Bass Instruments

RADAR FLOW METER

RSHU

User Manual

Bass Ölçme Enstrümanları Ltd. Şti.
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Directory

1. Product Description

The RSHU radar flow meter uses radar technology to measure water velocity and water level at the same time, and converts water flow through an integral model. The water flow can be measured in real time all day, and the non-contact measurement is not easily affected by the working conditions.

The main advantage of the RSHU series are as follows:

2. Technical Specifications

Range of velocimeter	1 m/s ~25m/s
Accuracy of velocimeter	0.01m/s
Pitch angle	0°~ 80°
Beam angle of velocimeter	12°*25°
Dead band of level gauge	8cm
Range of level gauge	30m
Accuracy of level gauge	±1mm
Beam angle of level gauge	6°
Max distance	30m
Power supply	Power supply
Operating current	13~15ma@24V
Communication	RS485 (baud rate 9600/115200), Bluetooth
Protocol	Modbus (9600/115200)
Temperature	-20~80°C
Enclosure	Aluminum
Dimension (mm)	142×87×94
IP Grade	IP68
Mounting type	Bracket

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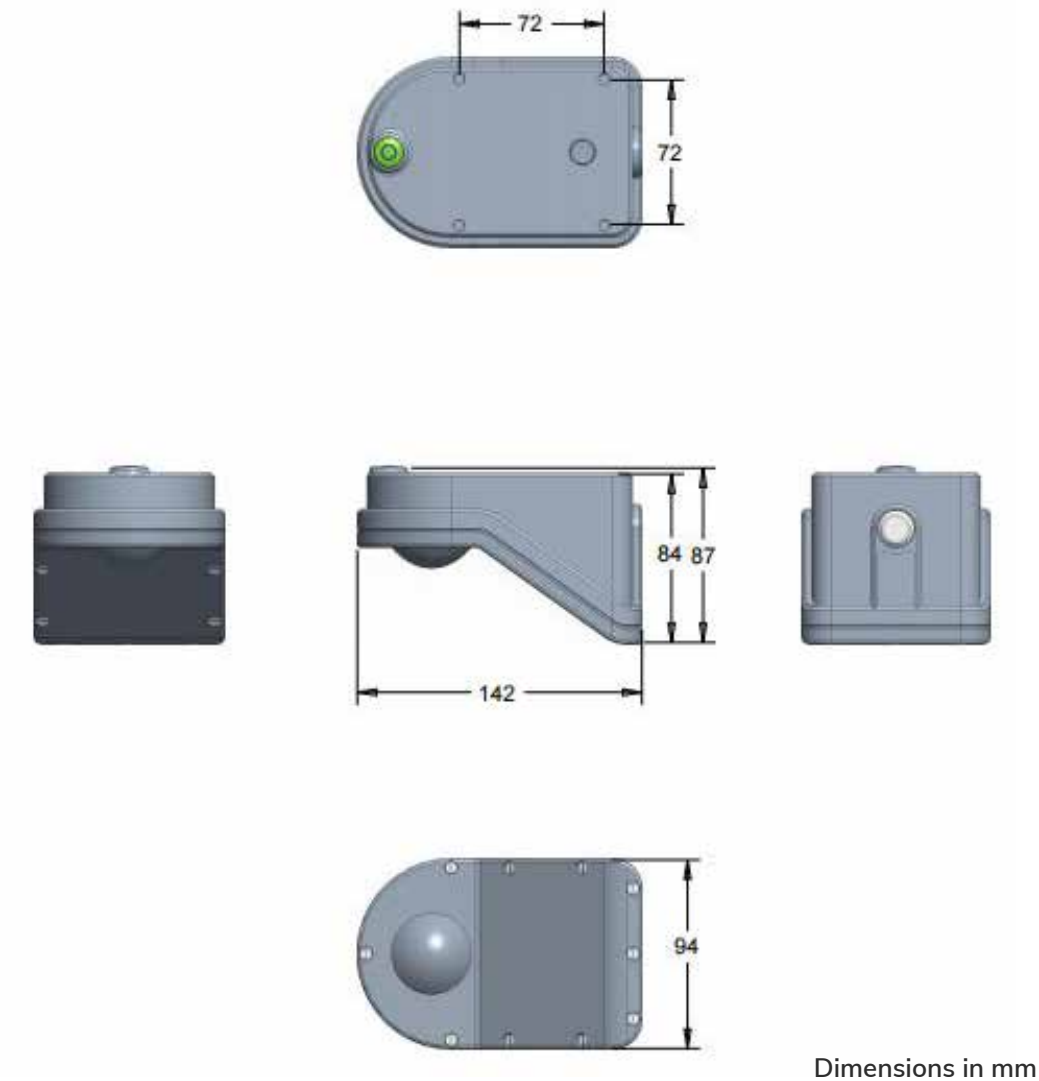
3. Dimension



Dimensions in mm

The RSHU flow meter has a compact structure and comes with horizontal bubbles for installation and adjustment.

