OHTS1099 Weighing Rain Gauge

1 Product Overview

The OHTS1099 is a universal precipitation measurement sensor based on the strain gauge weighing principle, capable of monitoring solid, liquid, and mixed-phase precipitation. The device employs a high-precision load cell with a real-time precipitation intensity measurement range of $6 \sim 1800\,\mathrm{mm/h}$ and a resolution of $0.1\,\mathrm{mm}$. The product features an automatic temperature-controlled heating module that activates when ambient temperature falls below $1^{\circ}\mathrm{C}$ and deactivates when exceeding $9^{\circ}\mathrm{C}$, preventing the catchment orifice from freezing. The device supports dual output interfaces via RS485 (Modbus-RTU protocol) and pulse signals, with an automatic drainage function triggered when water volume reaches 80% of the measurement range. The enclosure adopts a "convex" windproof structural design, effectively reducing evaporation loss and improving catch efficiency. The product complies with the technical requirements of SL21-2015 *Specifications for Precipitation Observation* and is suitable for low-power solar-powered applications.

2 Applications

- Precipitation observation at hydrological monitoring stations
- Rainfall data acquisition at meteorological stations
- Marine environment precipitation monitoring
- Disaster early warning for emergency management departments
- Road waterlogging monitoring for transportation systems
- Water volume assessment for agricultural and forestry irrigation
- Micro-meteorological monitoring for power systems
- Precipitation research for national defense and scientific studies

3 Features

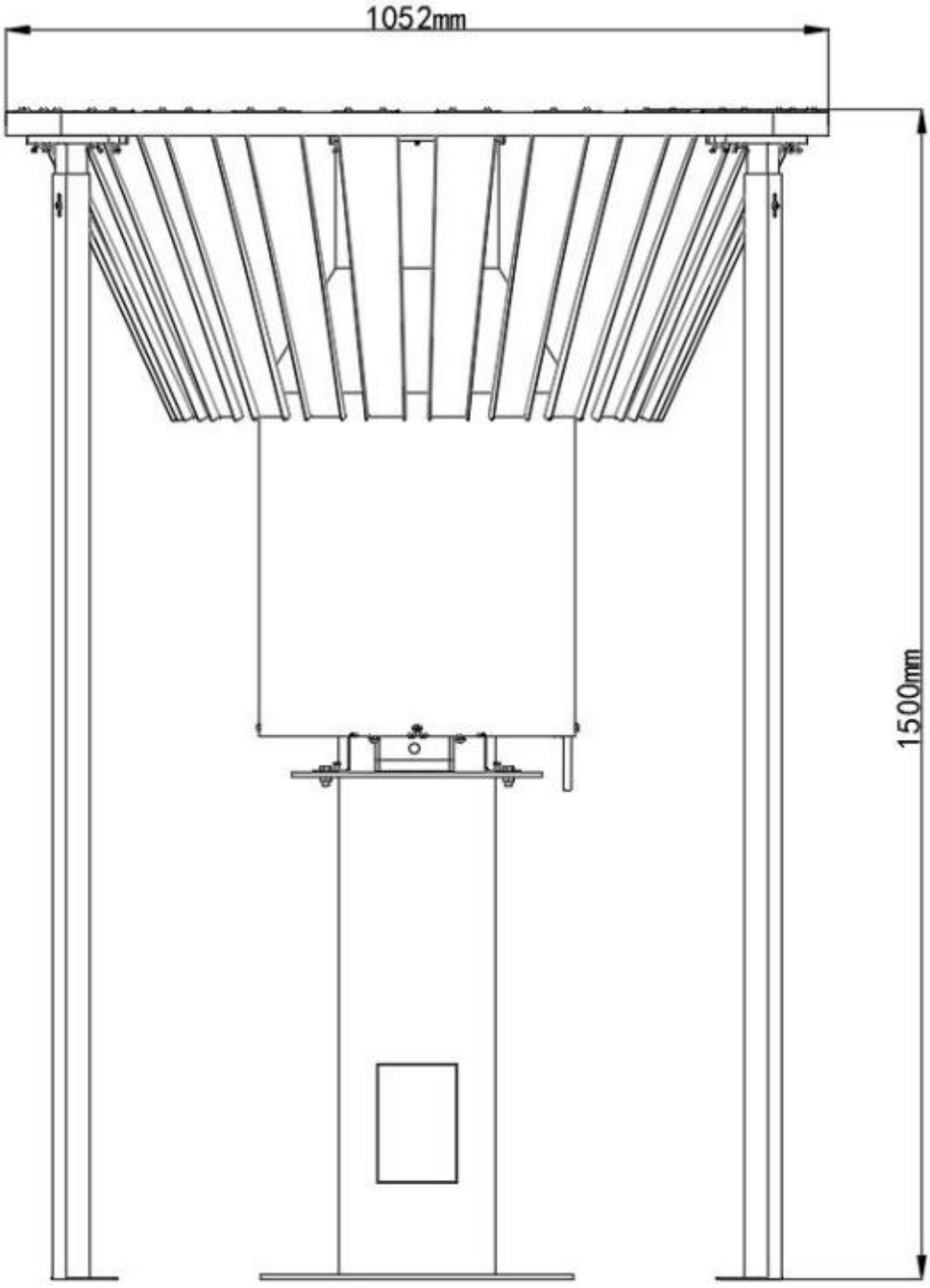
- Wide dynamic range precipitation intensity measurement, supporting rainfall rates of $6 \sim 1800\,\mathrm{mm/h}$
- Universal precipitation monitoring, compatible with solid, liquid, and mixed-phase precipitation
- Automatic temperature-controlled heating system to prevent winter freezing and snow blockage
- Intelligent automatic drainage mechanism triggered at 80% range threshold
- High-precision measurement with low error characteristics (±0.2mm@≤10mm, ±2%@>10mm)
- Windproof and evaporation-suppressing "convex" enclosure structure
- Dual-mode signal output: RS485 digital interface and pulse output
- Low-power design supporting off-grid solar power supply

