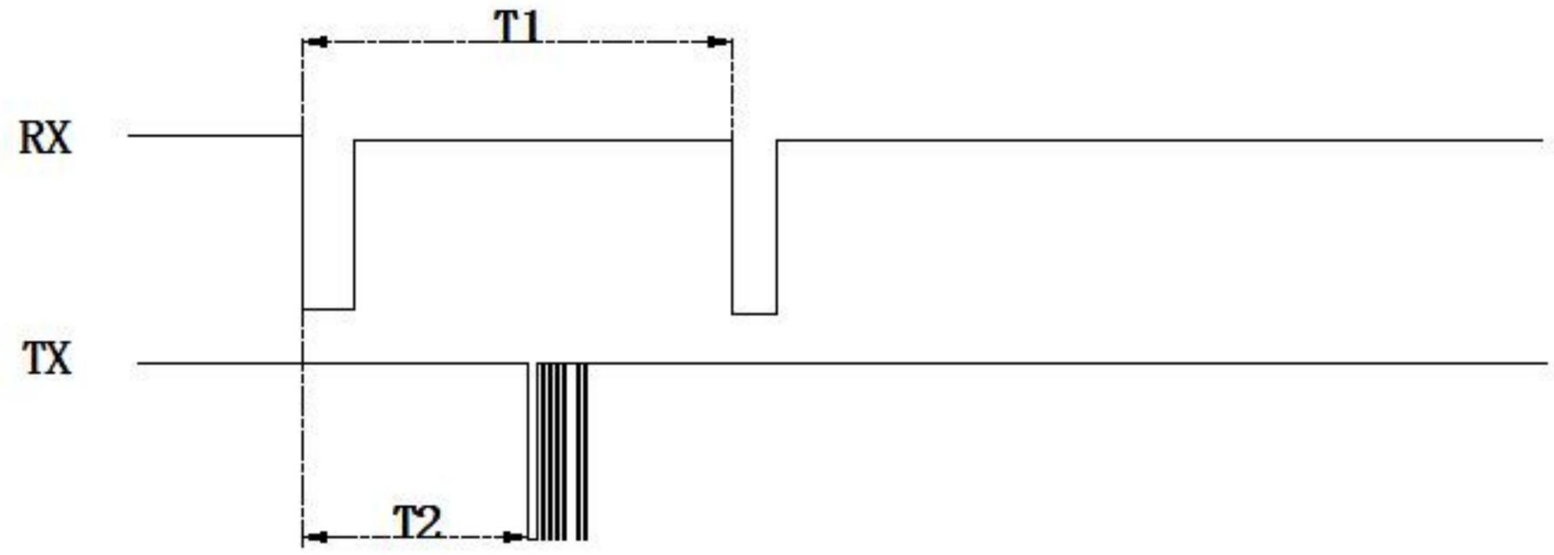
The 0x228 register in the module's Modbus protocol can be used to set the algorithm mode. The default algorithm mode is 0. When the module is set to algorithm modes 1, 2, or 3, the operating mode changes from the original controlled operating mode to an automatic operating mode with a 100 ms cycle, but measurement data is not automatically output. When the “RX” receives a falling edge, the most recently processed measurement data is output.

When co-frequency interference is detected in the detection environment, 0xFFFE data is output as a prompt. When no object is detected, 0xFFFD is output.

Note: For a detailed explanation of the algorithm mode, please refer to the 0x228 register section in “3.6.3 Modbus Registers”.

UART	Data Bit	Stop Bit	Parity Bit	Baud Rate
TTL Level	8	1	No	115200 bps

3.2.3 Timing Diagram



Note: T1＞T2+15ms ; T2=8～42ms ; The measurement is performed when the module is working in algorithm mode 0 and not in sleep mode.

3.2.4 UART Output Format

Frame Data	Description	Byte
Frame Header	Fixed to 0XFF	1 byte
Data _H	High 8 distance value	1 byte
Data _L	Low 8 distance value	1 byte
SUM	Communication checksum	1 byte

3.2.5 UART Output Example

Frame Header	Data _H	Data _L	SUM
0XFF	0X07	0 XA 1	0XA7

Note: The checksum only retains the lower 8 bits of the accumulated value;

SUM = (frame header + Data _H + Data _L) & 0x00FF

=(0xFF + 0x07 + 0 XA 1)&0x00FF

=0 XA 7;

Distance value = Data _H*256+ Data _L=0X07A1;

Converted to decimal equal 1953;

When the parameter value of modbus register 0x0209 is 0x00, the unit is mm , which means the current measured distance value is 1953 mm ;

When the parameter value of modbus register 0x0209 is 0x01, the unit is us , which means the current measured distance echo time value is 1953us , and this value divided by 5.75 gives the distance value in mm = 1953/5.75≈340 mm .

3.3 PWM Output Description

3.3.1 Pin Definition

PIN No.	PIN Name	PIN Description	Remark
1	VCC	Power input	
2	GND	Power ground	
3	RX	Trigger input PIN	(1)
4	TX	PWM Output PIN	(1)

Remark: (1) The output methods of the leads, pin functions and product models correspond one to one and cannot coexist with the output methods of other products.