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4. Installation

Accurately measuring flow requires attention to the following points:

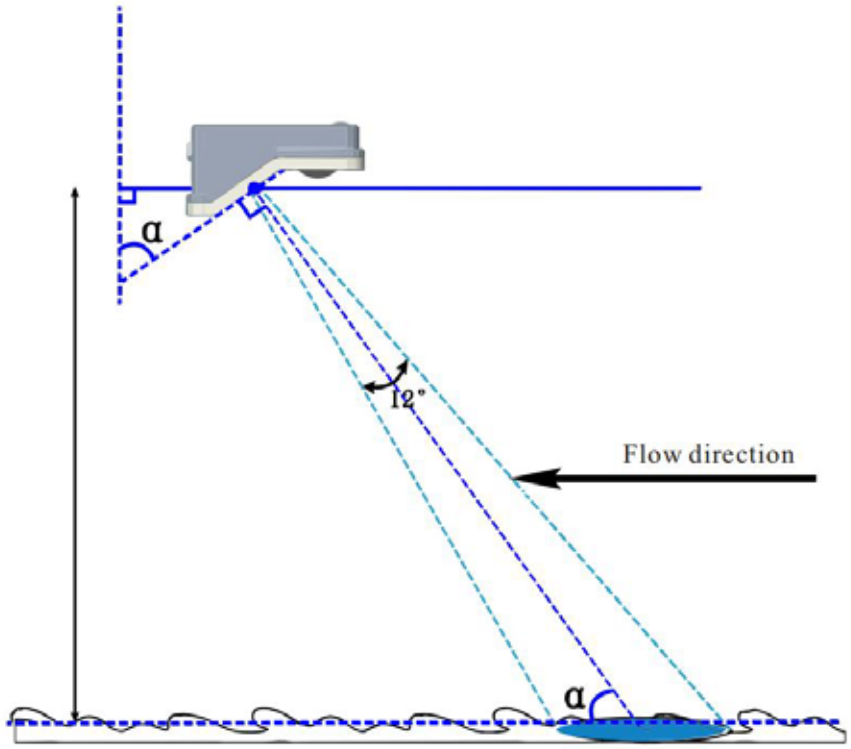
4.1 Selection of water area to be tested

1. There is no significant change in the direction and velocity of water flow in the test reach, and the water surface has waves.
2. No maelstrom and turbulence, the measured river section should be straight.
3. Floating objects: floating objects will interfere with the radar signal, and the measurement can return to normal after the floating objects leave the measurement range of the radar.
4. Rain: Rain is a moving object, it will also be measured by radar, radar built-in tracking system, can ensure accurate measurement results. For better measurement, it is recommended to adjust the installation Angle to about 45°.

Note: If the water surface to be measured is calm without waves, the electromagnetic wave emitted by the radar will not be reflected back to the receiver due to specular reflection, which will cause the radar to receive no echo signal, and it will not be able to give accurate flow rate results.

4.2 Angle of installation

1. In order to ensure the correct measurement of the water level, the flow meter is installed against the water surface to ensure that the bottom of the flow meter is installed horizontally (there is no excessive slope of the water surface). If the flow meter is installed tilted, it may affect the radar measurement accuracy and measurement stability. It is recommended that the horizontal Angle be controlled within plus or minus 3°.
2. When the flow meter is installed horizontally, the Angle between the velocimeter part and the water surface is 55°, and the bottom of the flow meter is parallel to the water surface, as shown in the figure below.
3. The Angle between the part of the current meter and the water surface determines the stability and reliability of the velocity measurement. If the Angle is too small, the radar echo is too weak, the radar can not measure stably, and the measurement results are not reliable. If the radar tilt is too large, such as between 85-90°, the radar cannot sense the Doppler shift of the water flow, and the measurement results will be unreliable. The gyroscope in the radar automatically compensates the flow rate according to the time deflection Angle, so precise adjustment is not necessary.