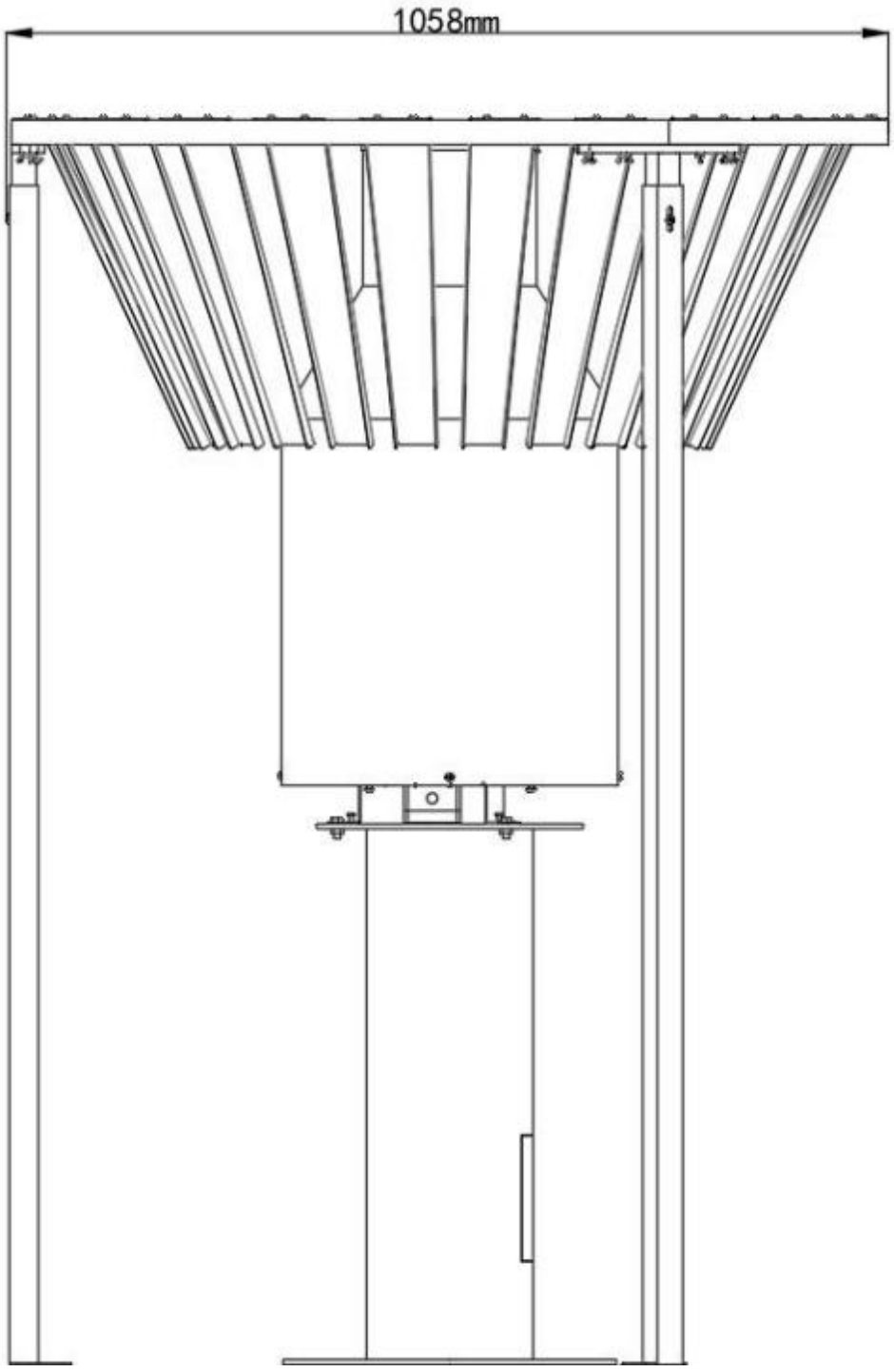
4 Technical Specifications

Parameter	Specification
Supply Voltage	$12\,\mathrm{V\,DC}$
Quiescent Power	$0.15\,\mathrm{W}$ (DC12 V)
Heating Power	$30\,\mathrm{W}$ (Optional, DC12 V)
Measurement Range	$0 \sim 1000\,\mathrm{mm}$
Resolution	$0.1\,\mathrm{mm}$
Catchment Diameter	$\phi 200_{0}^{+0.6}\,\mathrm{mm}$
Measurement Error	$\pm 0.2\,\mathrm{mm}$ (when $\leq 10\,\mathrm{mm}$); $\pm 2\%$ (when $> 10\,\mathrm{mm}$)
Operating Temperature	$-35^{\circ}\mathrm{C} \sim +65^{\circ}\mathrm{C}$
Operating Humidity	$0\%\mathrm{RH} \sim 95\%\mathrm{RH}$ (Non-condensing)
Precipitation Intensity Range	$6 \sim 1800\,\mathrm{mm/h}$
Output Interface	RS485 (Modbus-RTU), Pulse
Pulse Equivalent	$0.1\,\mathrm{mm/pulse}$
Heating Start Temperature	$< 1^{\circ}\mathrm{C}$
Heating Stop Temperature	$> 9^{\circ}\mathrm{C}$
Auto-Drain Threshold	80% of range
Communication Baud Rate	$1200/2400/4800/9600/19200/38400/57600/115200\,\mathrm{bit/s}$, default $4800\,\mathrm{bit/s}$

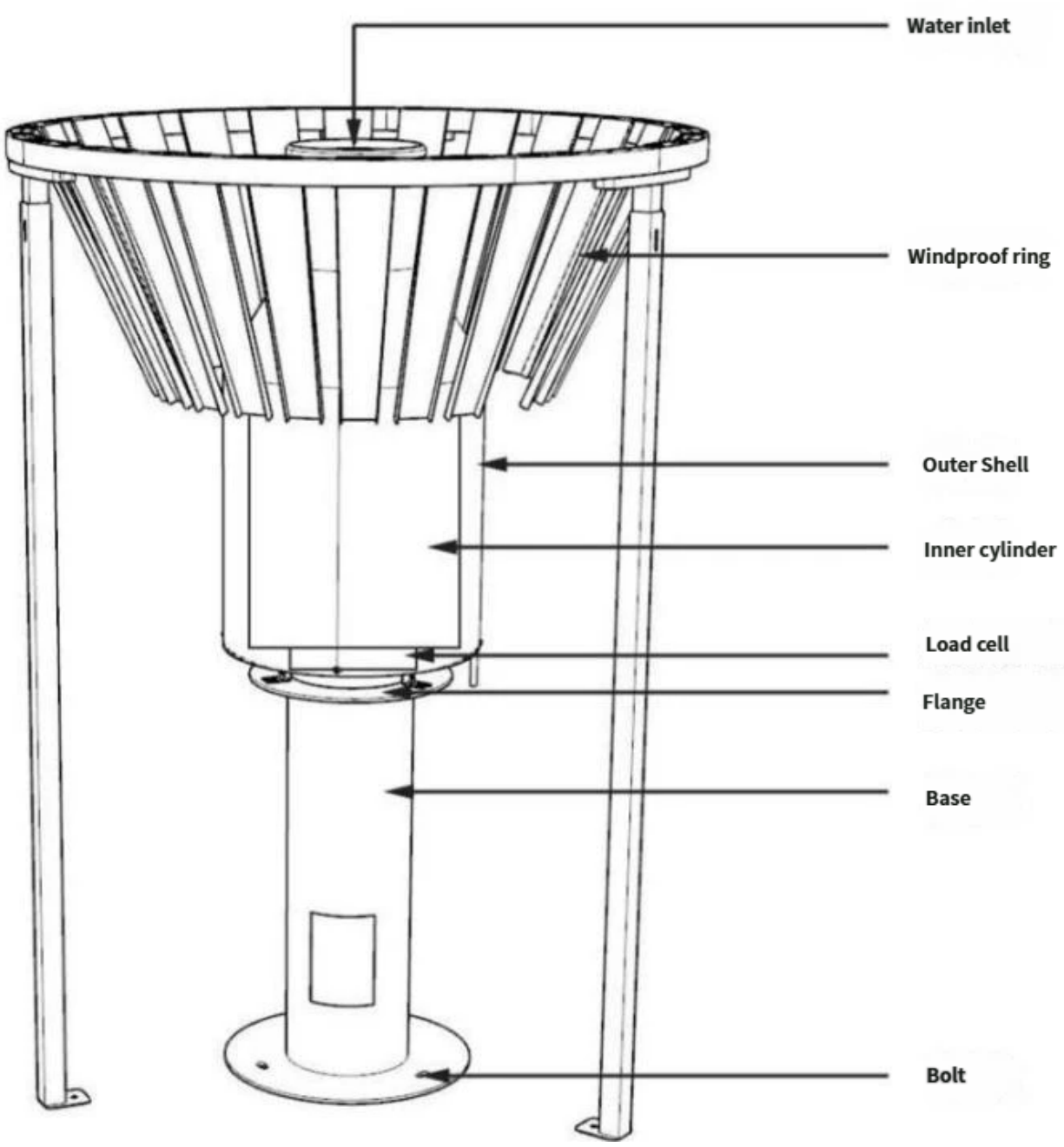
5 Physical Specifications

Parameter	Specification
Foundation Dimensions	$150\,\mathrm{cm} \times 150\,\mathrm{cm} \times 50\,\mathrm{cm}$ (L×W×D)
Foundation Mounting Holes	$\phi 18\,\mathrm{mm}$, depth $12 \sim 15\,\mathrm{cm}$
Wind Shield Height Adjustment	Fixing ring upper surface $2\,\mathrm{cm}$ above the upper edge of the catchment orifice