3.3.2 PWM Trigger Description

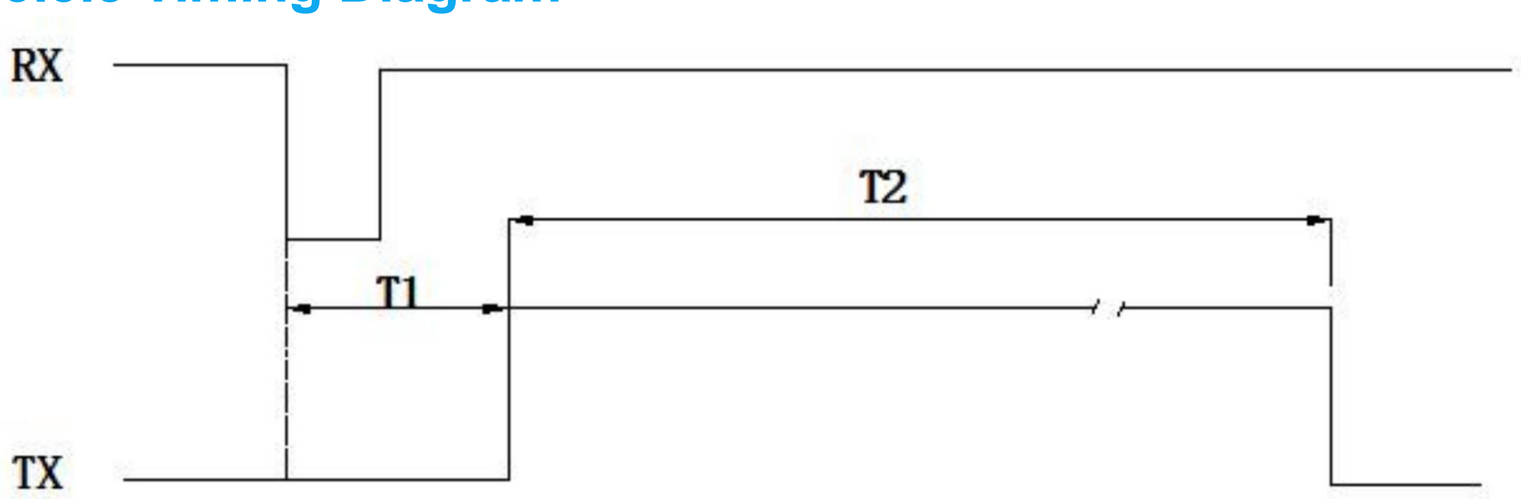
When the trigger input line “RX” receives a trigger pulse with a falling edge, the falling edge triggers the module to operate once, and the output line ‘TX’ outputs a TTL-level PWM high-level pulse width signal once. If the module does not detect an object, the output line “TX” outputs a fixed pulse width of approximately 13 ms (maximum range).

When no trigger pulse is received on the “RX” pin for more than 5 seconds, the module will enter sleep mode with the lowest power consumption. When a trigger pulse is received on the “RX” pin while in sleep mode, the module will immediately wake up and resume operation, but the response time will increase by 12 ms compared to when not in sleep mode.

The 0x228 register in the module's Modbus protocol can be used to set the algorithm mode, with the default algorithm mode being 0. When the module is set to algorithm modes 1, 2, or 3, the operating mode changes from the original controlled operating mode to an automatic operating mode with a 100ms cycle, but it does not automatically output a PWM high-level pulse width signal. After the “RX” receives a falling edge, it outputs the most recently processed PWM high-level pulse width signal.

Note: For a detailed explanation of the algorithm mode, please refer to the 0x228 register section in “3.6.3 Modbus Registers”.

3.3.3 Timing Diagram



Note: T1=5～8 ms (measured in non-sleep mode);

T2=0.18～13 ms (PWM high level pulse width time, measured in the range of 2 meters and algorithm mode 0);

When co-channel interference is detected, a pulse width of approximately 10 us is output.

3.3.4 Calculation Method

Formula: S=T*V/2 (S is the distance value, T is the PWM high level pulse width time, and V is the speed of sound in air).

At room temperature, the speed of sound V is 348 m/s. The simplified formula is S = T/57.5 (where S is measured in centimeters and T is measured in microseconds).

Example:

When the PWM high-level pulse width time T3 of the output lead “TX” is 10000us,

S= T/57.5=10000/57.5≈173.9(cm), indicating that the current measured distance value is 173.9cm.

3.4 Switch Output Description

3.4.1 Pin Definition

PIN No.	PIN Name	PIN Description	Remark
1	VCC	Power input	
2	GND	Power ground	
3	RX	Processing value and real-time value output selection lead, communication reception lead	(1)
4	TX	Switch output lead	(1)

Remark: (1) The lead function and the output method of the product model correspond one to one and cannot coexist with the output methods of other products.

3.4.2 Working Description

The module is factory-set with a threshold value, defaulting to 1 meter, and performs distance measurement approximately every 100ms.

When the detected distance value is less than the set threshold value, the “TX” pin outputs a high level (3.3V);

When the currently detected distance value is greater than the set threshold value, the “TX” pin outputs a low level (0V);

When the module operates in algorithm modes 1, 2, or 3, it outputs processed values, resulting in more stable data with a response time of ≥2 seconds and a hold time of ≥2 seconds;

When the module operates in algorithm modes 0, 4, or 5, it outputs real-time values with a response time of 0.3 seconds and a delay time of 0.5 seconds.

To enhance stability, the module defaults to algorithm mode 1, outputting processed values.

Both the threshold value and output polarity parameters are configurable. For example, when the output polarity is set to positive output (0x01), if the detected distance value is less than the set threshold value, a high level is output; if the current detected distance value is greater than the set threshold value, a low level is output. For negative output (0x00), the logic levels are reversed.

(Note: The TX pin of the module only outputs high/low level signals and has no drive capability. If there are special requirements for modifying the threshold value or other settings, please specify this when purchasing.)

