# OHTS1121 Rain/Snow Sensor

## 1 Product Overview

The OHTS1121 is a qualitative detection sensor based on AC impedance measurement principles, designed to detect rainfall or snowfall states in outdoor natural environments. The sensor employs AC excitation technology to prevent oxidation of the sensing plate surface, ensuring long-term detection sensitivity. The device can be equipped with an optional automatic heating module for low-temperature, high-humidity environments to prevent surface icing and condensation. It supports dual output modes: RS485 (ModBus-RTU) digital interface and relay switch output, suitable for rain/snow monitoring applications in environmental monitoring, agricultural greenhouses, and industrial facilities.

## 2 Applications

- Rain/snow state detection for meteorological and environmental monitoring stations
- Agricultural greenhouse environmental control systems
- Livestock breeding facility environmental monitoring
- Building peripheral rain/snow monitoring
- Building automation environmental control systems
- Outdoor equipment protection status monitoring
- Traffic infrastructure meteorological monitoring
- Photovoltaic/wind farm environmental monitoring
- Warehousing and logistics facility environmental monitoring
- Smart city environmental sensing nodes

## 3 Features

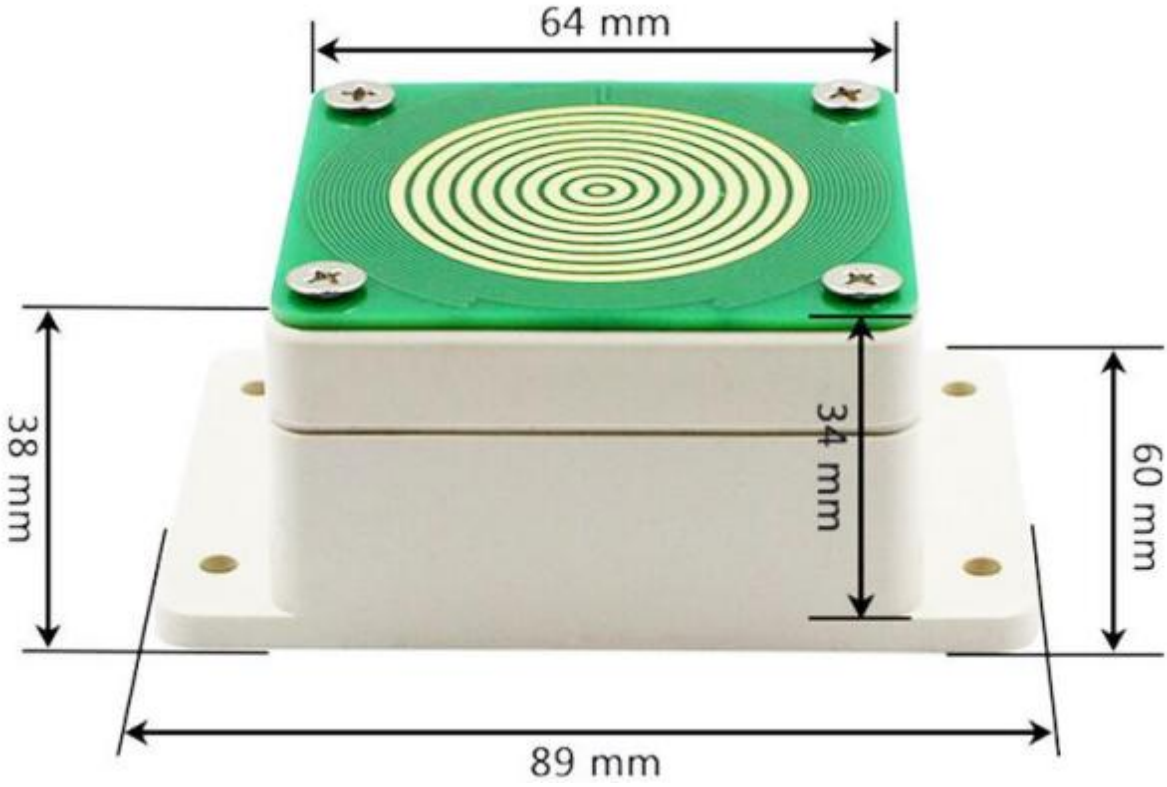
- Qualitative rain/snow detection with response time $\leqslant 0.5\,\mathrm{s}$
- AC measurement technology suppresses sensing plate oxidation, ensuring long-term stability
- IP68 protection rating for long-term outdoor deployment
- Dual-mode output: RS485 (ModBus-RTU) digital interface and relay normally-open contact
- Optional automatic heating function with configurable heating start temperature threshold (default $< 15\,^{\circ}\mathrm{C}$)
- Heating temperature upper limit control $\leqslant 40\,^{\circ}\mathrm{C}$ (default) to prevent dry burning
- Configurable detection sensitivity, range 500~3500
- Configurable alarm and reset delay, range 0~60000 s, to avoid frequent false alarms