1052mm
1500mm

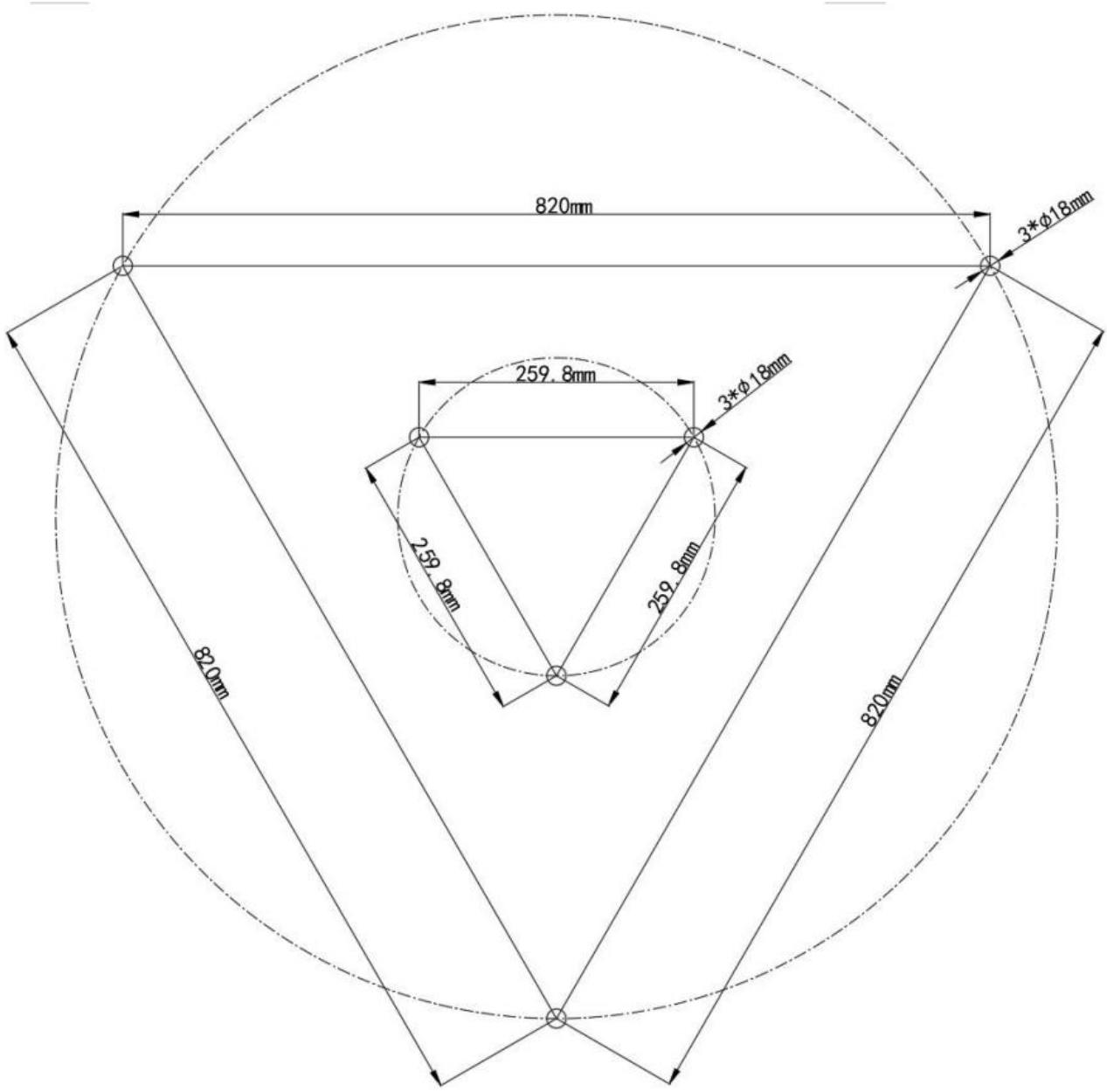


6 Installation



6.1 Foundation Construction

Concrete foundation specifications: 150 cm (Length) ×150 cm (Width) ×50 cm (Depth), flush with ground level. Drill 6 mounting holes of ϕ18 mm with depth 12 ~ 15 cm in the concrete foundation according to the diagram dimensions (two concentric circles), and place expansion bolts in the mounting holes.

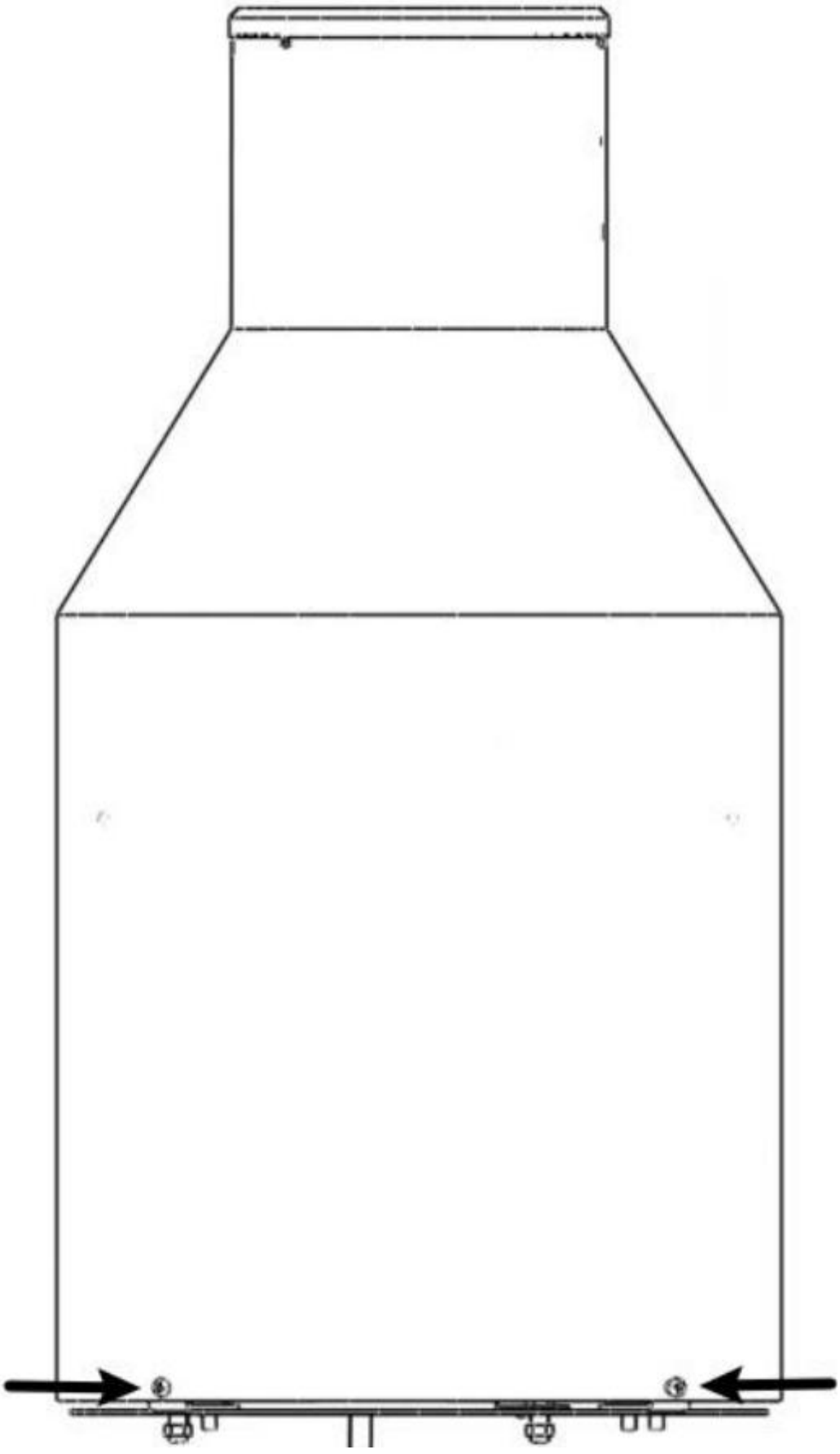


6.2 Base Installation

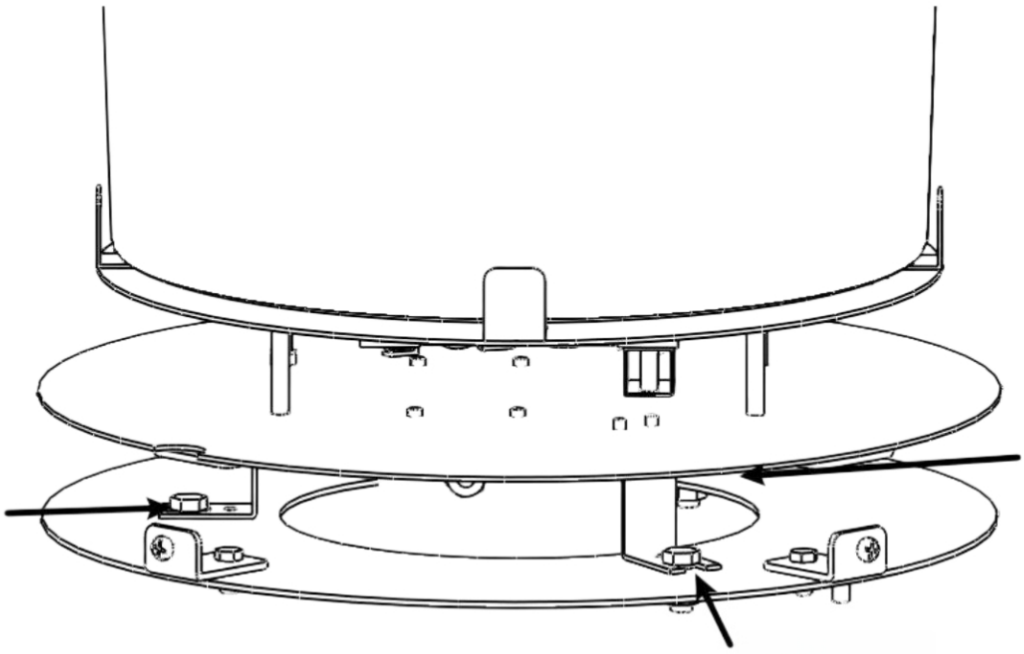
Route the DC power cable and signal cables through the conduit in the concrete foundation. Secure the base to the concrete foundation using bolts and nuts, ensuring the base remains level during installation.