3.4.3 Set threshold and output polarity

(1) Communication line connection

Connect the module's RX and TX leads to the host's TXD and RXD, respectively, to enable serial communication.

(2) Communication serial port settings

UART	Data Bit	Stop Bit	Parity Bit	Baud Rate
TTL Level	8	1	none	115200 bps

The setting is Only valid during module power-up (within 500 ms after power-up), repeat sending the command at 100 ms intervals until the module responds.

(3) Modify the threshold data format

The user machine is the host device and this module is the slave device.

Host sends:

Name	Frame Header	Command code	Threshold Value high	Threshold value low	Checksum
Byte	Fixed 0XFB	Fixed 0X05	1 byte	1 byte	1 byte

Slave response:

Name	Frame Header	Command code	Threshold Value high	Threshold value low	Status Bit	Checksum
Byte	Fixed 0XFB	Fixed 0X85	1 byte	1 byte	Set successfully: 0X00 Set failed: 0X01	1 byte

Note: Checksum = (frame header + command code + threshold high bit + threshold low bit + status bit) & 0x00FF

Example 1:

Host: FB 05 03 E8 EB (Checksum = (0 XFB + 0X05 + 0X03 + 0XE8) & 0X00FF = 0XEB)

Slave: FB 85 03 E8 00 6B

It indicates that the setting is successful and the switch distance is set to 1000 mm.

Threshold value setting range: 30～3000 mm .

(4) Modify the switch polarity data format

The user machine is the host device and this module is the slave device.
Host sends:

Name	Frame Header	Command code	Reserve	Output polarity	Checksum
Byte	Fixed 0XFB	Fixed 0X06	0X00	0x00: negative output, low level output when the value is less than the threshold; 0x01: Positive output, high level output when the value is less than the threshold	1 byte

Slave response:

Name	Frame Header	Command code	Reserve	Output polarity	Status Bits	Checksum
Byte	Fixed 0XFB	Fixed 0X86	0X00	High level: 0X01 Low level: 0X00	Setting successful: 0X00 Setting failed: 0X01	1 byte

Note: Checksum = (frame header + command code + output polarity + status bit) & 0x00FF

Example 1:

Host: FB 06 00 01 02 (checksum = (0XFB + 0X06 + 0X00 + 0X01) & 0X00FF = 0X02)

Slave: FB 86 00 01 00 82

It indicates that the setting is successful to 0X01. When the module is set to detect an object, " TX " lead outputs high level, " RX "lead Line output low level.

Example 2:

Host: FB 06 00 00 01 (checksum = (0XFB + 0X06 + 0X00 + 0X00) & 0X00 FF = 0X01)

Slave: FB 86 00 00 00 81

It indicates that the setting is successful. When the module is set to detect an object, " TX " lead outputs low level, " RX "Lead output high Level.

3.5 RS485 Output Description

3.5.1 RS485 Output pin definition

PIN No.	PIN Name	PIN Description	Remark
1	VCC	Power input	
2	GND	Power ground	
3	B	485 Communication inverting terminal	(1)
4	A	485 Communication in-phase terminal	(1)

Remark: (1) The lead function and the output method of the product model correspond one to one and cannot coexist with the output methods of other products.

3.5.2 RS485 Interface parameters

Interface	Data Bit	Stop Bit	Parity	Baud Rate
RS485 Level	8	1	none	115200 bps (default)

3.5.3 RS485 Interface Protocol

Using Modbus Protocol, please refer to " Modbus Protocol Description "chapter.

3.6 Modbus Protocol Description

UART controlled, PWM controlled, and switch output only support the serial Modbus protocol within 500 ms after power-on, while UART automatic and RS485 output modes do not have this limitation and can continue communication after power-on.

3.6.1 Modbus Protocol Parameters

Model	Check	Sensor Address	Read function code	Write function code
Modbus-RTU	CRC -16/ MODBUS	Can be set, default 0x01	0x03	0x06

3.6.2 Modbus Protocol Format

The user machine is the host device, and this module is the slave device.

The host sends (reads):

Name	Device Address	Function code 0x03	Register Address	Registers Qty	CRC16 Parity
Length (Byte)	1	1	2	2	2

Slave response (read):

Name	Device Address	Function code 0x03	Response Byte	Data Area	CRC16 Parity
Length (Byte)	1	1	1	N	2

Host sends (write):

Name	Device Address	Function code 0x06	Register Address	Data Area	CRC16 Parity
Length (Byte)	1	1	2	2	2

Slave response (write):

Name	Device Address	Function code 0x06	Register Address	Data Area	CRC16 Parity
Length (Byte)	1	1	2	2	2

3.6.3 Modbus Register

Register data has high byte first and low byte last.

（1） Modbus Register Table 1

Authority	Address	Function	Data Types	Instruction
Read-only	0x0100	Processing Values	Unsigned int, 16 Bit	Start ranging after receiving instruction, output distance value after the algorithm processing, unit:mm, response time is approx. 100~ 230ms (varies according to the range)
Read-only	0x0101	Real-time value	Unsigned int, 16 Bit	After receiving the command, the module starts the distance measurement once and outputs the real-time Distance value, unit: mm , response time is approx. 15~40 ms (varies with range)
Read-only	0x0102	Temperature	Signed int, 16 Bit	Unit: 0.1℃ , Resolution: 0.5℃ , Response time about 15～50 ms (varies with different ranges)
Read-only	0x010A	Echo time	Unsigned int, 16 Bit	After receiving the command, the module starts ranging once and outputs the real-time Echo time, unit: us , this value is divided by 5.75 to obtain a distance value in mm unit, the response time is about 15~40 ms (varies with range)

Notes :

(1) The response time was measured at a range of 0.5 to 3 meters, and the shorter the range, the faster the response time.