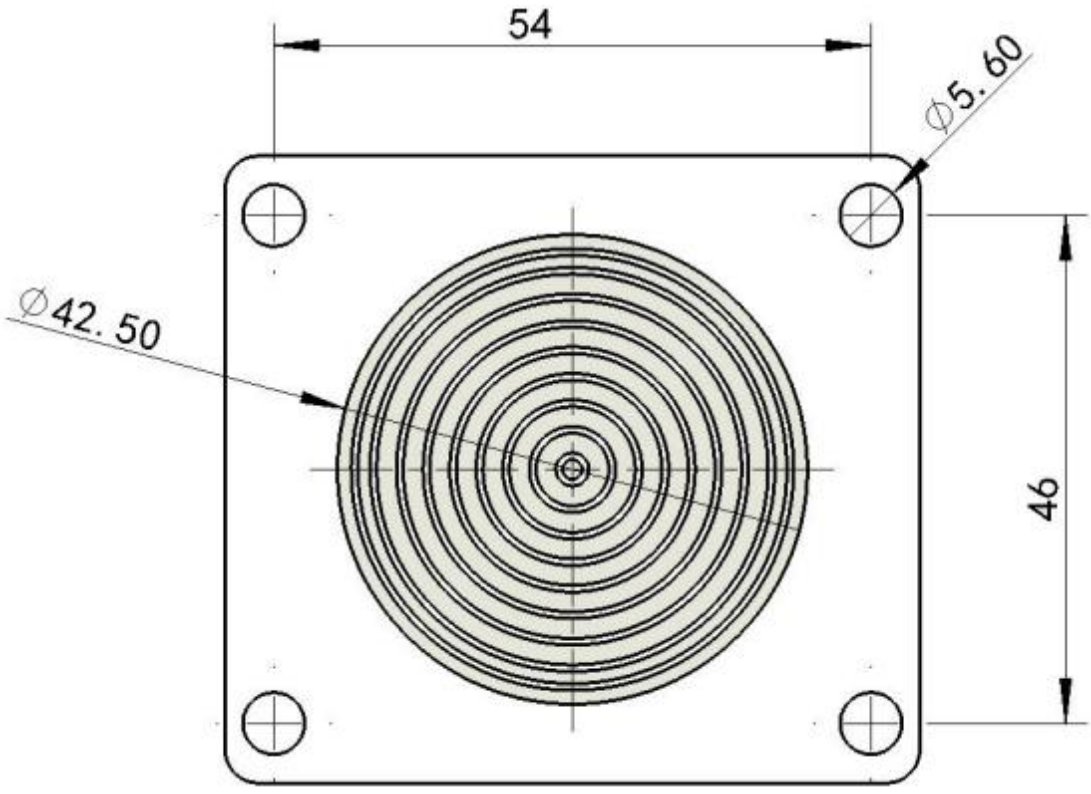
## 4 Technical Specifications

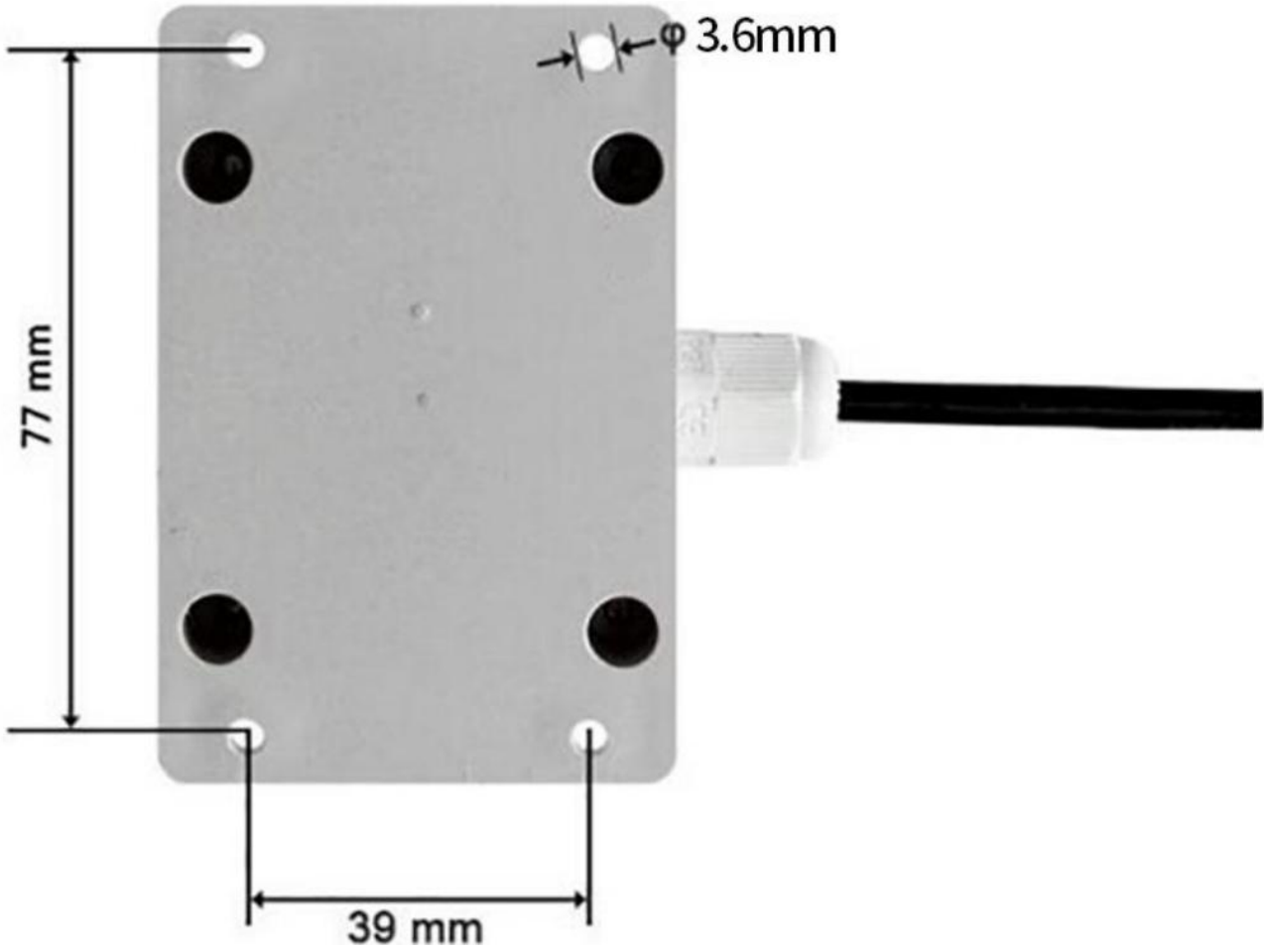
| Parameter | Specification | Remarks |
|---|---|---|
| Power Supply | $10\,\mathrm{V} \sim 30\,\mathrm{V\,DC}$ | - |
| Operating Temperature | $-40\,^{\circ}\mathrm{C} \sim 60\,^{\circ}\mathrm{C}$ | - |
| Storage Temperature | $-40\,^{\circ}\mathrm{C} \sim 80\,^{\circ}\mathrm{C}$ | - |
| Normal Operating Power | $0.4\,\mathrm{W}$ | - |
| Heating Operating Power | $7.5\,\mathrm{W}$ | Typical value |
| Relay Load Capacity | 250 VAC 1 A/30 VDC 1 A | Normally-open contact |
| Heating Start Temperature | $< 15\,^{\circ}\mathrm{C}$ | Default threshold, configurable |
| Heating Temperature Upper Limit | $40\,^{\circ}\mathrm{C}$ | Default, range $0 \sim 70\,^{\circ}\mathrm{C}$ |
| Communication Interface | RS485 | ModBus-RTU protocol |
| Default Baud Rate | $4800\,\mathrm{bit/s}$ | Optional 2400/4800/9600 |
| Data Format | 8 data bits, no parity, 1 stop bit | - |
| Default Device Address | 0x01 | Configurable |
| Supported Function Codes | 0x03, 0x06 | Read/Write holding registers |
| Detection Response Time | $\leqslant 0.5\,\mathrm{s}$ | - |
| Sensitivity Setting Range | $500 \sim 3500$ | Default 800 |
| Alarm Delay Range | $0 \sim 60000\,\mathrm{s}$ | Default 1 s |

