

Radar Flow Meter

Velocity Measurement Range: 0.05 ~ 15m/s (Related to water flow)

Velocity Measurement Accuracy: $\pm 1\%$ FS, $\pm 2.5\%$ of reading

Transmitting Frequency: 24.000 ~ 24.250GHz

Distance Accuracy: $\pm 1\text{cm}$ Protection Degree: IP66

Introduction

The radar flow meter, as a kind of water level meter and flow velocity with microwave technology, is combined with the measuring technologies by mature radar water level meter and radar velocimeter, which is mainly applied to the measurement for water level and flow velocity of open channels, such as river, reservoir gate, pipe network of subterranean river course and irrigation channel. This product can effectively monitor the change status of water level, velocity and flow, so as to provide accurate flow information for the monitoring unit.

Advantages

Radar Flowmeter Advantages and Disadvantages:

1. Built-in imported 24GHz radar flow meter, 26GHz radar liquid level gauge, CW plane microstrip array antenna radar, non-contact detection, the two-in-one product can realize the measurement of flow rate, water level, instantaneous flow and cumulative flow.
2. All-weather, high-frequency microwave ranging technology can realize online automatic monitoring, unattended.
3. The antenna transmission frequency is flexible and adjustable, and the anti-interference ability is strong.
4. A variety of data communication interfaces RS-232 / RS-485 can be set, which is convenient for users to connect to the system.
5. The construction and installation are simple, the measurement operation is combined with the sleep mode (about 300mA during normal operation, and the sleep mode is less than 1mA), which saves energy and reduces consumption, and is economical and applicable.
6. The non-contact meter does not destroy the flow state of the water and ensures the accurate measurement data.
7. IP67 protection grade, not affected by climate, temperature, humidity, wind, sediment and floating objects, and suitable for high flow rate environment during flood period.
8. Anti-condensation, waterproof and lightning protection design, suitable for various outdoor environments.
9. Small appearance, convenient installation and easy maintenance.
10. Domestic brands with independent intellectual property rights, localized service response support.
11. The core components have the test report of "Huadong Testing Center for Hydrological Instruments".

Application

Radar flow meters are widely used in hydrological surveys, surface water resources monitoring, water measurement and metering in irrigation areas, river channel monitoring, as well as natural waters such as rivers, reservoirs, lakes, tides, irrigation channels (open channels), river channels, and farmland pipelines. Water monitoring.

Radar flow meter is also suitable for urban water logging, urban sewage, municipal water intake and drainage water monitoring, flood control, flood control, underground pipe network and other water level monitoring as well as drainage pipe network, drainage outlet, hydropower station ecological discharge flow monitoring and other fields, suitable for regular and irregular sections.

The radar flow measurement system can realize all-weather automatic collection and real-time monitoring of open channel, natural river flow and water data.

Installation

The installation of radar flow meter must pay attention that the direction of radar wave propagation cannot be blocked by objects, otherwise the radar signal will be attenuated and the measurement will be affected. When installing on the side, it is recommended that the horizontal rotation angle should not exceed the range of 45-60 degrees.

Considering different working conditions, we first need to consider the following 2 factors:

1. Antenna Beam Range:

The flow meter integrates a radar level meter and a radar velocimeter. The radar antenna beam angle of the radar level meter is $11^{\circ} \times 11^{\circ}$, and the antenna beam angle of the radar velocimeter is $14^{\circ} \times 32^{\circ}$. When the level meter illuminates the water surface, the irradiation area is similar A circle, when the velocimeter illuminates the water surface, the illuminated area is similar to an elliptical area, as shown in Figure 1.1. Accurately understanding the illumination range of radar waves helps to choose a suitable place to install and avoid some scenes that are easily disturbed, such as rivers on both sides of the river, like the branches swinging in the wind.

