Stainless Steel Tipping Bucket Rain Sensor (RS485)

SISCO-RS-3005

Catalogue

Chapter 1 Product Introduction

1.1 Product Overview

This instrument is a primary measuring device for precipitation, and its performance complies with the requirements of the national standard GB/T 21978.2–2014 Specifications for Precipitation Observation.

The core component of this instrument, the tipping bucket, features a three-dimensional streamlined design that enables smoother water flow, while also providing self-cleaning properties for dust and ease of cleaning. The pulse-to-RS485 signal output allows direct readout of rainfall accumulation without the need for secondary calculation, offering simplicity and convenience.

1.2 Functional Features

As shown in Figure 1, this instrument consists of the housing, filter, collector, funnel, tipping bucket, terminal block, leg supports, reed switch, control box, rain gauge base, and other components. The rain gauge base is equipped with the tipping bucket shaft, circular level vial, reed switch bracket, and signal output terminals. Unlike other tipping-bucket rain gauges, this instrument features an integrated positioning structure for the tipping bucket shaft sleeve. The tipping bucket is installed in the shaft

bearings via the tipping bucket shaft. The internal assembly is completed at the factory, eliminating the need for on-site installation of internal components and thereby facilitating more convenient field setup.

The tipping bucket of this instrument features a three-dimensional streamlined design with a downward-curved arc-shaped flow-guiding tip. Its aesthetically pleasing and smooth contour ensures superior water-shedding performance, while also making cleaning and maintenance easier.

A magnet is mounted on the tipping bucket, and a reed switch is installed on the reed switch bracket. The magnet and reed switch have been factory-adjusted to the optimal coupling distance, ensuring that the instrument's output signal maintains a definitive proportional relationship with the number of tipping bucket cycles.

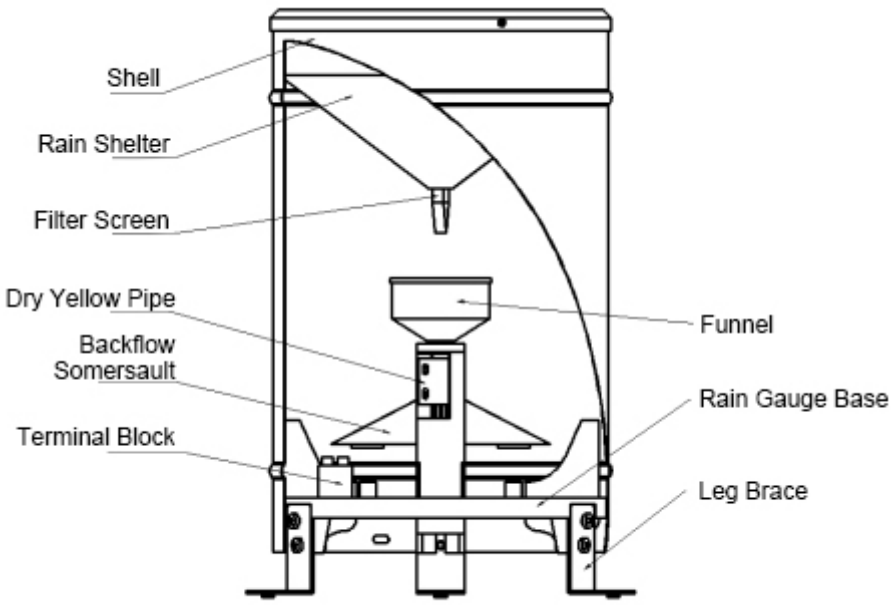

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Figure 1

1.3 Main Technical Specifications

Parameter	Specification
Aperture of collecting rim	φ200 mm
Cutting edge angle	40°–45°
Resolution	0.2 mm / 0.5 mm (selectable)
Measurement error	≤ ±3 % (based on indoor artificial rainfall, with the instrument's own discharge volume as the reference)
Rainfall intensity range	0 mm – 4 mm/min (maximum permissible rainfall intensity: 8 mm/min)
Communication interface	RS485 (standard ModBus-RTU protocol)
Maximum power consumption	0.24 W
Operating environment	Ambient temperature: 0–55 °C Relative humidity: <95 % (at 40 °C)
Supply voltage range	4.5 – 30 VDC

1.4 Product Selection Guide

Note: The matching mounting bracket/support plate is not included and must be purchased separately.