(2)0x0100/0x0101/0x010A registers, output 0xFFFE data as a prompt when co-frequency interference is detected in the detection environment, and output 0xFFFD when no object is detected.

(2) Modbus Register Table 2

Authority	Address	Function	Data Types	Instruction
Read and Write	0x0200	Slave Address	Unsigned int, 16 Bit	Range: 0x01～0xFE (default 0x01), 0xFF F is the Broadcast Address.

Read and Write	0x0201	Baud rate	Unsigned int, 16 Bit	Serial port baud rate (default 115200), unit: bps , effective immediately after setting, baud rate corresponding to the register value is as follows: 0x0002:4800, 0x0003:9600, 0x0004 :14400, 0x0005 :19200, 0x0006:38400, 0x0007:57600, 0x0008 :76800, 0x0009 :115200
Read and Write	0x0205	Switch output polarity	Unsigned int, 16 Bit	Set the switch output polarity, only valid in switch mode; 0x00: negative output, output low when the value is less than the threshold; 0x01: Positive output, output high when the value is less than the threshold(default)
Read and Write	0x0206	Set the switch value Threshold	Unsigned int, 16 Bit	Set the switch value threshold, unit: mm , range: 30~ 3000 mm , only valid in switch mode
Read and Write	0x0208	Signal Level	Unsigned int, 16 Bit	The signal level can be set to Level 1 to 9, (Default Level l 5) The higher the level, the larger the detection angle and the more sensitive the induction, and the longer the measurable range can be. L 1: Measurable range: approx. 50 cm L2: Measurable range: approx. 80 cm L 3: Measurable range: approx. 110 cm L4: Measurable range: approx. 170 cm L 5: Measurable range: approx. 200 cm L 6: Measurable range: approx. 210 cm L 7: Measurable range: approx. 260 cm L 8: Measurable range: approx. 280 cm L 9: Measurable range approx. 300 cm Note: 1. The measurement was taken at a temperature of 25° C and a humidity of 65% RH, with the object being measured being a 50cm × 60cm flat cardboard box. The transducer was positioned as vertically as possible to the object being measured. 2. For the relationship between detection angles at different levels, please refer to “4 Effective Detection Range Reference Diagram.”

Read and Write	0x0209	Output distance value Data Unit	Unsigned int, 16 Bit	Controlled/automatic output protocol distance value unit, 0x00- mm , 0x01- us (this value is divided by 5.75 to obtain a distance valuein mm Unit). Effective only for UART Auto and UART Controlled modes.
Read and Write	0x021A	Power supply noise reduction level	Unsigned int, 16 Bit	Power supply noise reduction levels are divided into 1～5 Level (default is 1) Applicable to scenarios with different power supplies. The higher the level, the greater the noise suppression, the overall angle will also be affected. The higher the level, the greater the impact on the angle. Levels Description: 1- Suitable for battery-powered applications; 2-Suitable for USB power supply and other devices with certain high-frequency noise occasion; 3-Suitable for occasions with longer distance USB power supply; 4- Suitable for occasions powered by switching power supply; 5- Suitable for switching power supply and complex environmental interference Occasions, generally not recommended to use;
Read and Write	0x021F	Range	Unsigned int, 16 Bit	Setting Range 300 mm ～3000 mm Default: 2000 mm Note: The maximum measurable range depends on the angle level. The smaller the angle level, the shorter the maximum measurable range.

Read and Write	0x0228	Algorithm Mode	Unsigned int, 16 Bit	Algorithm mode selection: 0: real-time value 1: Liquid surface sloshing filtration level 1 2: Liquid surface sloshing filtration level 2 3: Liquid surface sloshing filtration level 3 4: Small step filtering mode 5: High sensitivity mode UART AUTO, switch value default: 1 UART Controlled, PWM , RS485, IIC Default: 0 Note: 1. After setting to mode 1~3, the sensor will be forced to automatic measurement and controlled output in controlled mode, the distance value will become the processed value, and the response time will be ≥2S. 2. Algorithm Mode 5 has the Highest sensitivity, largest angle, blind zone of approximately 8–11 cm, which is suitable for scenes with foam on the surface. 3. When the PWM mode is set to mode 1 ~ 5, it becomes a processed value output, and the PWM signal is output after the distance value is obtained from the measurement.

(3) The impact of baud rate on single packet communication duration

Serial No.	Baud rate	Communication duration	Remark
1	4800	16ms	
2	9600	8ms	
3	14400	5.6ms	
4	19200	4ms	
5	38400	2.4ms	
6	57600	1.6ms	
7	76800	0.8ms	
8	115200	0.6ms	

Note: The higher the baud rate, the shorter the single packet communication time.

3.6.4 Modbus Communication Examples

Example 1: Reading process value data

Host: 01 03 01 00 00 01 85 F6

Slave: 01 03 02 02 F2 38 A1

Note: The sensor address is 0x01, and the processing distance value is 0x02F2, which is converted into decimal as 754 mm .

Example 2: Read real-time value data
Host: 01 03 01 01 00 01 D4 36
Slave: 01 03 02 02 EF F8 A8
Note: The sensor address is 0x01, the real-time distance value is 0x02EF , which is converted to decimal as 751 mm .

Example 3: Read temperature data
Host: 01 03 01 02 00 01 24 36
Slave: 01 03 02 01 2C B8 09
Note: The sensor address is 0x01, the real-time temperature value is 0x012C , which is converted into decimal as 30.0℃.