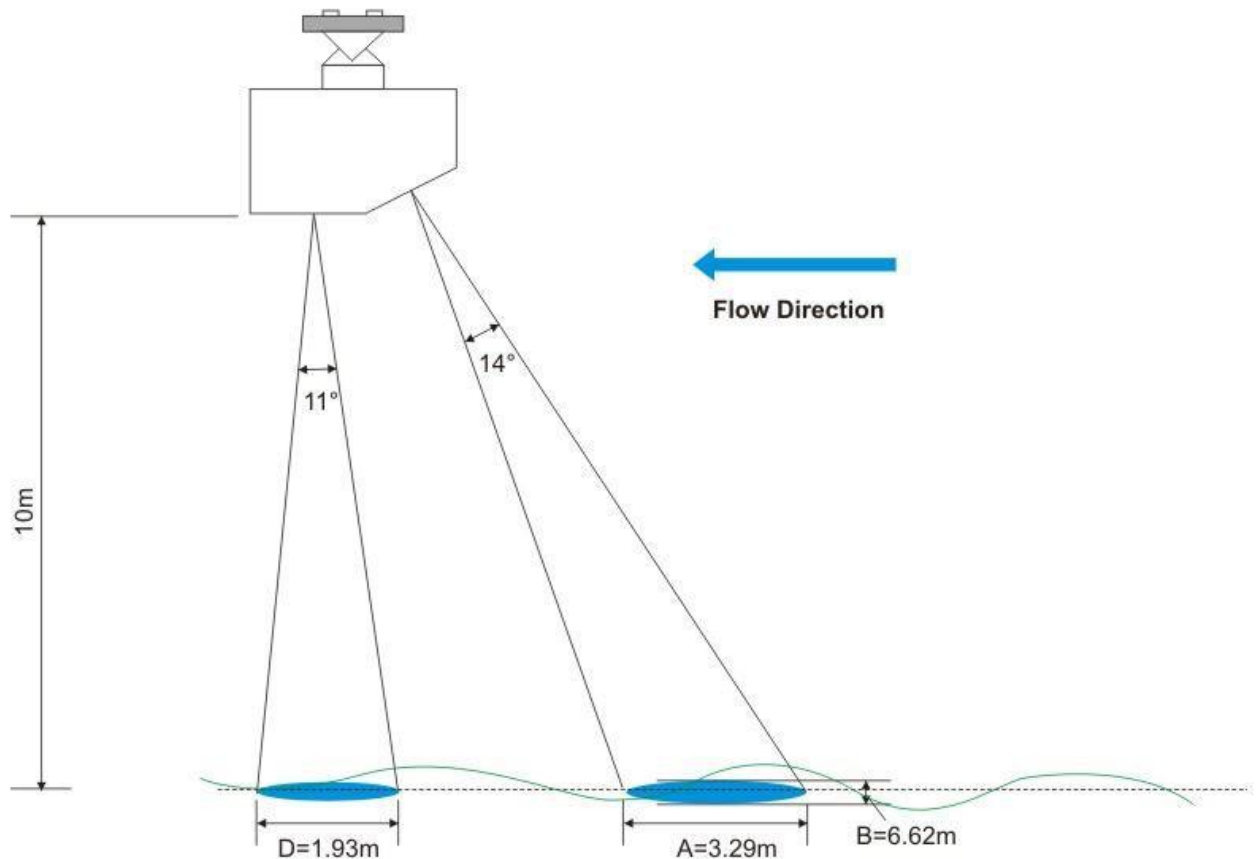


Figure 1.1 Installation of 10-meter radar level meter and a radar velocimeter antenna irradiation area

The boundary of the water surface area illuminated by the radar is proportional to the installation height. Table 1.2 shows the parameter values of A, B, and D when the beam of the radar level meter and the radar velocimeter illuminates the water surface when the installation height is 1 meter (see Figure 1.1 for the meanings of A, B, and D). , the actual installation height (unit meter) multiplied by the following value is the actual corresponding parameter

Name	Length (m)
Radar velocimeter A	0.329
Radar velocimeter B	0.662
Radar level gauge diameter D	0.192

1.2 Antenna beam irradiation surface parameter values

2. Influence of installation height on current measurement:

Under the same conditions, the higher the installation height, the weaker the echo and the worse the signal quality. Especially in the scene with low water flow speed, the ripple is small, which is more difficult to detect. At the same time, the area of the radar wave irradiation area will be larger, and the beam irradiation may be When it reaches the bank of the canal, it is affected by the moving target on the bank. If the installation is too low, it is not conducive to anti-theft protection, so for pole installation, it is recommended that the installation height range is 3-4 meters.

In addition to the above two points, the specific requirements are as follows:

- 1) When installing the flow meter, the liquid level meter and the flow meter radar cannot be blocked, otherwise the measurement accuracy will be affected; there is no huge stone block water in the detection channel section, no huge vortex, turbulent flow and other phenomena;
- 2) The detection channel should be as straight as possible, stable and concentrated
- 3) The radar velocimeter is only affected by the dynamic target. When the channel is hardened and there are no weeds or trees, even if the beam is irradiated on both sides of the channel, it will not affect the flow measurement. In addition, the flow measurement section is as regular as possible;
- 4) The detection channel section should be kept smooth to prevent the accumulation of floating objects.
- 5) The beam of the current meter is recommended to face the direction of the incoming water, as shown in Figure 1.1, and the horizontal angle to the direction of the water flow is 0 degrees.
- 6) When installing the flow meter, try to ensure that the upper surface of the casing is level and installed in the middle of the channel.

Table 1: Working Condition Parameters

Parameter	Description
Supply Voltage	DC 7 ~ 24V
Current(12V Power Supply)	About 300mA in normal operation, and less than 1mA in sleep mode.
Working Temperature	-35°C ~ 70°C
Protection Class	IP67
Emission Frequency	24.000 ~ 24.250GHz
Communication Interface	RS-232 / RS-485
Communication Protocol	MODBUS-RTU / Customized Protocol / SZY206-2016 "Water Resources Monitoring Data Transmission Protocol"

Table 2: Measurement Parameters

Parameter	Description
Velocity Range	0.15 ~ 15m/s
Velocity Accuracy	$\pm 1\%$ FS, $\pm 2.5\%$ of reading
Velocity Resolution	0.01m/s
Distance Range	1.5 ~ 40m
Distance Accuracy	± 1 cm
Distance Resolution	1mm
Antenna Beam Angle	Flow Velocity: $14 \times 32^\circ$ Water level: $11 \times 11^\circ$
Interval Time	1 ~ 5000min

Table 3: Appearance Parameters

Parameter	Description
flow meter Size (LxWxH)	302 \times 150 \times 156mm
Support Size (LxWxH)	100 \times 100 \times 100mm
Weight	flow meter + support: 5.8kg
Housing Material	Galvanized, stainless steel sheet