SN-					Company Code
	3026-				Semi-stainless steel dual tipping bucket
		YL-			Rain gauge
			N01-		RS485 output (ModBus protocol)
				02	0.2mm
				05	0.5mm

1.5 Product Appearance

Chapter 2 Hardware Connection

2.1 Pre-Installation Inspection

Equipment Checklist:

Tipping bucket rain gauge	1set	Base stop block	1pc.	Certificate of conformity	1copy
M6×20 screws	3sets	M8×70 anchor bolts	3 ets		

(1) Remove the instrument from the packaging box and carefully check the accessories against the packing list in this manual to verify that all items are present and intact.

(2) Carefully read the product manual and the certificate of conformity.

(3) Inspect the instrument appearance for any damage, paying special attention to ensure that the tipping bucket is intact and undamaged. Handle the tipping bucket with care to avoid damaging the pivot points of the tipping bucket shaft and the arc-shaped water-guiding tips at both ends of the bucket. Do not touch the inner wall of the tipping bucket with fingers to prevent contamination, which could impair the accuracy of the instrument.

2.2 Indoor Installation and Testing

As shown in Figure 2: Remove the EPE (expanded polyethylene) foam block from the bottom of the instrument, and then install the supplied stop block onto the bottom of the instrument.

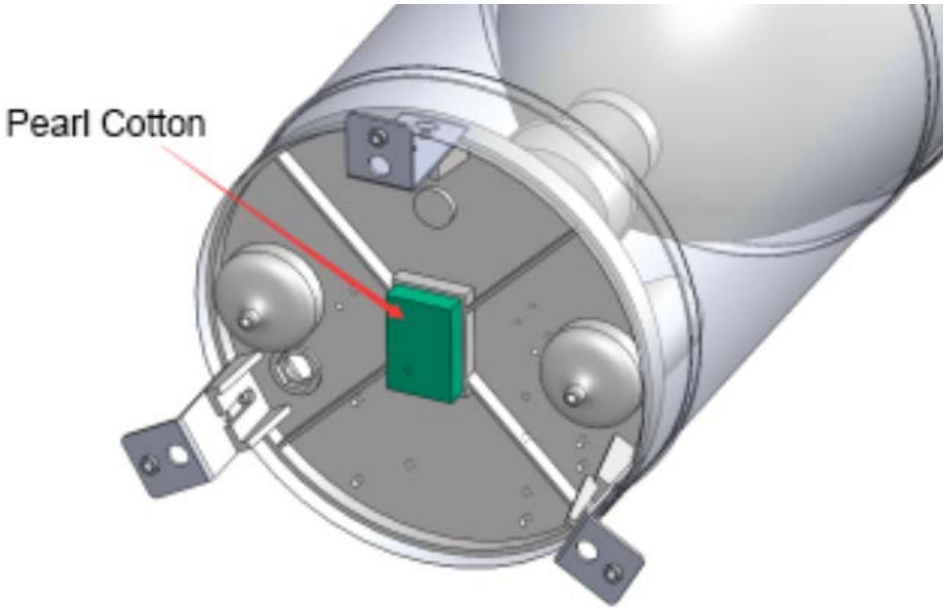


Figure 2

2.3 Outdoor Installation and Commissioning

2.3.1 Preparing the Installation Foundation

As shown in Figure 3: For outdoor ground or rooftop installation, a cement foundation shall be prepared in accordance with the dimensions and requirements specified in Figure 3. The top surface of the cement foundation shall be level. The recommended foundation dimensions are a square base of no less than 40 cm × 40 cm or a circular base with a diameter of 40 cm, with a height of no less than 30 cm. The orifice of the

collecting rim shall be positioned at a height of 70 cm above the ground surface. Additionally, no obstruction taller than the instrument's collecting rim shall be present within a radius of 3 to 5 meters around the orifice.