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4.3 Mounting height

1. The farther the radar is from the water surface, the weaker the echo received by the radar, and the worse the ability of the radar to correctly detect the water velocity.
2. The radar should not be too close to the water surface, and it is easy to be submerged by water.
3. If need to measure the water velocity is very low (<0.1m/s), or relatively calm water, need to test at close range to improve the energy of the radar to receive the signal, it is recommended that the distance from the water is 10-30cm.
4. To ensure the proper measurement of water levels, ensure that the installation height is much higher than the radar dead band and less than the radar's range limit.

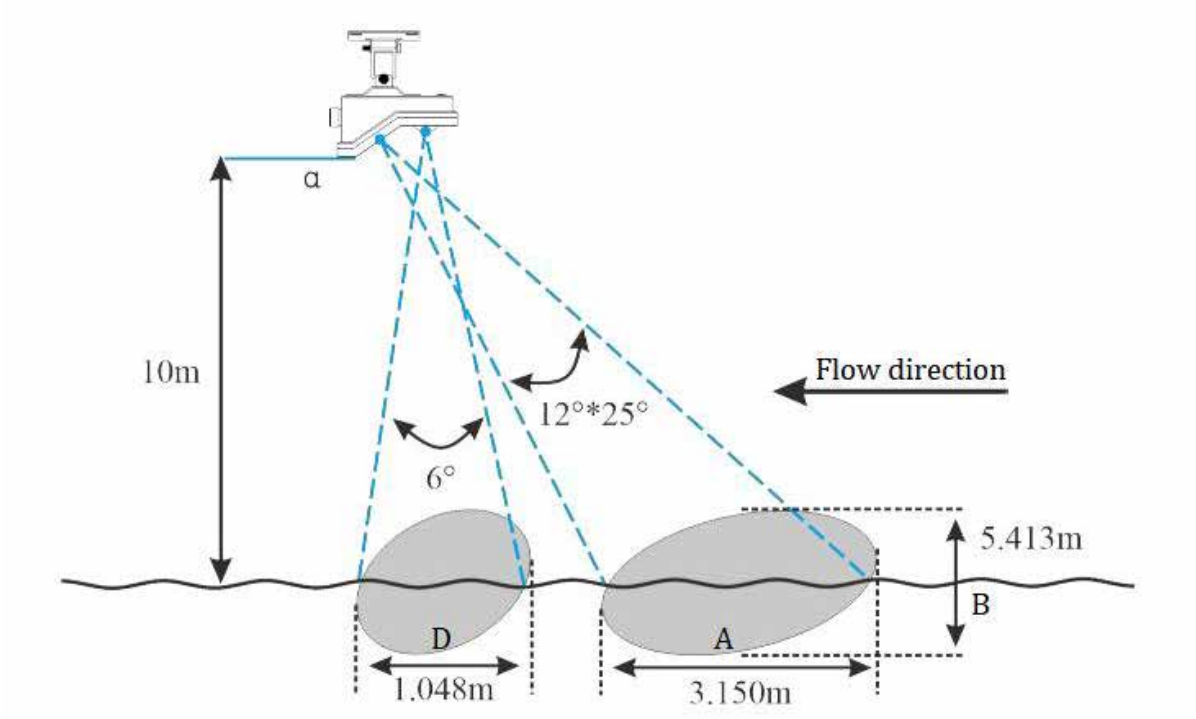
4.4 Radar FOV

The field of view of radar is called FOV. The radar field of view shows a cone shape and diffuses outwards. In the field of view, other objects with speed other than the measured water velocity, such as turbines, pedestrians, cars, or other prominent disturbers.

The RSHU has a water velocity measuring module FOV of approximately 12°x 25°and a water level measuring module FOV of approximately (6°x 6°) .

Example: The FOV range of the water level measuring module at 10m away =(2×tan(6/2/180*π)×10)=1.048m.

Note: FOV is only a simple measure of the radar beam width, not that the radar can not detect objects outside the beam completely, so when installing the radar, it is necessary to confirm the echo curve, check the clutter outside the non-liquid level and flow rate, if there is a high clutter, it is necessary to do false echo study for shielding.