# 5 Physical Specifications

| Parameter | Specification |
|---|---|
| Protection Rating | IP68 |
| Mounting Method | Wall-mounted, expansion plug fixation |
| Accessories | Expansion plugs $\phi$6 mm × 4, self-tapping screws 4 pcs |






# 6 Installation

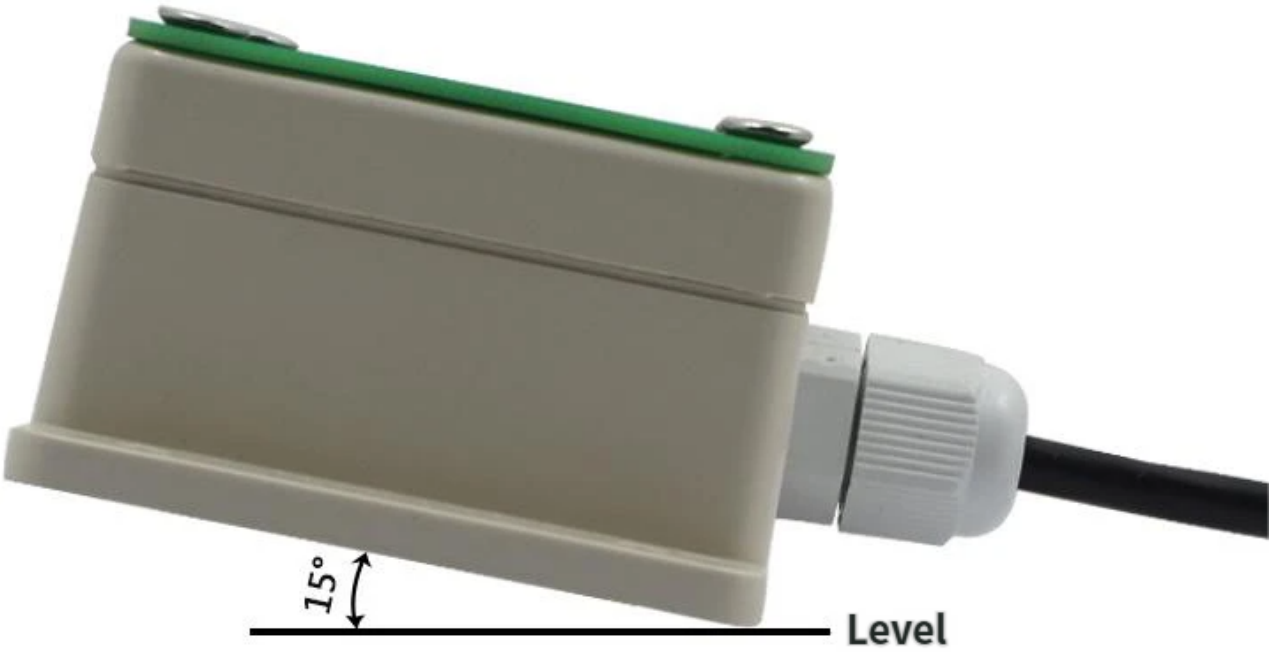
## 6.1 Pre-Installation Inspection

Device Inventory:

- Rain/snow sensor main unit: 1 pc
- Certificate of conformity, warranty card, technical documentation
- Expansion plugs: 4 pcs, self-tapping screws: 4 pcs
- USB to RS485 converter (optional)

## 6.2 Installation Procedure

1. Select installation location, ensuring the sensor sensing surface faces upward; recommended tilt angle refers to installation diagram
2. Secure the sensor to the mounting surface using expansion plugs and self-tapping screws
3. Complete electrical connections according to wiring definitions
4. Check wiring polarity before power-on; power up for commissioning after confirmation




# 7 Wiring Definition

| Wire Color | RS485 Type (-N01) | Switch Type (-R01) |
|---|---|---|
| Brown | Power Positive (10 ~ 30 V DC) | Power Positive (10 ~ 30 V DC) |
| Black | Power Negative (GND) | Power Negative (GND) |
| Yellow | RS485-A | - |
| Blue | RS485-B | - |
| White | - | Relay normally-open contact |
| Green | - | Relay normally-open contact |

**Wiring Precautions**:

- RS485 bus device addresses must not conflict; A/B wire sequence must not be reversed