Example 4: Modify the slave address
Host: 01 06 02 00 00 05 48 71
Slave: 01 06 02 00 00 05 48 71
Note: The sensor address is changed from 0x01 to 0x05.

Example 5: Reading the baud rate
Host: 01 03 02 01 00 01 D4 72
Slave: 01 03 02 00 03 F8 45
Description: Read the baud rate. The baud rate read is: 9600 bps

Example 6: Setting the baud rate
Host: 01 06 02 01 00 03 99 B3
Slave: 01 06 02 01 00 03 99 B3
Description: Set the baud rate to 9600 bps

3.7 IIC Output Description

3.7.1 Pin definition

PIN No.	PIN Name	PIN Description	Remark
1	VCC	Power input	
2	GND	Power ground	
3	RX	IIC Clock Line SCK	
4	TX	IIC Data cable SDA	

3.7.2 IIC Module parameters

This module is a slave device and supports multiple parallel connections. Communication line SDA With SCK needs to be connected externally by the user with pull-up resistors. The recommended size range is: 3K～10K.

Communication level: equal to VCC

Communication rate: 10~100 kbit /s

Broadcast address: 0x00

Default address: 0xE8

The 8-bit slave address described in this article is obtained by shifting the 7-bit address one bit to the left.

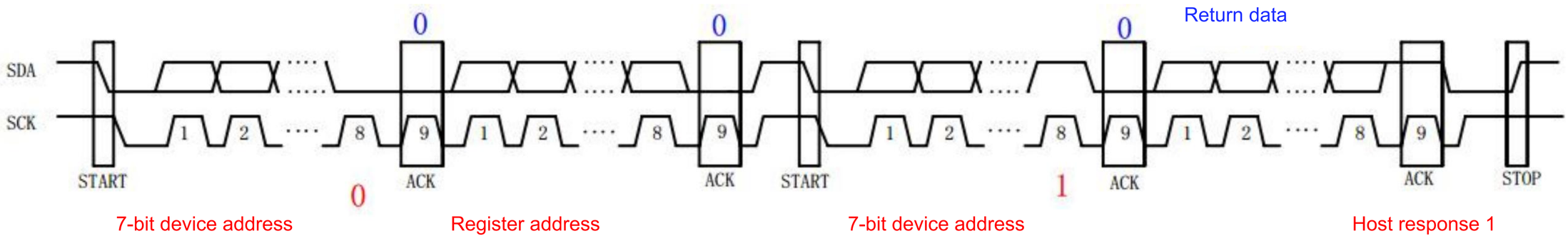
For example, the 7-bit address corresponding to 0xE8 is expressed as 0x74.

Users can modify the address to any one of the following 20 addresses: 0xD0, 0xD2, 0xD4, 0xD6, 0xD8, 0xDA, 0xDC, 0xDE, 0xE0, 0xE2, 0xE4, 0xE6, 0xE8, 0xEA, 0xEC, 0xEE, 0xF8, 0xFA, 0xFC, 0xFE.

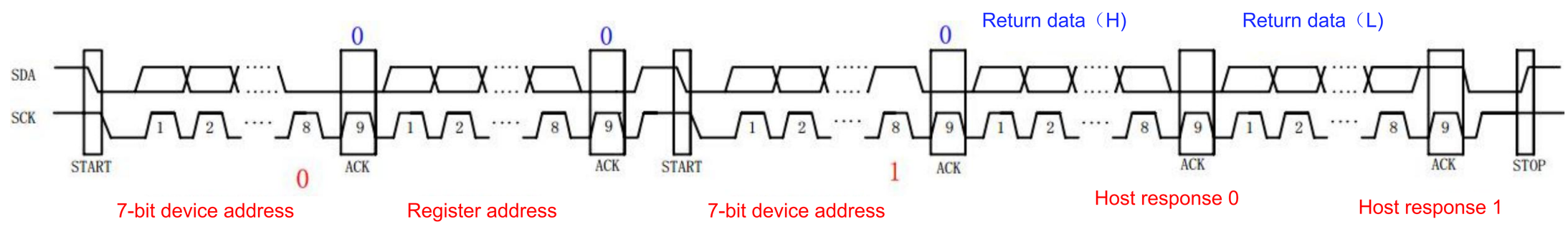
3.7.3 IIC Timing diagram

（1） Read 1 Bytes of data

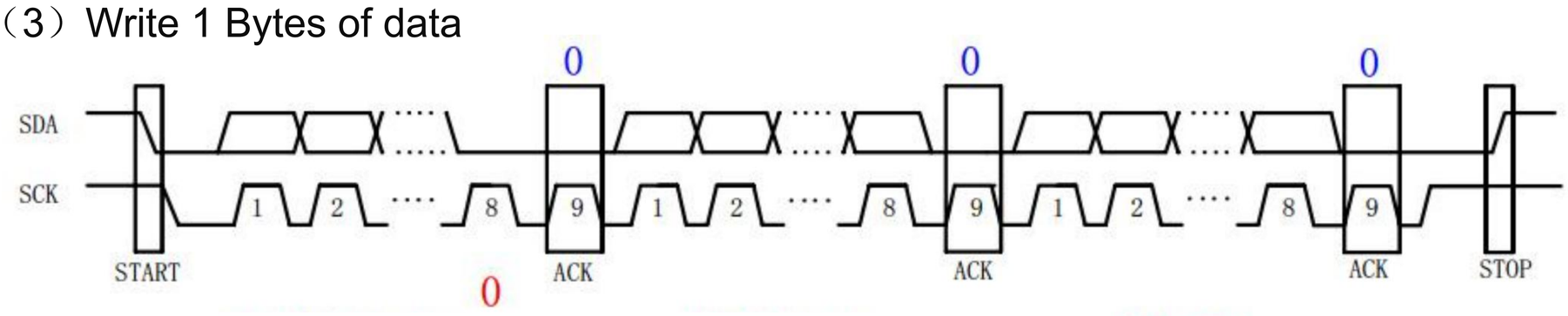
Note: The blue part above the timing is the signal generated by the slave, and the red part below the timing is the signal generated by the master.