2.3.2 Mounting and Fixing the Instrument, and Leveling the Collecting Rim

As shown in Figure 3: Drill three mounting holes of Φ12 mm with a depth of 8－10 cm into the cement foundation according to the dimensions indicated. Insert the expansion anchor bolts into the mounting holes and secure them with locknuts. Then mount the instrument base onto the three height-adjustable support nuts. Adjust the height of the support nuts and use a spirit level to verify that the rim is perfectly level. Finally, tighten the upper locknuts to secure the instrument in place.

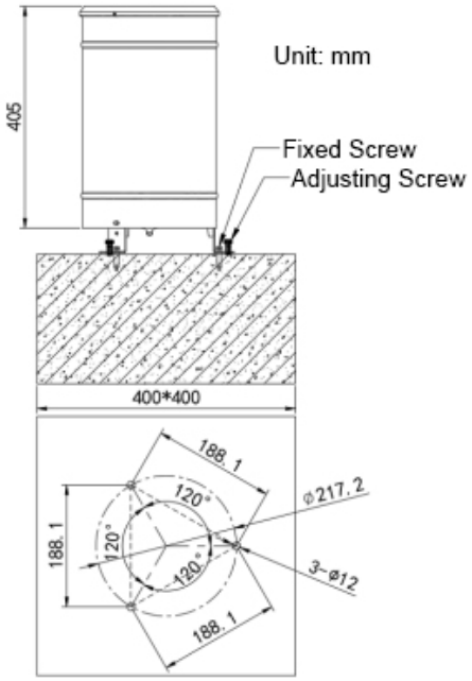


Figure 3

2.4 Wiring Instructions

Wire Color	Description	Wire Color	Description
Brown	Power positive (+)	Yellow	485A
Black	Power negative (−)	Blue	485B

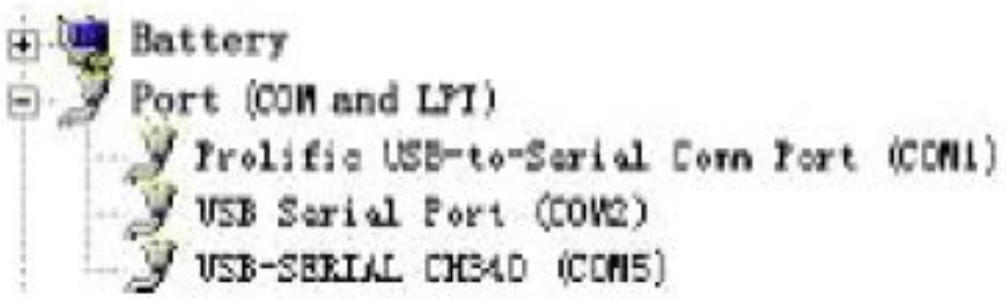
Chapter 3 Configuration Software Installation and Usage

Our company provides the accompanying "485 Parameter Configuration Software," which allows convenient reading of sensor parameters via a computer, as well as flexible modification of the sensor's device ID and address.

Note: When using the software's auto-detection function, ensure that only one sensor is connected to the RS485 bus.

3.1 Connecting the Sensor to the Computer

After properly connecting the sensor to the computer via a USB-to-RS485 converter and providing power to the sensor, the correct COM port can be viewed on the computer (check the COM port under "My Computer → Properties → Device Manager → Ports").



Open the provided data package, navigate to "Debugging Software" → "485 Parameter Configuration Software," and double-click to open it.

If no COM port is found in the Device Manager, this means that the USB-to-RS485 driver has not been installed (the driver is available in the data package) or has not been installed correctly. Please contact technical support for assistance.

