

Radar Water Level Gauge

Product specification



RD-306

Acknowledgement

First of all, I would like to express my heartfelt thanks to you for choosing our products!

RD-306 is a non-contact integrated radar water level gauge/open channel flowmeter designed by our company with high precision, low power consumption and high integration. This product integrates power supply battery, high-precision radar level gauge, RTU data transmission unit, Bluetooth parameter adjustment, temperature measurement and other functional units, and can be used for liquid level and flow measurement in various industries. Its discharge measurement principle is based on the water level-discharge relationship of standard weir channel or calibration curve, By accurately measuring the liquid level, the instantaneous flow rate and cumulative flow rate of the output section are converted. The liquid level measurement adopts high-precision pulse coherent radar (PCR) technology, which has higher measurement accuracy, lower power consumption and ultra-small volume compared with the traditional pulse radar liquid level gauge. At the same time, because 60G submillimeter radar wave is used as carrier signal, it has the characteristics of non-contact, high precision, small volume and energy saving, which makes it free from corrosion, temperature gradient, air pressure, water vapor on water surface, bubbles in water and sediment during measurement. The optimized algorithm makes the measurement result more accurate.

In particular, we recommend that you read this manual before using the RD-306 Integrated Radar Water Level Gauge/Open Channel Flowmeter, so that you will have a better understanding of how to use this advanced measuring instrument. This manual details the use, maintenance and precautions of RD-306 integrated radar water level gauge/open channel flowmeter.

Instructions for use

❖ **Matters needing attention and restrictions on use**

Note: Please use our products correctly (according to the text shown) and fully observe the following precautions, so as not to cause harm to the instrument and human body.

Legend:

⚠ Note: Attention/Warning

Matters needing attention in the process of transportation, use and maintenance must be carefully read.

Matters needing attention are as follows:

❖ **Operating environment and matters needing attention in electricity consumption**

⚠ Warning: Do not use this instrument in places where flammable and explosive gases are or may be present.

⚠ Caution: Do not touch the water surface or put the instrument into the water.

⚠ Caution: Do not place the instrument at extreme temperatures and avoid static electricity.

❖ **Instrument operation**

⚠ Caution: No matter in the use, storage or transport of the instrument, should be taken and placed carefully, do not fall damage.

⚠ Note: The installation and setting of this integrated radar water level gauge/open channel flowmeter can only be installed and operated by professional technicians.

⚠ NOTE: Please do not disassemble or alter the integrated radar water level gauge/open channel flowmeter, otherwise there will be no warranty.

⚠ Note: If the instrument breaks down, please hand it over to our company for after-sales maintenance, please do not disassemble and assemble without permission!

❖ **Instrument components**

⚠ Warning: This instrument is not equipped with internal spare parts, and it is not allowed to disassemble the instrument parts without authorization.

❖ **Hazardous substance management**

⚠ To discard RD-306, please comply with the Hazardous Substances Management Regulations and treat it as waste electronic/electrical products.

⚠ Warning: Do not throw used instruments into classified waste or municipal garbage.

❖ **Use restriction regulations**

The design of RD-306 meets the requirements of routine and safety.

❖ **Declaration**

The design of RD-306 meets and complies with the requirements of low voltage index.

1 product introduction

1.1 Product Profile

RD-306 integrated radar water level gauge/open channel flowmeter is independently developed by our company. It adopts FMCW technology and takes 60G mm radar wave as carrier signal. The product has high measurement accuracy, low power consumption, small size and light weight; The measurement process is not affected by environmental factors such as temperature, air pressure, sediment, dust, river pollutants, floating objects on the water surface, air, etc., and has good wind-proof and anti-shake ability; The optimized algorithm makes the measurement results more accurate and stable.

RD-306 has built-in integrated RTU acquisition and uploading function and built-in Bluetooth function, which can set device parameters and view device measurement results through mobile APP.