（2） Read 2 Bytes of data, with the high eight bits in front and the low eight bits in the back.



（3）Write 1 Bytes of data



3.7.4 IIC Register

Register data has high byte first and low byte last.

（1）IIC Register Table 1

Authority	Address	Function	Data Types	Instruction
Read-only	0x00～0x01	Program version identifier	Unsigned int, 16 Bit	Module software version number identification

Read-only	0x02～0x03	Distance value	Unsigned int, 16 Bit	Output real-time distance value, and determine the output unit according to the trigger instruction, the data has mm and us units; When co-frequency interference is detected in the environment, output 0xFFFE data as a prompt. When no object is detected, output 0xFFFD. Premature reading will respond with 0xFFFF to indicate that the distance measurement is not yet complete. It is recommended that after triggering ranging, wait for the corresponding delay time before reading the distance value.
Read and Write	0x05	Slave Address	Unsigned int, 8 Bit	8bit slave device address, default 0xE8, 0x00 is the broadcast address; Any of the 20 addresses can be written to: 0xD0, 0xD2, 0xD4, 0xD6, 0xD8, 0xDA, 0xDC, 0xDE, 0xE0, 0xE2, 0xE4, 0xE6, 0xE8, 0xEA, 0xEC, 0xEE, 0xF8, 0xFA, 0xFC, 0xFE
Read and Write	0x06	Power supply noise reduction Level	Unsigned int, 8 Bit	Power supply noise reduction level (default is 1) to suit different Power supply scenarios; the higher the level, the better the noise suppression, and at the same time, the measured object with a smaller signal may not be detected. Description of different levels: 1- Suitable for battery-powered applications; 2-Suitable for USB power supply and other devices with certain high-frequency noise occasion; 3-Suitable for longer distance USB power supply situations; 4- Suitable for occasions powered by switching power supply; 5- Suitable for switching power supply and complex environmental interference Occasionally, which is generally not recommended to use

				The signal level can be set from Level 1 to 9, (Default Level 5); the larger the level, the larger the detection angle and the more sensitive the induction, the longer the measurable range is. L 1: Measurable range: approx. 50 cm L 2: Measurable range: approx. 80 cm L 3: Measurable range: approx. 110 cm L 4: Measurable range: approx. 170 cm L 5: Measurable range: approx. 200 cm L6: Measurable range: approx. 210 cm L 7: Measurable range: approx. 260 cm L 8: Measurable range: approx. 280 cm L9: Measurable range approx. 300 cm Note: 1. . The measurement was taken at a temperature of 25° C and a humidity of 65% RH, with the object being measured being a 50cm × 60cm flat cardboard box. The transducer was positioned as vertically as possible to the object being measured. 2. For the relationship between detection angles at different levels, please refer to “4 Effective Detection Range Reference Diagram.”
Read and Write	0x07	Signal Level	Unsigned int, 8 Bit	
Read and Write	0x09	Algorithm Mode	Unsigned int, 8 Bit	Algorithm mode selection: 0: real-time value 1: Liquid surface shaking filtration level 1 2: Liquid surface shaking filtration level 2 3: Liquid surface shaking filtration level 3 4: Small step filtering mode 5: High sensitivity mode UART automatic, switch value default: 1 UART Controlled, PWM , RS 485, IIC Default: 0 Note: 1. After setting to mode 1~3, the sensor will be forced to automatic measurement and controlled output in controlled mode, the distance value will become the processed value, and the response time will be ≥2S.The distance value or echo time value can be obtained by directly reading the 0x02 to 0x03 registers. Writing the corresponding trigger measurement command to the 0X10 register can switch between reading the distance value or echo time value.

Read and Write	0x09	Algorithm Mode	Unsigned int, 8 Bit	2. Algorithm Mode 5 has the Highest sensitivity, largest angle, blind zone of approximately 8–11 cm, which is suitable for scenes with foam on the surface. 3. When the PWM mode is set to mode 1 ~ 5, it becomes a processed value output, and the PWM signal is output after the distance value is obtained from the measurement.
Read-only	0x0A～0x0B	Temperature	Signed int, 16 Bit	Unit: 0.1℃ , Resolution: 0.5℃ , can be read after triggering ranging
Write only	0x10	Command control	Unsigned int, 8 Bit/16 Bit	Please see Table 2 for details.