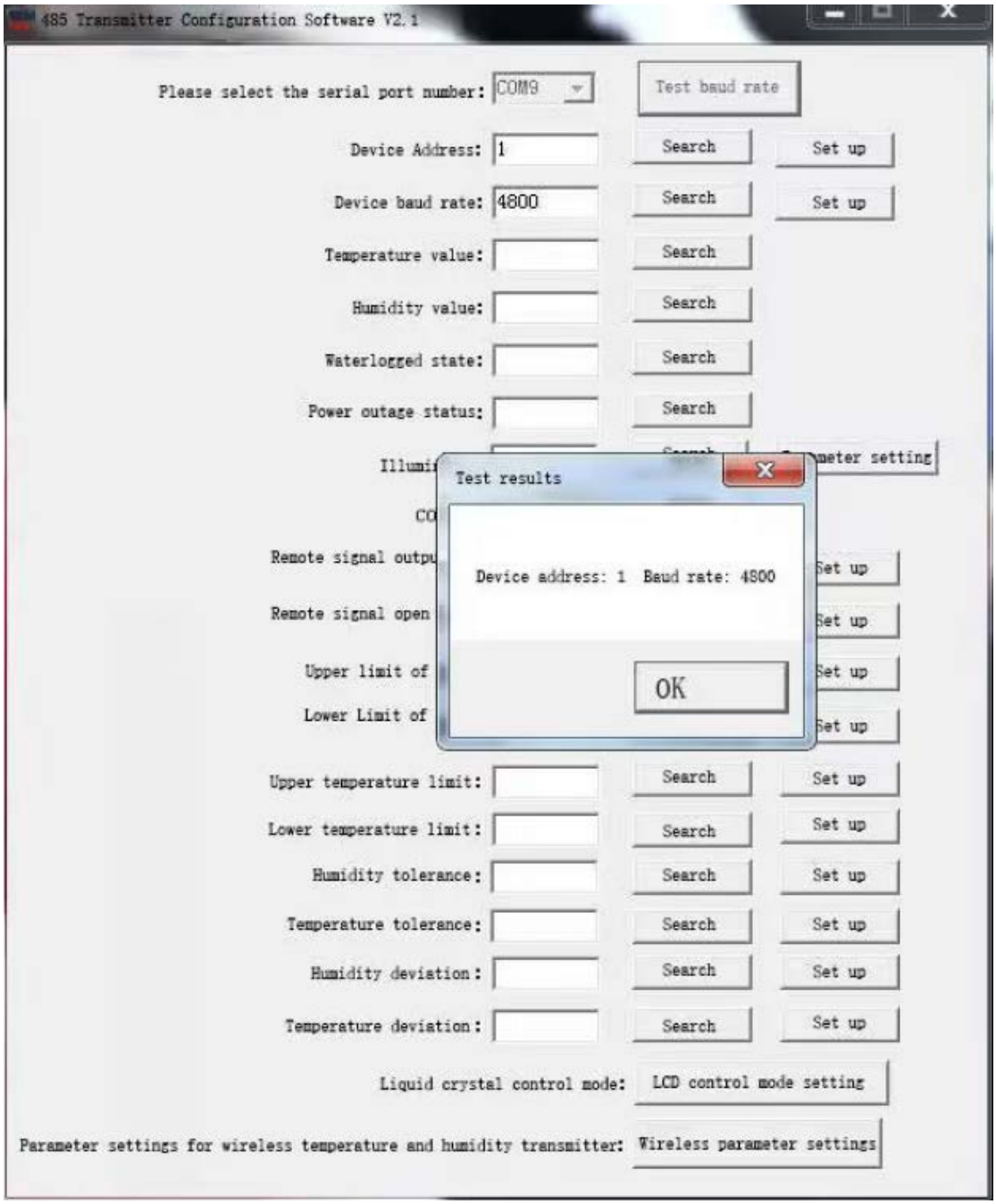
3.2 Using the Sensor Monitoring Software

① The configuration interface is shown in the figure. First, obtain the serial port number using the method described in Section 3.1, and select the correct serial port.

② Click the "Test Baud Rate" button in the software. The software will automatically detect the current baud rate and address of the device. The default baud rate is 4800 bit/s, and the default address is 0x01.

③ Modify the address and baud rate as required for your application. The current functional status of the device can also be queried.

④ If the test fails, please re-check the device wiring and the installation status of the RS485 driver.