6.3 Main Unit Installation

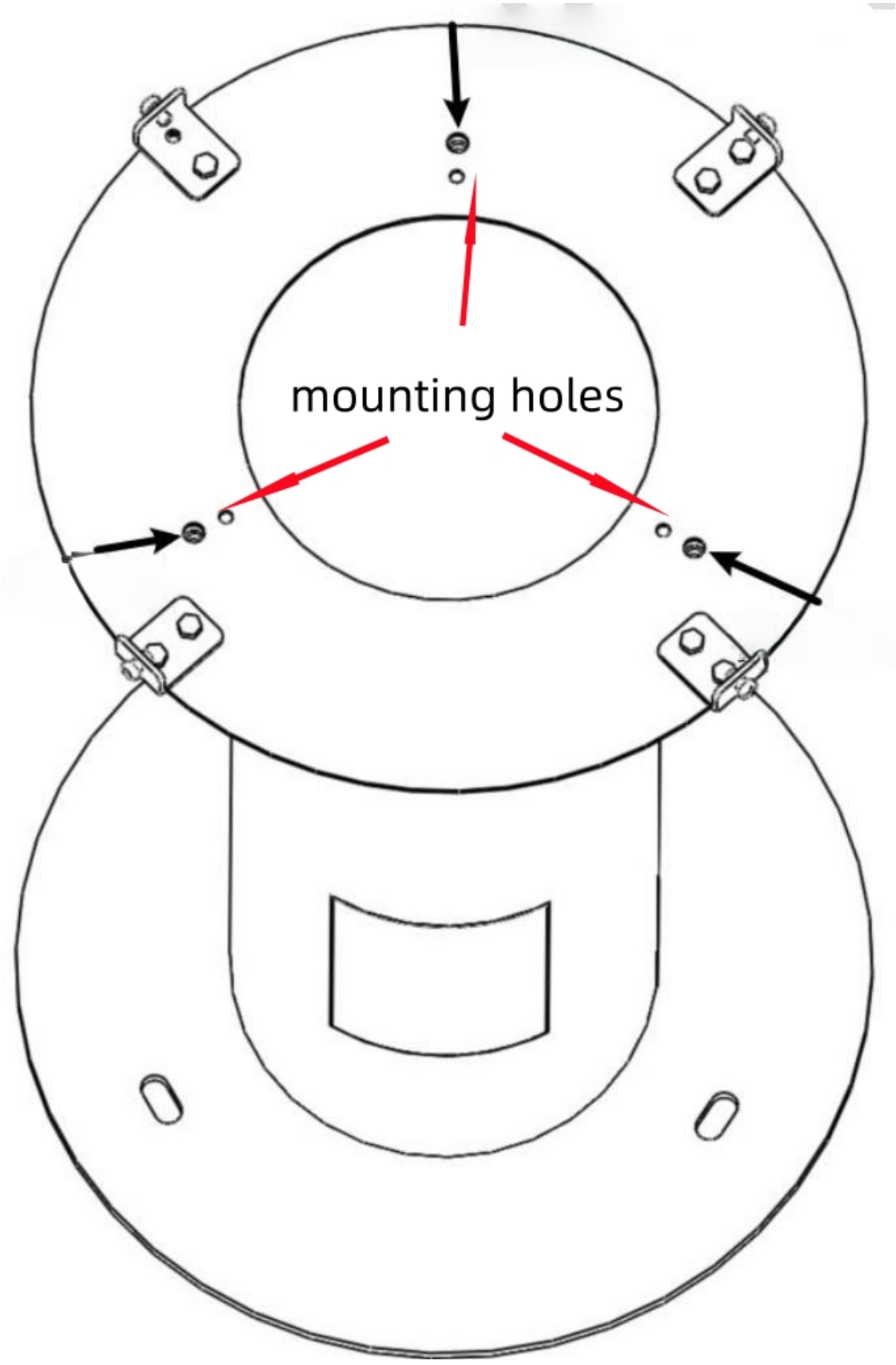
1. Remove the four screws on the enclosure, detach the enclosure, and store it safely.