(2) IIC Register Table 2, Control Instructions

Authority	Register	Instruction	Function	Explanation
Write only	0x10	Measuring range	Trigger ranging once	Write the measurement range to trigger the sensor measurement, the range is: 0x03～0x23, the unit is 100 mm, representing 300mm~3000 mm range, returns the distance value in mm; Measurement time takes 15～110 ms; Note: Please read the distance value after the ranging is completed.Reading the 0x02 register too early will result in a response of 0xFFFF.
Write only	0x10	Measuring range +0x64	Trigger ranging once	Write the measurement range to trigger the sensor measurement, the range Range: 0x67～0x87, unit 100 mm , representing 300 mm ~3000mm Range, return us Unit echo Time value, divided by 5.75 to get mm Unit distance value; Note: 1. Measurement time takes 15～110 ms ; Please read the distance value after the ranging is completed. Reading the 0x02 register too early will result in a response of 0xFFFF; 2. 0x67= 0x03 + 0x64, indicating the measurement range 300 mm, and the echo time is returned; 0x87 = 0x23 + 0x64, indicating the measurement range 3500mm , and the echo time is returned;

Write only	0x10	0x5A + 0xA5	Restart the sensor	The slave restarts immediately after receiving the command

3.7.5 Communication Examples

Example 1: Read the module software version number. The operation steps are as follows:

Address(write)	0x00	Address (read)	0x00	0x01

The module is identified by the software version number 0x0001.

Example 2: Trigger the module to measure distance at a range of 2 meters and read the real-time distance value. The steps are as follows.

① Send trigger ranging command:

Address(write)	0x10	0x14

Delayed waiting 50 ms

③ Read distance value:

Address(write)	0x02	Address (read)	0x04	0xE9

The real-time distance value is 0x04E9, converted to decimal is 1257 mm .

Example 3: The host modifies the module IIC address. The operation steps are as follows:

Original address 0xE 8 (write)	0x05	New Address 0xD0

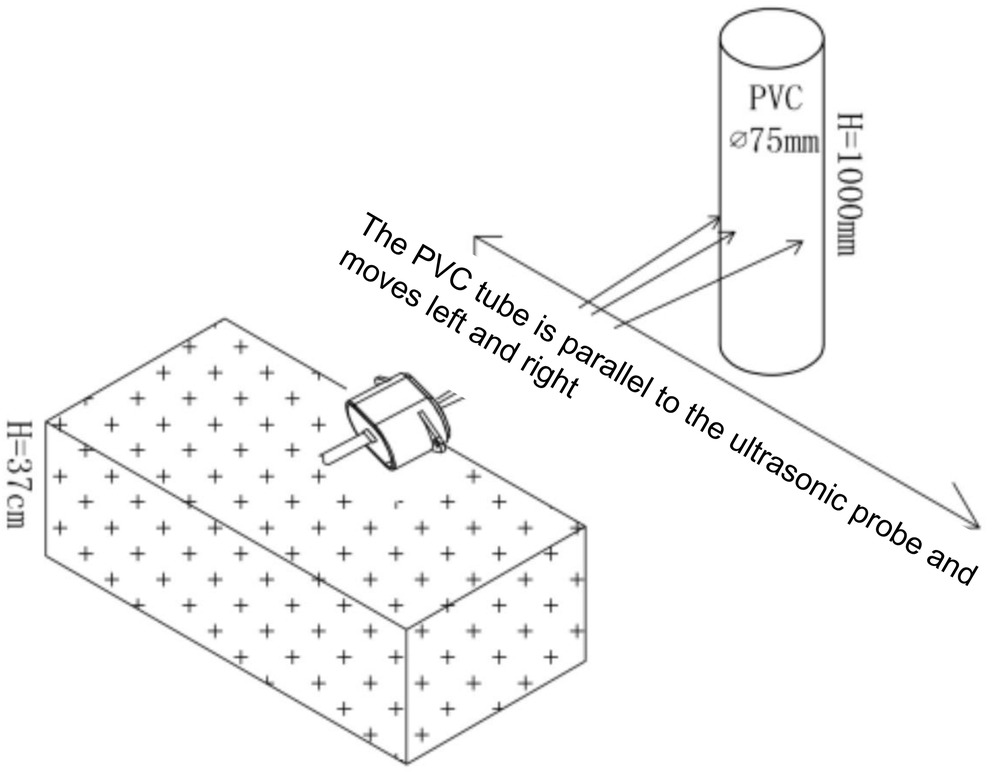
Example 4: Modify the module signal level, the steps are as follows:

