FRM6100 K-Band Radio Wave Velocity Meter

FEATURES

- 24GHz CW planar microstrip radar, with phase-locked loop, high frequency stability
- Non-contact measurement, safe and low loss, less maintenance, not affected by sediment, etc.
- All-weather work, not affected by temperature, strong anti-interference ability
- The combination of measurement operation and sleep mode saves energy and reduces consumption
- Provide a variety of interface methods for easy access to the platform system
- IP67 waterproof design, suitable for various outdoor environments
- Small and compact appearance, super cost-effective
- Simple installation and less civil construction

OVERVIEW

FRM6100 radio wave velocity meter is a non-contact flow velocity detection device independently developed by our company, which can be used to monitor the surface velocity of water bodies such as natural rivers, open channels, and underground pipe networks and assist water treatment operations.

This radio wave flow meter works in the 24GHz ISM frequency band and adopts the CW mode, which can detect the water flow velocity information in real time around the clock, and is not affected by climate, temperature, water vapor on the water surface and pollutants in the water. The product has a built-in efficient back-end processing algorithm, which can accurately obtain the water flow speed.

This product provides three standard physical circuit interfaces: RS232, RS485 (default), 4~20mA.

SPECIFICATION

Speed range	0.1 ~ 15m/s (related to water flow)
Speed accuracy	±0.01m/s; ±1%FS
Resolution	0.01m/s
Effective distance	0.5 ~ 30 m
Measure time	3 ~ 240s
Intervals	1 ~ 18000s
Measurement direction	Two-way optional
Automatic angle correction	30°~ 60°
Communication Interface	RS-485/ RS-232 / 4-20mACurrent Loop
Interface communication parameters	9600, 8, 1,None
Protocol	Custom ASCII/MODBUS
Working frequency	24.000 ~ 24.250GHzadjustable
Antenna style	Planar Microstrip Array Antenna, 14°×32°
Operating Voltage	+7~28V DC
Working current	Working mode, working current ≤ 120mA@12V Low power consumption (sleep) mode, working current ≤ 1mA@12V
Operating temperature	-40 ~60°C
Protection class	IP67
Dimensions (l×w×h)	110×110×43 (mm)
Front cover steel (white), rear cover aluminum alloy (black)	Front cover steel (white), rear cover aluminum alloy (black)

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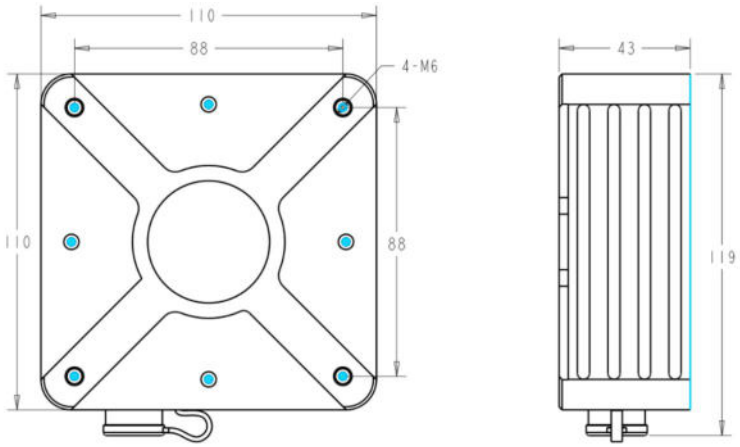
DIMENSION

Unit: MM



INSTALLATION

The selection of the river reach for flow measurement is directly related to the accuracy of flow measurement. In order to obtain better flow measurement results, the flow measurement reach should meet the following conditions as far as possible:

1. There are no huge rocks blocking water, no large eddies, turbulent currents, turbulent currents and other phenomena in the test river reach.
2. The water flow should be smooth in the test river section, the flow speed should not change greatly, and the river section should be straight.

A Float disturbance

Floaters with a small area (less than half of the radar irradiated area) or fast passing through the radar irradiated area have little effect on the measurement results. When such a problem occurs, back-end processing can be used to mask or process the current measurement value by combining the first and last data results of the current measurement.