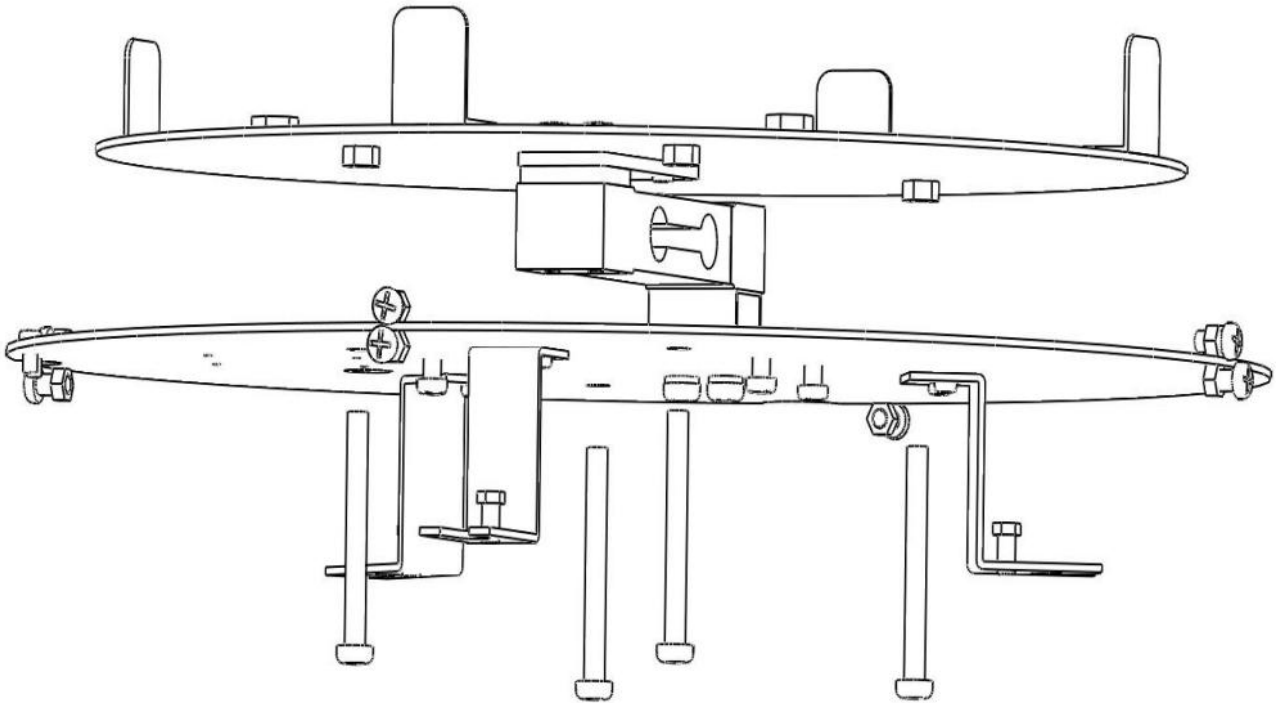


2. Remove the M8 × 20 screws from the base plate and fixing plates.

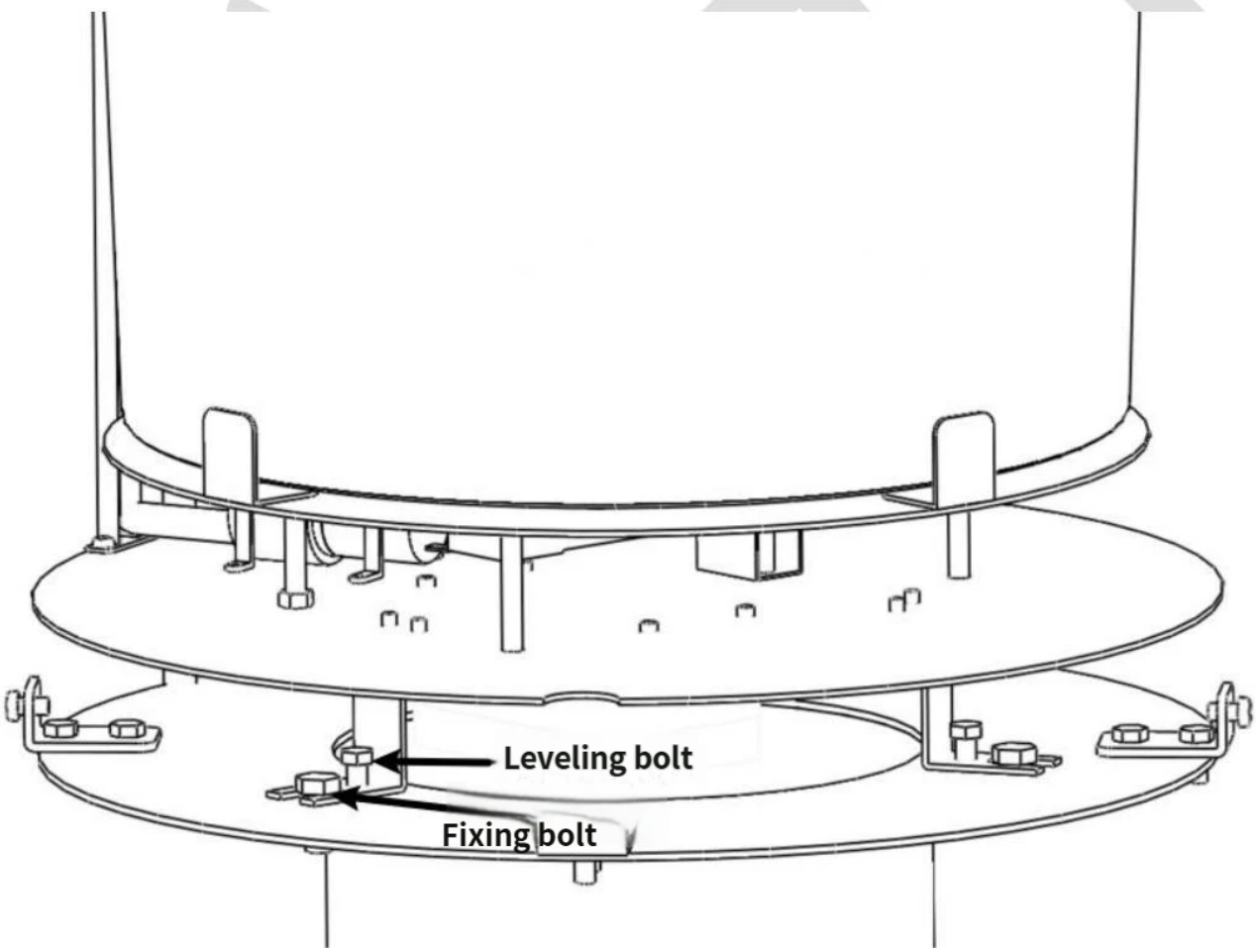


3. Place the fixing plates onto the foundation base, aligning the mounting holes. Remove the shipping locks (four external hexagon countersunk screws $\mathrm{M6} \times 60$).


mounting holes



4. Screw the three leveling bolts (M5 × 10) into the base plate, place the entire base plate assembly onto the foundation base, and secure with three sets of fixing bolts (M8 × 20) and nuts (M8) (do not tighten fully yet). Adjust the three leveling bolts until level, then tighten the fixing bolts. Connect the heating device connector to the main control unit.



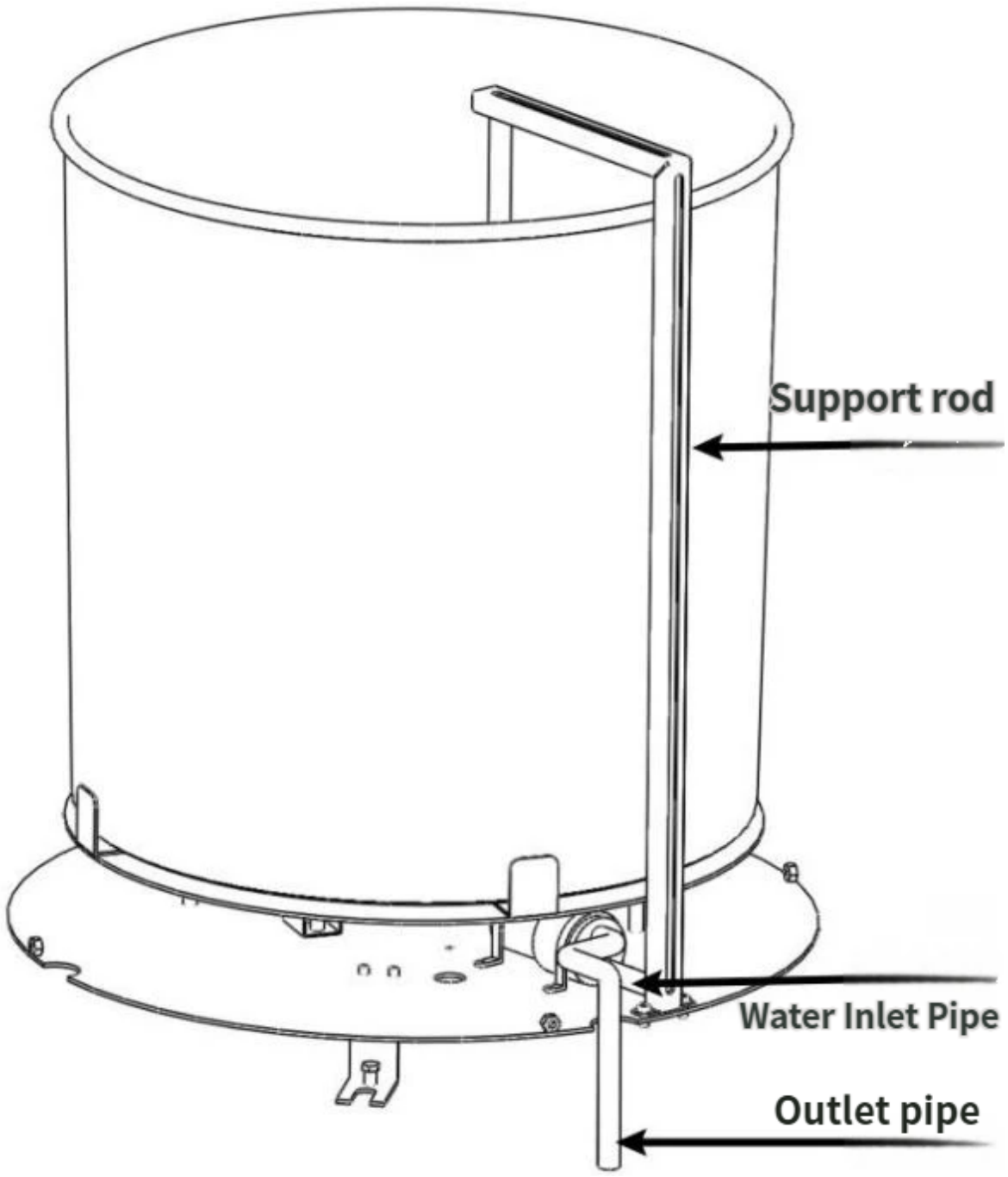
6.4 Pre-filling Liquid

Before use, add approximately 1 L of water to the collection bucket and place it securely on the weighing tray. If evaporation is severe, add eco-friendly evaporation suppressant oil to completely cover the liquid surface. When temperature is below 0°C, use antifreeze (ethylene glycol or methanol mixture) to ensure the liquid does not freeze below −35°C.

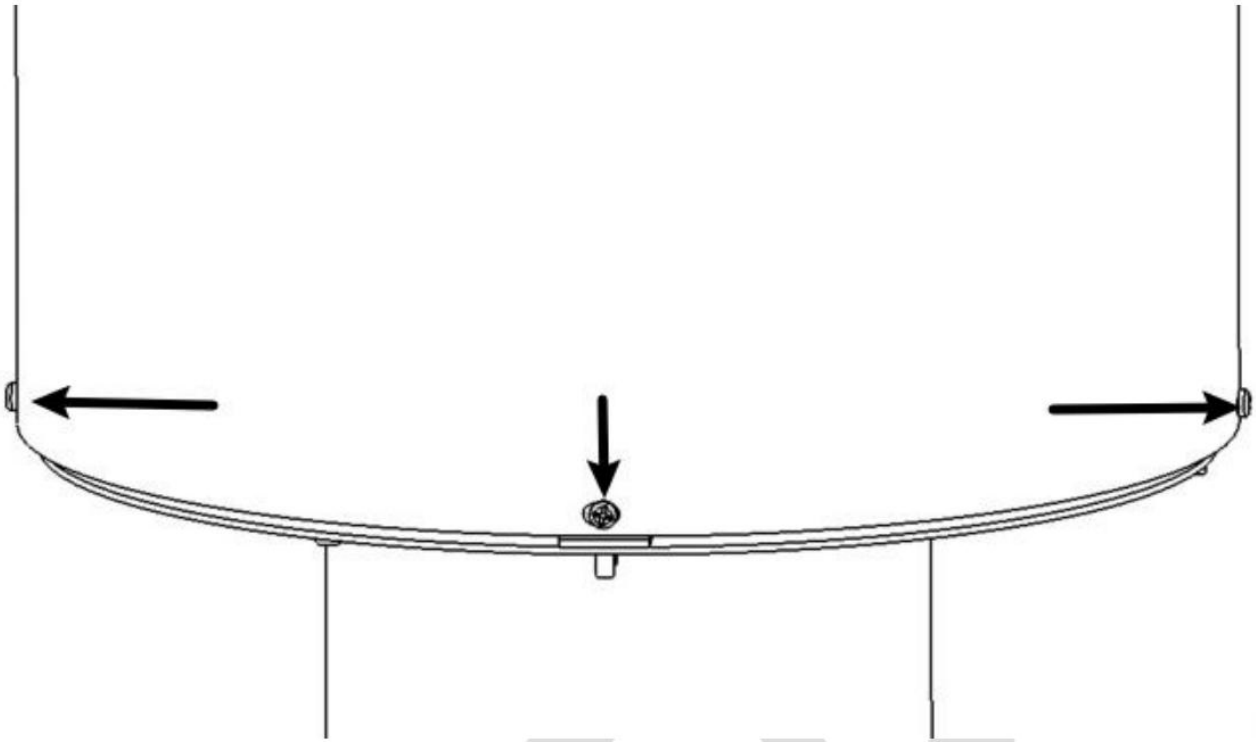
Antifreeze Mixing Ratio Table (Based on 1000 mm precipitation volume):