1.2 Instrument characteristics

1. Product specification: $\varnothing 154 \times 171.4$ (mm), weight 1.3 kg, which can be used for basic building facilities such as bridges or auxiliary facilities such as cantilever construction;
2. Sampling non-contact mode, the sensor does not contact with the measured fluid and does not interfere with the fluid flow pattern;
3. Millimeter-level high-precision measurement of liquid level and ultra-low blind area;
4. The measuring range is 0.2-3m/0.2-7m;
5. Built-in battery, ultra-low power sleep mode, 3 ~ 7 years working hours;
6. Remote parameter adjustment, configuration and upgrade can be debugged and maintained remotely without going to the site;
7. Bluetooth connection, on-site adjustable maintenance through mobile APP;
8. Small size, compact structure, compact and simple installation;
9. IP68 fully waterproof design, immersed in water will not be damaged;
10. Non-contact measurement, not affected by ambient temperature and humidity, and not corroded by water;
11. Multiple working modes: cycle, sleep, automatic;
12. The test data can be stored in excel type and can be downloaded by APP.

1.3 Basic measurement principles

RD-306 integrated radar water level gauge/open channel flowmeter adopts FMCW modulation mode and takes triangular wave as modulation signal. The working process is as follows: Firstly, a voltage modulation circuit generates a triangular wave voltage and inputs it to a VCO (Voltage Controlled Oscillator) to generate electromagnetic waves with varying frequencies. The frequency of electromagnetic wave changes according to the law of modulation voltage. The electromagnetic wave emitted by the antenna generates an echo after being reflected by the measured object. Electromagnetic waves are emitted from the beginning to the target. The radar transmission frequency has changed during the time period when it is reflected by

the target and then returned to the antenna. The radar antenna couples the echo signal with the transmitted signal to obtain a difference frequency signal. The distance and velocity information of the target are contained in the frequency of the difference frequency signal. Because the difference frequency signal is very weak, it needs to be processed by the preamplifier and filter circuit of radar sensor to send the signal to ADC (analog-to-digital converter) of MCU. MCU analyzes the waveform collected by ADC through FFT algorithm to get the difference frequency, and finally calculates the distance from the measured target to the sensor through the derived formula.

When the source of radar wave is relatively stationary with the target, the bandwidth of radar transmission frequency is B, the time of radar wave from transmission to return to radar antenna is Δt , the frequency of triangular wave is f, and the frequency of difference frequency signal is f_d . The derivation is as follows: (S: range from radar plate to target, T: period of triangular wave)

$$\Delta t = \frac{2S}{c_0}$$

$$T = \frac{1}{2f}$$

$$S = \frac{f_d C_0}{4fB}$$

In the above formula, C_0 is the speed of light, F is the frequency of modulated triangular wave, B is the radar sweep bandwidth, and FD is the difference frequency signal obtained by MCU analysis, so the only FD can calculate the corresponding distance between radar plate and target.

1.4 Technical Specifications

1.4.1 Equipment characteristics

1. Small size, high reliability, simple operation and convenient maintenance;
2. It is not affected by environmental factors such as temperature, sediment, dust, river pollutants, floating objects on water surface and air pressure;
3. Used for non-contact liquid level measurement in open channels, rivers, irrigation canals, underground drainage pipe networks, flood control and other occasions;
4. Non-contact measurement mode, convenient measurement and no pollution to the environment;
5. Waterproof grade IP68, which effectively avoids damp of internal devices.

1.4.2 Electrical characteristics

1. Built-in battery, ultra-low power sleep mode, 3 ~ 7 years working time;
2. The working current and standby current are low, and solar energy can be used for power supply, which is convenient for installation and maintenance-free;
3. Lightning protection circuit can protect against lightning by 6KV, and can effectively protect equipment from lightning strikes in thunderstorm days;
4. The test accuracy is high and the data is stable, which effectively ensures the accuracy of the test;