B Rain disturbance

The flow meter integrates an algorithm for suppressing rainfall interference, which can effectively reduce rainfall interference. However, to obtain the best possible measurement results, the following measures can be used together:

1. The installation angle is α = 30°, as shown in figure 1
2. In the case of rainfall, for the occasional abnormal data, through multiple measurements, the back-end processing is performed on the multiple measurement results to achieve the purpose of shielding the abnormal values.

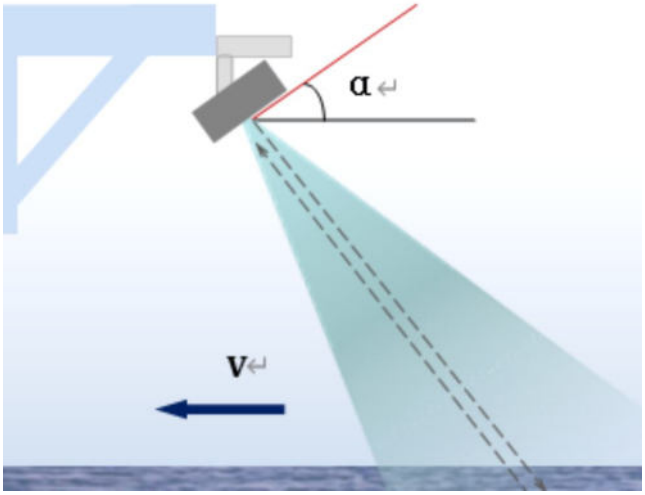


Figure1 Schematic diagram of 30 degree installation of flow meter

There are several details to consider when installing a flow meter for flow measurement.

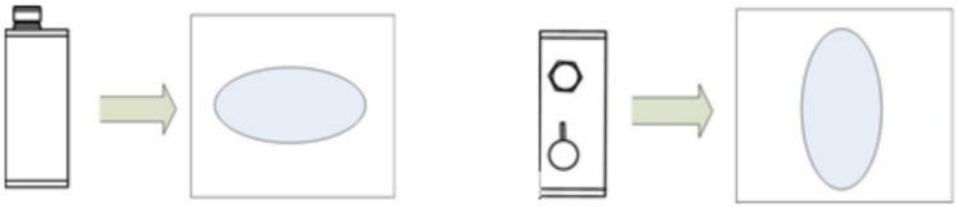
A. Influence of installation angle on current measurement

It is generally necessary to tilt the current meter at an angle to the water surface.

The installation angle of the current meter can be adjusted appropriately within the range of 30 to 60 degrees. Note that the installation angle refers to the angle between the antenna plane of the current meter and the horizontal plane (the complementary angle between the radar beam and the horizontal plane). In a uniform environment, large angles are easy to jump, and the smaller the installation angle, the better the suppression of rainfall interference and the better the signal quality. The recommended installation angle is about 30 degrees, as show in figure 1.

B. Radar beam influence on current measurement

The angle of the radar antenna of the current meter is 14°×32°, so using the current meter to measure, there is a clear difference between the horizontal angle of 14° or 32°. When the current meter irradiates the water surface, the irradiated area resembles an elliptical area, as shown in Figure 2. Therefore, an accurate understanding of the irradiation range of radar waves helps to choose a suitable place for installation and avoid some scenes that are easily disturbed, such as branches swaying with the wind on both sides of a river.



(a) (b)

Figure2 Schematic diagram of the rear projection plane of the radar tilted

C. 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. If the installation is too low, the water will have an impact on the radar beam, and the flow meter may be submerged when the water rises, so it is recommended to install it at a height of more than 0.5 meters. At the same time, the installation height will affect the irradiated area of the radar. The higher the installation, the larger the area of the radar wave irradiated area. Please refer to Table 3-1 (the actual installation height multiplied by the following value is the actual corresponding boundary).

The velocity measurement range of the current meter is 0.1 ~ 15m/s. For low velocity, due to the small ripple and weak signal echo, the premise that the low velocity can be measured is that the installation height cannot be too high.

APPLICATION CASES

- Velocity monitoring of rivers, irrigation canals, flood control, etc.
- Environmental pollution discharge and water resource monitoring
- Monitoring of urban flood control and water logging
- Monitoring of rainstorm floods in mountainous areas