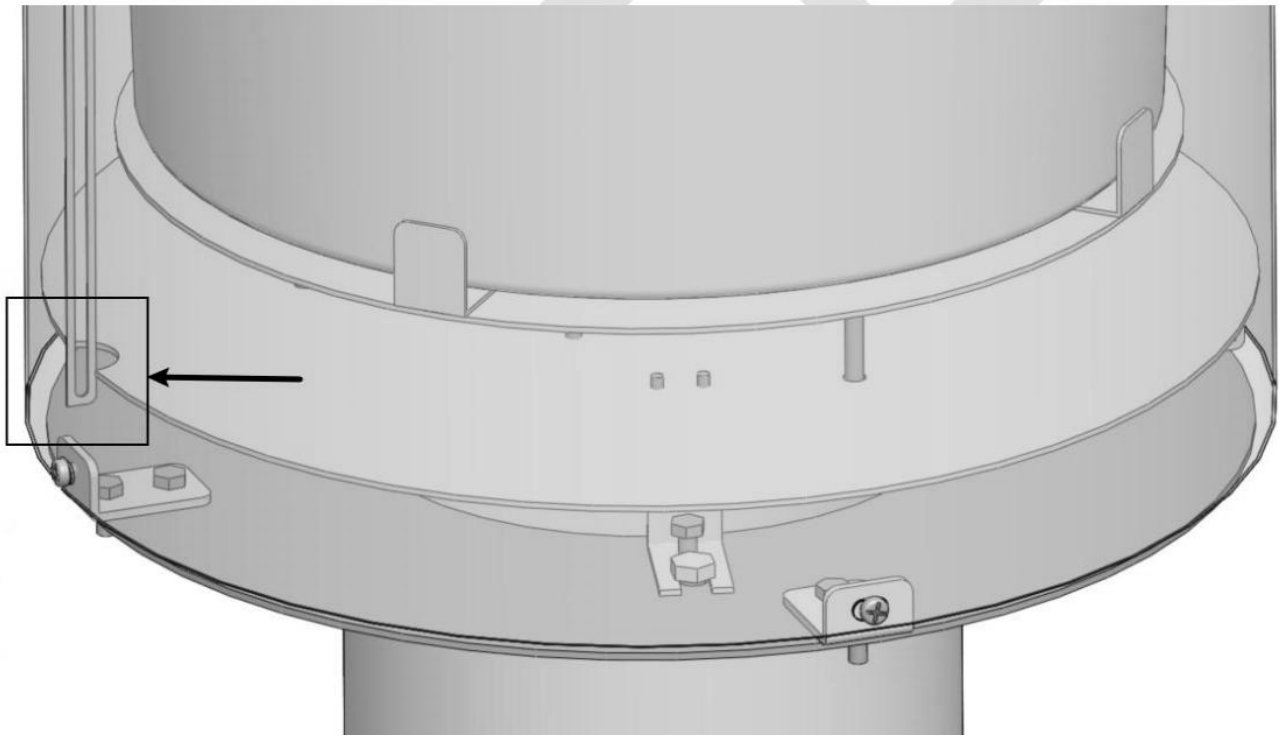
Historical Average Minimum Temperature	Ethylene Glycol Addition (L)	Methanol Addition (L)
0°C (or above)	0	0
−5°C	1.75	2.25
−10°C	2.75	4.25
−15°C	4	5.5
−20°C	4.5	6.75
−25°C	5.25	7.75
−30°C	6	8.75
−35°C (or below)	6.5	9.5

After adding the liquid, install the automatic drainage support rod to the base using two screws (M4 × 6), and insert the water guide tube into the pump inlet at the base.



After installation, reinstall the outer enclosure onto the base, ensuring the internal cable channel aligns with the groove in the base.