485 Transmitter Configuration Software V2.1
Please select the serial port number:
COM9
Test baud rate
Device Address:
1
Search
Set up
Device baud rate:
4800
Search
Set up
Temperature value:
Search
Humidity value:
Search
Waterlogged state:
Search
Power outage status:
Search
Test results
Device address: 1 Baud rate: 4800
OK
Remote signal outpu
Remote signal open
Upper limit of
Lower Limit of
Upper temperature limit:
Search
Set up
Lower temperature limit:
Search
Set up
Humidity tolerance:
Search
Set up
Temperature tolerance:
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Set up
Humidity deviation:
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Set up
Temperature deviation:
Search
Set up
Liquid crystal control mode:
LCD control mode setting
Parameter settings for wireless temperature and humidity transmitter:
Wireless parameter settings

Chapter 4 Communication Protocol

4.1 Basic Communication Parameters

Coding	8-bit binary
Data bits	8 bits
Parity	None
Stop bits	1 bit
Error check	CRC (Cyclic Redundancy Check)
Baud rate	Selectable: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bit/s; factory default: 4800 bit/s

4.2 Data Frame Format Definition

The ModBus-RTU communication protocol is adopted, with the frame format defined as follows:

| Start structure | ≥ 4 bytes of idle time |

| Address code | 1 byte |

| Function code | 1 byte |

| Data field | N bytes |

| Error check | 16-bit CRC code |

| End structure | ≥ 4 bytes of idle time |

Address code: The address of the transmitter, which must be unique within the communication network (factory default: 0x01).

Function code: Indicates the function of the command issued by the master.

Data field: Contains the actual communication data. Note: 16-bit data is transmitted with the high byte first (big-endian).

CRC code: A 2-byte error-checking code.

Master Inquiry Frame Structure:

Address Code	Function Code	Register Start Address	Register Length	CRC Low Byte	CRC High Byte
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave Response Frame Structure:

Address Code	Function Code	Byte Count	Data Area 1	Data Area 2	Data Area N	CRC Code
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

4.3 Register Addresses

Register Address	Content	Operation (Hex)	Range and Definition
0000H	Rainfall	0x03/0x04/0x06	Rainfall value, scaled up

	value		by a factor of 10
07D0H	Device address	0x03/0x04/0x06/ 0x10	1–254 (factory default: 1)
07D1H	Device baud rate	0x03/0x04/0x06/ 0x10	0 = 2400, 1 = 4800, 2 = 9600, 3 = 19200, 4 = 38400, 5 = 57600, 6 = 115200, 7 = 1200

4.4 Communication Protocol Examples and Explanations

4.4.1 Querying the Current Rainfall Value

Inquiry Frame:

Address Code	Function Code	Start Register	Data Length	CRC Low	CRC High
0x01	0x03	0x00 0x00	0x00 0x01	0x84	0x0A

Response Frame:

Address Code	Function Code	Byte Count	Rainfall Value	CRC Low	CRC High
0x01	0x03	0x02	0x00 0x1A	0x39	0x8F

Current Rainfall Value: (The transmitted value is scaled up by a factor of 10)

001A (hex) = 26 (decimal) → Rainfall value: 2.6 mm

4.4.2 Clearing Rainfall Data

Inquiry Frame:

Address Code	Function Code	Start Register	Clear Command	CRC Low	CRC High
0x01	0x06	0x00 0x00	0x00 0x5A	0X09	0XF1

Response Frame:

Address Code	Function Code	Start Register	Clear Command	CRC Low	CRC High
0x01	0x06	0x00 0x00	0x00 0x5A	0X09	0XF1

4.4.3 Modifying the Device Address

Inquiry Frame: (Assuming the current address is 01 and needs to be changed to 02)

Address Code	Function Code	Start Address	Modified Value	CRC Low	CRC High
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

Response Frame:

Address Code	Function Code	Start Address	Modified Value	CRC Low	CRC High
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

4.4.4 Modifying the Baud Rate

Inquiry Frame: (Assuming the current baud rate is 4800 and needs to be changed to 9600)

Address Code	Function Code	Start Address	Modified Value	CRC Low	CRC High
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

Response Frame:

Address Code	Function Code	Start Address	Modified Value	CRC Low	CRC High
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

4.4.5 Querying the Device Address

When the user has forgotten the device address, the following function code can be used to query the address.