- Switch type output is passive relay contact; external load power supply required
- When bus length exceeds 100 m, terminal matching with 120 Ω resistor recommended

# 8 Communication Protocol and Data Conversion

## 8.1 Communication Parameters

| Parameter | Setting |
|---|---|
| Coding | 8-bit binary |
| Data Bits | 8 bits |
| Parity | None |
| Stop Bits | 1 bit |
| Error Check | CRC-16 (Cyclic Redundancy Check) |
| Baud Rate | 2400/4800/9600 bit/s, default 4800 |

## 8.2 Data Frame Format

Adopts ModBus-RTU protocol with frame structure as follows:

**Master Query Frame**:

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

**Slave Response Frame**:

| Address Code | Function Code | Valid Byte Count | Data Area | CRC |
|---|---|---|---|---|
| 1 byte | 1 byte | 1 byte | $N \times 2$ bytes | 2 bytes |

## 8.3 Register Address Mapping

| Register Address | PLC Address | Content | Operation | Function Code | Default Value | Range |
|---|---|---|---|---|---|---|
| 0000H | 40001 | Real-time rain/snow status | Read-only | 03 | 0 | 0 or 1 |
| 0030H | 40049 | Heating temperature upper limit | Read/Write | 03/06 | 35 °C | 0 ~ 70 °C |
| 0031H | 40050 | Heating temperature lower limit | Read/Write | 03/06 | 15 °C | −30 ~ 70 °C |
| 0032H | 40051 | Heating temperature hysteresis | Read/Write | 03/06 | 5 °C | 0 ~ 70 °C |
| 0033H | 40052 | Alarm/Reset delay | Read/Write | 03/06 | 1 s | 0 ~ 60000 s |
| 0034H | 40053 | Detection sensitivity | Read/Write | 03/06 | 800 | 500 ~ 3500 |