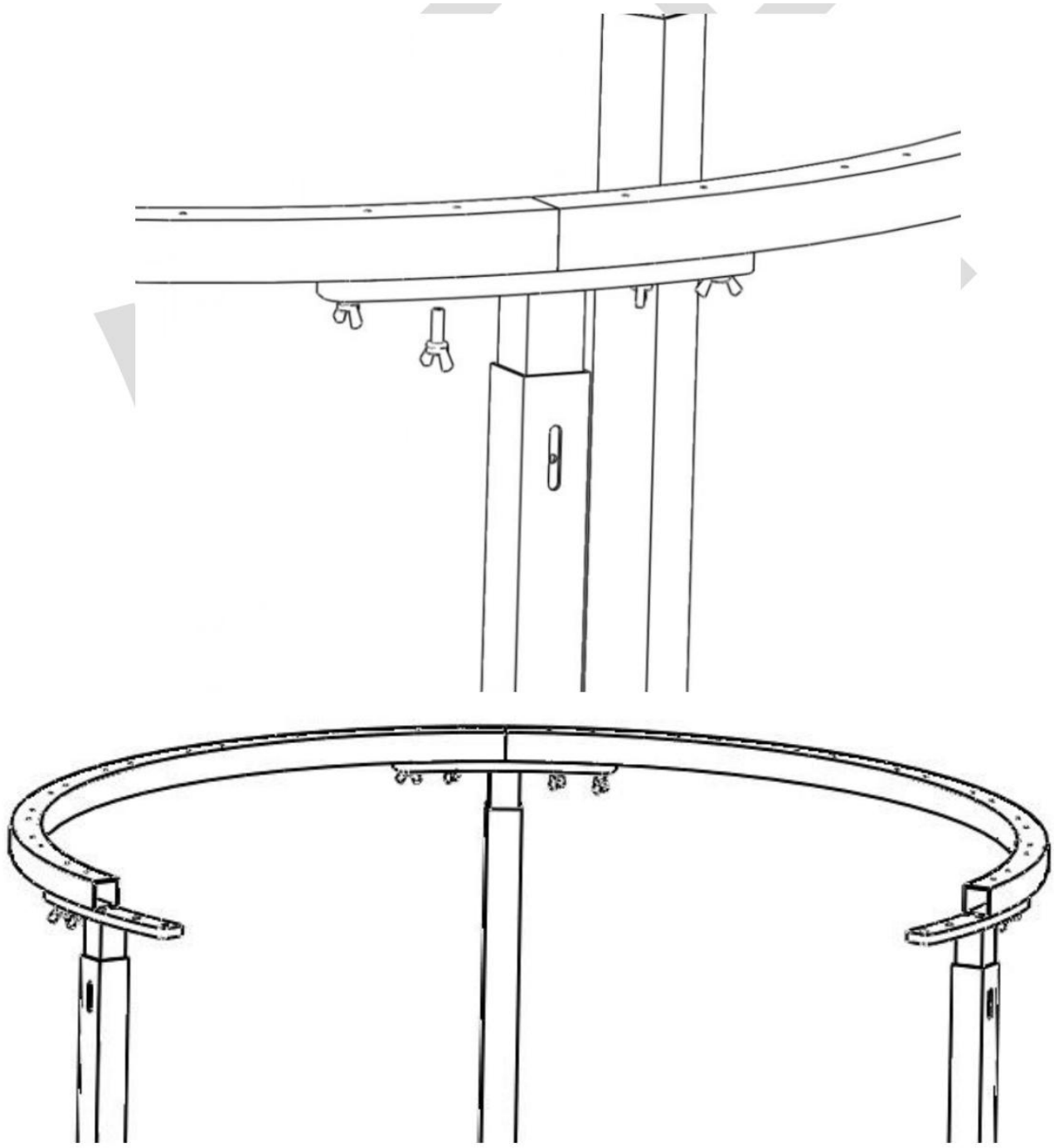


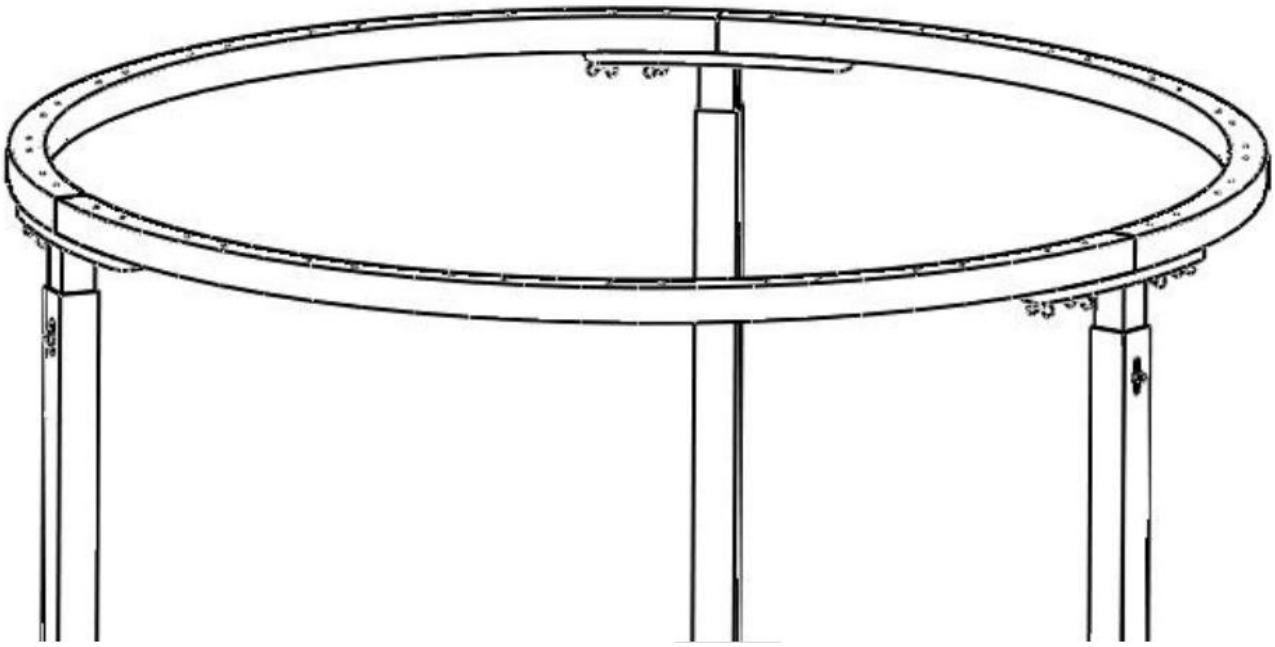
6.5 Wind Shield Installation

6.5.1 Installing the Wind Shield Fixing Ring

Secure the 3 "T"-shaped support brackets to the upper parts of the three vertical rods using screws (M5 × 10) with spring washers. The inner arc of the T-shaped brackets should face the same direction as the grooves in the support plates.

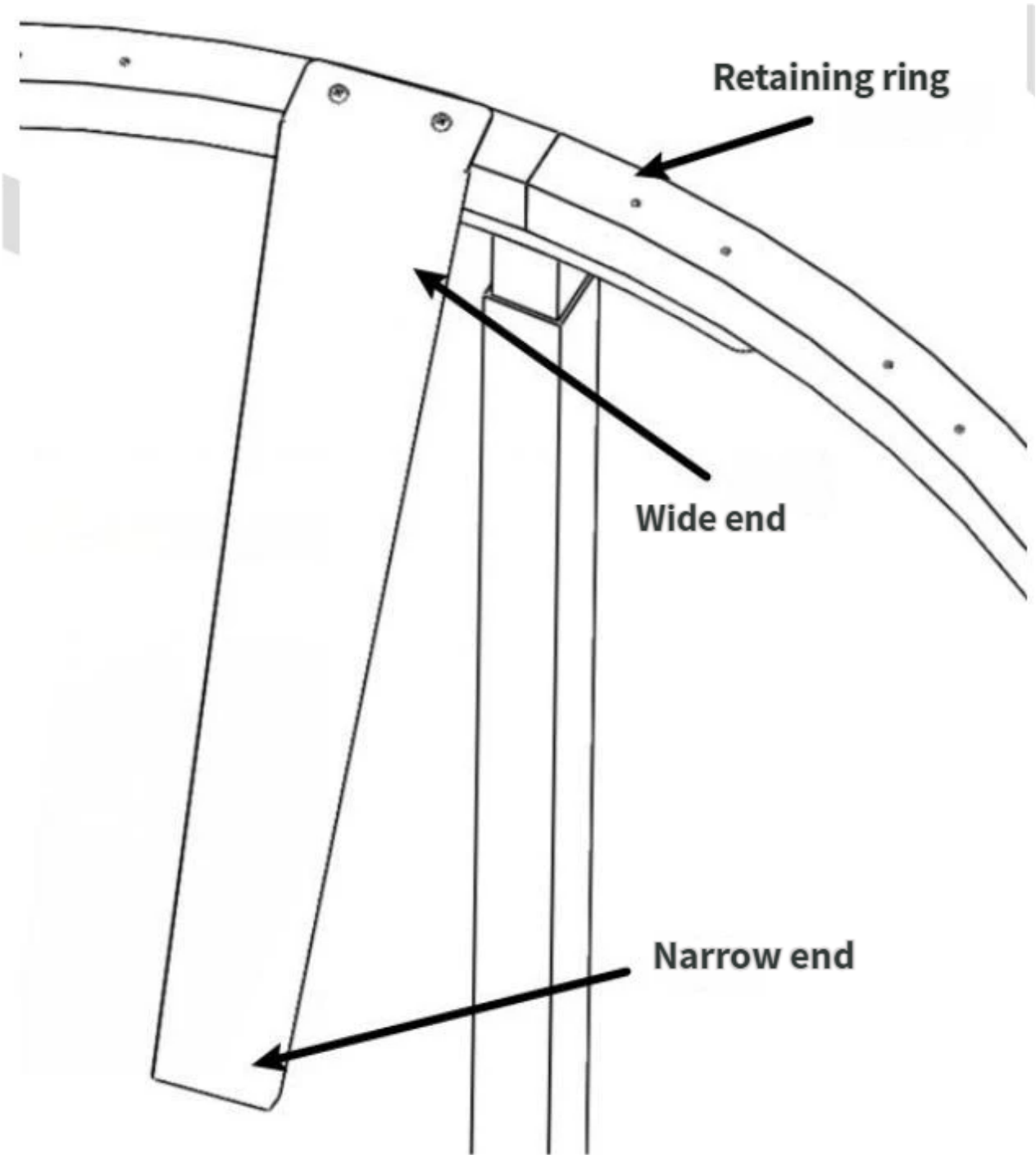
Install the 3 sections of wind shield fixing rings onto the three wind shield brackets using thumb screws (M5 × 16).