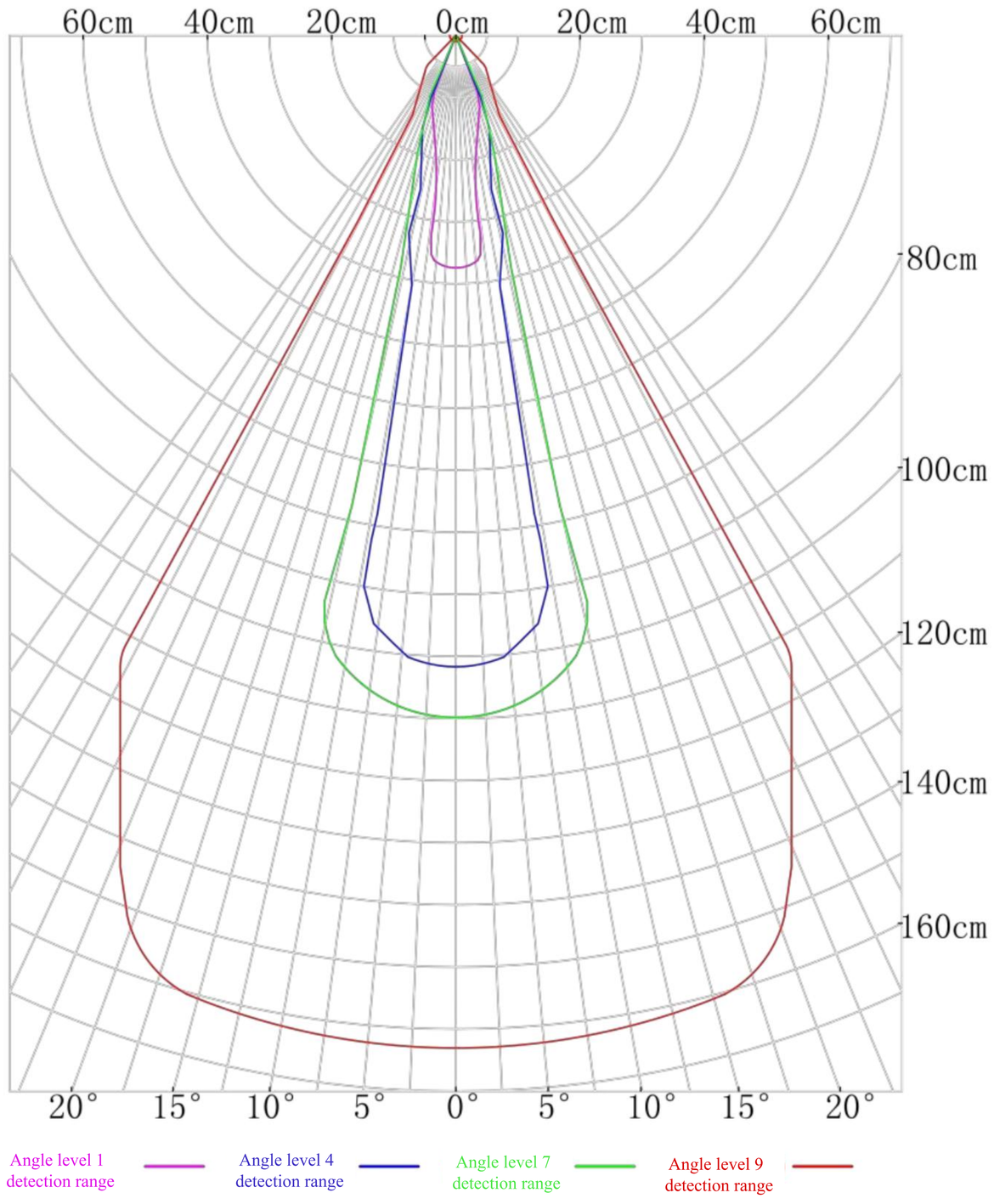
Address(write)	0x07	0x04

Modify the module signal level to Level 4th.

4. Effective detection range reference diagram

The test object was a white cylindrical PVC tube with a height of 100 cm and a diameter of 7.5 cm.





5.Module Series Description

The L07A series is a conventional liquid level detection sensor suitable for general liquid level detection scenarios without food-grade requirements and without corrosive substances.

The L07B series is a food-grade liquid level detection sensor suitable for liquid level detection scenarios with food-grade requirements.

The L07C series is a liquid level detection sensor resistant to nutrient solution corrosion, suitable for liquid level detection scenarios involving nutrient solutions in hydroponic cultivation.

6. Module Selection Instructions

NO.	L07 Series Model	Feature	Output Method	Remark
1	DYP-L07AYYUW-V1.0	Conventional products, black	UART Auto	
2	DYP-L07AYYTW-V1.0		UART controlled	
3	DYP-L07AYYMW-V1.0		PWM Pulse Width	
4	DYP-L07AYYGDW-V1.0		Switch	
5	DYP-L07AYYCW-V1.0		IIC	
6	DYP-L07AYY4W-V1.0		RS485	

7	DYP-L07BYYUW-V1.0	Food grade product, grey	UART Auto	
8	DYP-L07BYYTW-V1.0		UART controlled	
9	DYP-L07BYYMW-V1.0		PWM Pulse Width	
10	DYP-L07BYYGDW-V1.0		Switch	
11	DYP-L07BYYCW-V1.0		IIC	
12	DYP-L07BYY4W-V1.0		RS485	
13	DYP-L07CYYUW-V1.0	Anti-nutrient solution corrosion products, grey	UART Auto	
14	DYP-L07CYYTW-V1.0		UART controlled	
15	DYP-L07CYYMW-V1.0		PWM Pulse Width	
16	DYP-L07CYYGDW-V1.0		Switch	
17	DYP-L07CYYCW-V1.0		IIC	
18	DYP-L07CYY4W-V1.0		RS485	

7. Installation Recommendations

1. When installing the sensor, ensure that the transducer's emitting surface is parallel to the surface being measured. This ensures that the sound waves emitted vertically toward the surface of the object being measured return with maximum energy, thereby ensuring maximum range stability and reliability.
2. In front of the sensor, it should be noted that except for the measured object, other objects should avoid the sensor testing range;
3. If there is steam at the site of use and installation, water droplets are easy to adhere to the surface of the probe, so try to avoid the influence of water droplets;
4. When installing and securing the sensor, avoid structural deformation, metal resonance, or other forms of resonance. Avoid components that may cause resistance, such as elbows, valves, or variable diameters

8. Precautions

1. The company reserves the right to change this document and update its functions without prior notice;
2. Please pay attention to the structural tolerance during design. Unreasonable structural design may cause temporary abnormality of module function;

3. Please pay attention to the electromagnetic compatibility assessment during design. Unreasonable system design may cause abnormal module function.
4. When it comes to the application of product limit parameters, please contact our FAE Confirm relevant precautions;

9. Packaging Specifications

1. The default packaging method is DYP's conventional packaging method;
2. Packaging materials can be customized according to customer IQC related standards;
3. The container transportation method needs to adopt the staggered consolidation method, and at the same time, the outer edge of the single stack needs to be wrapped with a reinforced gusset to provide sufficient support.