## 8.4 Data Parsing

**Rain/Snow Status Definition**:

- 0x00: No rain/snow (normal status)
- 0x01: Rain/snow detected (alarm status)

**Sensitivity and Detection Characteristics Relationship**:
The sensitivity setting value and detection sensitivity exhibit an inverse relationship. Let $S$ be the sensitivity setting value; the actual detection threshold is inversely proportional to $S$:

$$\text{Detection Threshold} \propto \frac{1}{S}$$

Where $S \in [500, 3500]$. Default value $S = 800$. Decreasing the value increases detection sensitivity but increases false alarm risk; increasing the value decreases detection sensitivity.

**Alarm Delay Logic**:
Let $T_{\text{delay}}$ be the alarm delay setting value (unit: s); state switching must satisfy:

$$\Delta t \geqslant T_{\text{delay}}$$

Where $\Delta t$ is the continuous rain/snow detection time. The device confirms state change and outputs alarm signal only when continuous detection time exceeds the set threshold.

### 8.5 Communication Examples

**Read Rain/Snow Status (Address** 0x01**)**:

- Query Frame: `01 03 00 00 00 01 84 0A`
- Response Frame (no rain/snow): `01 03 02 00 00 B8 44`
- Response Frame (rain/snow present): `01 03 02 00 01 79 84`

**Set Alarm Delay to** 10 s **(Address** 0x33**)**:

- Write Value: 0x000$A$ (i.e., 10)
- Query Frame: `01 06 00 33 00 0A F9 C2`
- Response Frame: `01 06 00 33 00 0A F9 C2`

## 9 Precautions

1. **Safety Limitations**: This device is strictly prohibited for use as safety protection equipment, emergency stop devices, or any interlock protection system that may cause personal injury. Equipment failure may cause status misreporting and is not suitable for control loops involving personnel safety.
2. **Electrical Safety**: Ensure power is disconnected before wiring; supply voltage must not exceed 30 V DC. RS485 bus must ensure correct A/B polarity to avoid communication failures caused by reverse connection.
3. **Environmental Limitations**: Although the device has IP68 protection rating, prolonged submersion beyond the certified liquid depth should still be avoided. The heating function may not completely prevent icing under extreme low-temperature conditions; actual environmental assessment is required.
4. **Installation Position**: The sensor should be installed horizontally or at the recommended tilt angle to ensure the sensing surface can effectively contact precipitation. Avoid installation near strong electromagnetic interference sources or in obstructed locations.
5. **Maintenance**: Regularly check the cleanliness of the sensing plate surface; remove dust or contaminants to maintain detection sensitivity. Functional testing is recommended after extended periods of non-use.
6. **Address Configuration**: When multiple devices communicate on the bus, ensure each device has a unique address. The factory default address for all devices is 0x01; modify via configuration software to avoid conflicts.

## 10 After-Sales Guarantee & Support

**Warranty Period**: Within 24 months from the date of purchase (with valid purchase certificate), free repair and parts replacement services are provided for failures caused by material or workmanship defects under normal use and maintenance conditions.

**Lifetime Maintenance**: After the warranty period expires, lifetime paid maintenance services are provided, charging only for material costs and labor fees.

**Non-Warranty Scope**:

- Equipment damage caused by incorrect installation, improper use, or operational errors
- Failures caused by unauthorized technicians disassembling, modifying, or replacing internal components
- Damage caused by liquid ingress, foreign object entry, or negligent maintenance
- Damage caused by force majeure factors such as natural disasters or accidents
- Failures caused by use beyond the operating parameters specified in the technical specifications

**Technical Support**: Product technical consultation, configuration software usage guidance, and fault diagnosis support are provided.

# 11 Manufacturer Information

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# 12 Revision History

| Version | Date | Description |
|---|---|---|
| V1.0 | - | Initial release |