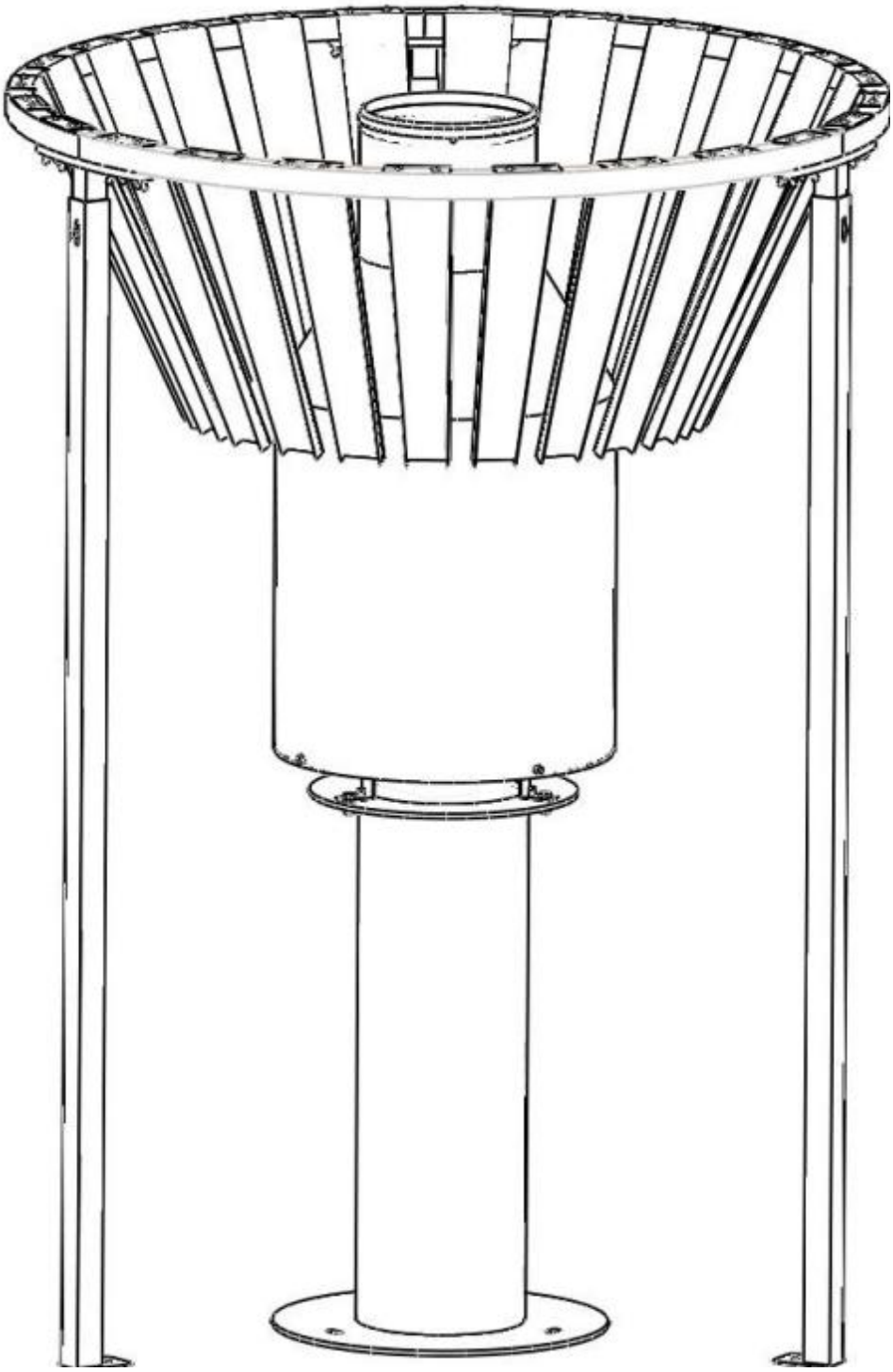
6.5.2 Installing Wind Shield Blades

Install the wind shield blades onto the wind shield fixing rings using screws (M4 × 12). Adjust the blade height and angle so the upper edge aligns with the upper edge of the fixing ring.



6.5.3 Completion

Mount the wind shield onto the pre-installed fixing screws on the foundation. Adjust the height through the slotted holes in the vertical rods so that the upper surface of the fixing ring is 2 cm above the upper edge of the sensor's catchment orifice.



7 Wiring Definition

7.1 RS485 Type

Wire Color	Definition	Wire Color	Definition
Brown	Power Positive (V+)	Yellow	RS485-A
Black	Power Negative (V−)	Blue	RS485-B

7.2 Pulse Type

Wire Color	Definition	Wire Color	Definition
Brown	Power Positive (V+)	Yellow	Pulse Output NO Terminal
Black	Power Negative (V−)	Blue	Pulse Output COM Terminal

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	Configurable: 1200/2400/4800/9600/19200/38400/57600/115200 bit/s, default 4800 bit/s

8.2 Data Frame Format

Using Modbus-RTU communication protocol:

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	Byte Count	Data Area 1	Data Area 2	Data Area N	CRC Checksum
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

8.3 Register Address Definition

Register Address	Content	Operation Code	Data Description
0000 H	Today's Precipitation	03/04	Unit: mm, value scaled by 10×
0001 H	Minute Precipitation	03/04	Unit: mm, value scaled by 10×
0002 H	Yesterday's Precipitation	03/04	Previous 24-hour cumulative, unit: mm, value scaled by 10×
0003 H	Total Precipitation (High Word)	03/04	Unit: mm, value scaled by 10×
0004 H	Total Precipitation (Low Word)	03/04	Unit: mm, value scaled by 10×
0005 H	Precipitation Intensity	03/04	Unit: mm/min, value scaled by 10×
0009 H	Version Number	03/04	Device firmware version
0020 H	Sampling Interval	03/04	Range: $1 \sim 60$ min, default 1 min
0034 H	Year-Month	03/04/06/10	High: Year (00-99), Low: Month (1-12), BCD code
0035 H	Day-Hour	03/04/06/10	High: Day (01-31), Low: Hour (00-24), BCD code
0036 H	Minute-Second	03/04/06/10	High: Minute (00-59), Low: Second (00-59), BCD code
0037 H	Precipitation Reset	06/10	Write 0003 H to execute reset
07D0 H	Device Address	03/04/06/10	Range: $1 \sim 254$, default 1
07D1 H	Device Baud Rate	03/04/06/10	$0:2400; 1:4800; 2:9600; 3:19200; 4:38400; 5:57600; 6:115200; 7:1200$

8.4 Data Conversion Formulas

Precipitation Conversion:

$$\text{Actual Precipitation}(\text{mm}) = \frac{\text{Register Integer Value}}{10}$$

Precipitation Intensity Conversion:

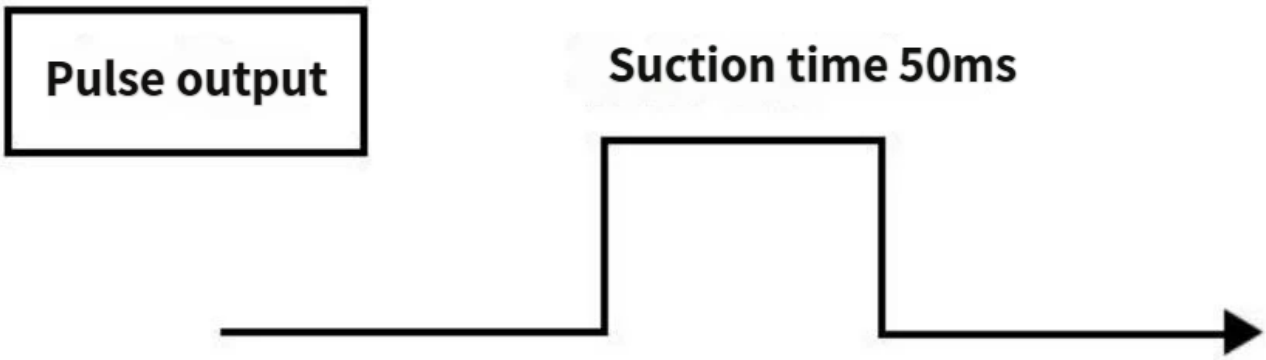
$$\text{Actual Precipitation Intensity}(\text{mm/min}) = \frac{\text{Register Integer Value}}{10}$$

Time Decoding (BCD Code):

$$\text{Year} = \text{High Byte Value}; \quad \text{Month} = \text{Low Byte Value}$$

8.5 Pulse Output Characteristics

Outputs one valid pulse for every cumulative 0.1 mm of precipitation, non-real-time output with 1 min delay.



9 Precautions

- This device is strictly prohibited from use as a safety device or emergency stop device, nor for any other application where equipment failure could result in personal injury
- Technical manuals must be consulted prior to installation, operation, or maintenance; failure to follow these instructions may result in death or serious injury
- The device is intended for authorized use only as specified
- The inner wall of the catchment orifice should be wiped regularly with a soft cloth to maintain cleanliness; remove leaves and foreign objects promptly to ensure unobstructed water flow
- When not in use for extended periods, install a protective cover over the catchment orifice
- Under long-term operating conditions, monthly cleaning is recommended; cleaning must be performed at least every three months
- When antifreeze or evaporation suppressant oil in the inner bucket is low, add appropriate amounts
- Lightning protection safety inspections should be conducted annually in spring
- Methanol is a flammable and toxic chemical; ethylene glycol is a chemical substance; both must be used and stored strictly according to safety regulations
- When operating below 0°C, if antifreeze is not used, ensure precipitation does not exceed 80% of the bucket volume, otherwise irreversible damage to the measurement system may occur

10 After-Sales Guarantee & Support

Warranty Period: 12 months from date of purchase (based on valid proof of purchase)

Warranty Coverage: During the warranty period, if the equipment exhibits defects in materials or workmanship under normal use and maintenance, free repair and replacement of parts will be provided upon verification.

Lifetime Maintenance: Paid repair services are available for the lifetime of the product beyond the warranty period.

Exclusions from Warranty:

- Damage caused by incorrect installation, use, or operation
- Disassembly, repair, modification, alteration, or replacement of parts by unauthorized technicians
- Damage caused by negligent use or ingress of water or other substances
- Failures or damage caused by accidents or natural disasters
- Failures resulting from operation outside the parameters listed in the product specifications

11 Manufacturer Information

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Email: support@orangehorsetech.com

12 Revision History

Version	Revision Date	Revision Content	Revised By
V1.0	-	Initial release	-