Inquiry Frame:

Address Code	Function Code	Start Address	Modified Value	CRC Low	CRC High
0xFF	0x03	0x07 0xD0	0x00 0x01	0x91	0x59

Response Frame:

Address Code	Function Code	Start Address	Modified Value	CRC Low	CRC High
0xFF	0x03	0x02	0x00 0x01	0x50	0x50

The address code read from the response is the actual device address: 01

Chapter 5 Maintenance and Care

5.1 Routine Maintenance

This instrument is designed for long-term outdoor operation under harsh environmental conditions. Therefore, the inner wall of the collecting rim should be regularly wiped with a soft cloth to keep it clean. If foreign matter such as leaves is found inside the collecting rim, it should be promptly removed to ensure unobstructed water flow. When the instrument is not in use for an extended period, a protective cover should be placed over the rim to protect the collecting orifice.

For instruments in continuous long-term operation, cleaning is generally recommended once a month and must be performed at least once every three months.

5.2 Cleaning the Tipping Bucket

The tipping bucket is a critical component of this instrument and directly affects measurement accuracy. Over time, a small amount of dust or grease may accumulate on the inner surface of the tipping bucket, necessitating cleaning. When cleaning, rinse the inner wall of the tipping bucket repeatedly with clean water, or gently brush it with a degreased brush. It is strictly prohibited to scrub the inner wall of the tipping bucket with hands or any other objects.

Chapter 6 Troubleshooting and Solutions

This table lists the general fault symptoms, possible causes, and corresponding corrective actions that may occur with the instrument.

Symptom at Central Station	Rain Gauge Fault	Solution
No data received during rainfall	1. No signal output from rain gauge, or transmission line fault 2. Reed switch failure 3. Magnet too far from reed switch 4. Soldered connection loose, signal wire broken, or signal wires reversed 5. Tipping bucket stuck 6. Instrument clogged	1. Check at the downstream station 2. Replace 3. Adjust the distance 4. Repair/Reconnect 5. Remove obstruction 6. Clear blockage
Rainfall data received differs significantly from reference rain gauge during rainfall	1. Tipping bucket tipping threshold misaligned (error generally does not exceed ±10%) 2. Improper magnet-to-reed switch positioning, causing intermittent operation and resulting in missed pulses 3. Normal variation under actual conditions; instrument is functioning properly	1. Re-calibrate the tipping threshold 2. Adjust the distance 3. No action required (instrument is not faulty)
Continuous rainfall data received at central station when no rain is actually falling	Check whether the connector socket has water ingress (this tends to occur after heavy rainfall)	Dry out the water ingress and re-seal

Note: The fault symptoms listed in the above table are not necessarily all

attributable to the rain gauge itself. After inspecting and rectifying any internal instrument faults, the transmission lines, data acquisition device, and other associated equipment should also be checked for faults and resolved accordingly.

Chapter 7 Safety Precautions

WARNING: Risk of Personal Injury

It is strictly prohibited to use this device as a safety device, emergency stop mechanism, or in any application where device failure could result in personal injury.

Usage Restrictions

This device shall be used solely for its intended purpose and within its authorized scope of application.

Prior to installation, operation, or maintenance, the relevant instructions in the technical manual must be carefully read and fully understood.

Failure to comply with the above warnings and instructions may result in death or serious personal injury.

Chapter 8 Warranty Information

This product is covered by a warranty period of 12 months from the date of purchase (subject to valid proof of purchase). Within the warranty period, under normal use and maintenance conditions, should the product fail due to defects in materials or workmanship, we will provide free repair or replacement of parts upon confirmation by our company's inspection. After the warranty period expires, we will continue to provide paid repair services for the lifetime of the product.

The warranty does not apply under any of the following circumstances:

1. Damage resulting from improper installation or operation of the product.
2. The product has been disassembled, repaired, modified, or altered by personnel not authorized by our company, or internal components have been replaced by the user.
3. Damage caused by negligent use, or by ingress of water or other foreign substances into the device.
4. Damage or failure caused by accidents or natural disasters.
5. Damage or failure resulting from operation beyond the working parameter ranges specified in the product specifications.