2 Product Installation

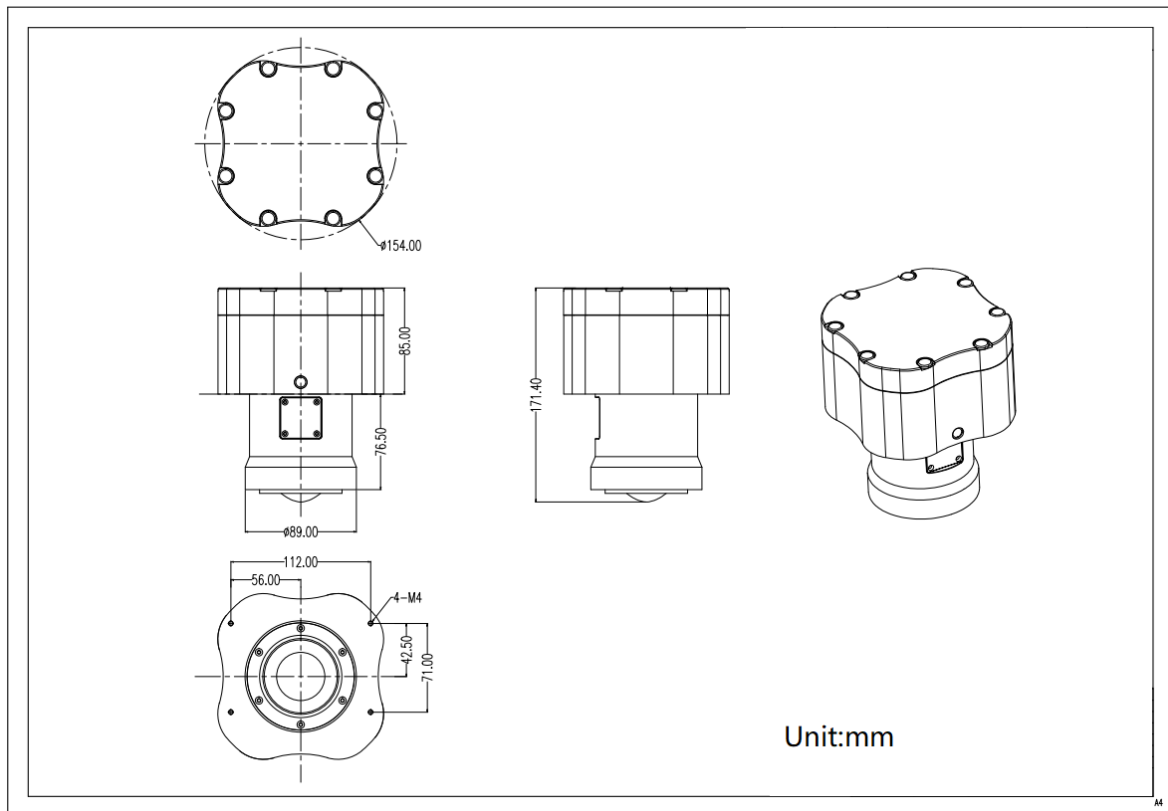
2.1 Instrument structure

Appearance of instrument:



RD-306 Integrated Radar Water Level Gauge

2.2 Appearance Dimensions of Instrument



2.3 Selection of measuring points

When choosing the installation site, it is necessary to ensure that the radar wave covers the water surface, avoid the influence of floating objects, vortices and aquatic plants, and avoid the error of radar wave covering the ground due to riverbed siltation and main trough swing in low water period, and the coverage area is approximately circular.

The diameter and distance relationship of the circle is shown in the following table:

Installation height (M)	Water level gauge coverage diameter range (M)
0.2	0.028
0.5	0.07
1	0.14
2	0.28
3	0.42
5	0.7
7	0.98

After installation, it is necessary to ensure that the radar detection plane of water level gauge/open channel flowmeter is parallel to the horizontal plane. It is best to use reference tools when installing, and ensure that the installation height of integrated radar water level gauge/open channel flowmeter is within

the measuring range;

The selection of installation points should follow the following main principles:

1. The canal is straight, the canal foundation is fixed, and the section is regular and stable, which is convenient for equipment installation;
2. The water flow is smooth and uniform, and is not affected by vortex, gate opening and closing and backwater of canal system buildings;
3. The measuring section is perpendicular to the water flow direction;
4. There should be no buildings, trees or weeds that affect the water flow near the section, and they will not be affected by the discharge when downstream of the building.

3. Technical parameters

Parameter	
Measuring range	0.2 ~ 3m/0.2 ~ 7m
Measurement accuracy	± 2mm
Resolution	0.1 mm
Radar antenna	Pulse coherent radar
Radar frequency	60GHz
Radio wave emission angle	8 °
Battery specification	Built-in lithium battery
Upload cycle	0-24 hours, settable
Working hours	3-7 years (related to reporting cycle)
Wireless communication module	
Wireless configuration	Bluetooth (above standard 4.0)
Transmit/receive power sensitivity	+ 8dBm/-95dBm at 0.1% BER
Shell material	Black PC (UV-resistant)
Dimensions (mm)	φ 154 × 171.4 (mm)
Protection level	IP68
Operating temperature	-35 °C-70 °C
Storage temperature	-40 °C-85 °C
Lightning protection	Lightning protection level 6KV
Data download	APP Download