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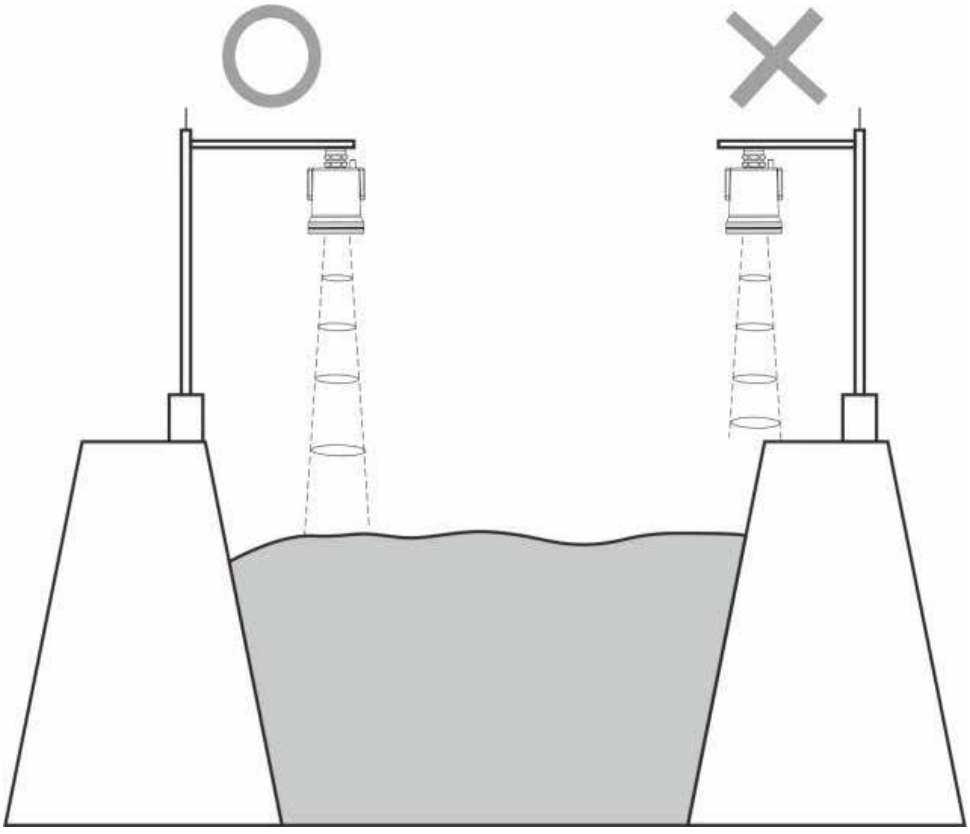
Mounting height (m)	The diameter range covered by the flowmeter (m)		
	Diameter of water level gauge signal (D)	Short axis of velocimeter (A)	Long axis of velocimeter (B)
1	0.105	0.315	0.541
2	0.210	0.630	1.083
3	0.314	0.945	1.624
4	0.419	1.260	2.165
5	0.524	1.575	2.706
6	0.629	1.890	3.248
7	0.734	2.205	3.789
8	0.839	2.520	4.330
9	0.943	2.835	4.872
10	1.048	3.150	5.413

4.5 Mounting position

1. The farther mounting position is from the center of the water flow, the greater the error of the average velocity.
2. The closer the mounting position is to the river bank, the more susceptible it is to factors such as water grass and others along the river bank. RSHU 6
3. It is recommended that the mounting position as close to the center of the river as possible.
4. To make the water level measurement as reliable as possible, avoid interference in the radar measurement range, such as banks, walls, and overhangs. After installation, it is recommended to check the echo curve, and if there is unavoidable interference, it can be shielded by false echo study.



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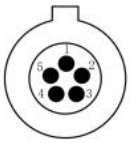
5. Wiring

Accurately measuring flow requires attention to the following points:

5.1 Wiring instruction

Wiring instructions: When the aviation plug is inserted, the two parts of the red dot should be aligned, and you can plug it when you hear a snap. Please refer to the table below.



Socket

No.	Wire Color	Function	Remark
1	Black	Negative	Negative pole
2	White	485A	Baud rate 9600, reverse wiring is not accepted.
3	Green	485B	Baud rate 9600, reverse wiring is not accepted.
4	Yellow	485_GND	RS485 ground, wire it if necessary
5	Red	Positive	9-30V

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6. Frequently Asked Questions

(1) Why does the velocity measurement result stuck or jump?

The velocity measurement results may stuck or jump as follows:

a. Check whether the power supply is within the required range.
b. Check whether the working current is normal (less than 45mA@24V).
c. Check whether the water surface is static or the water ripple is small (if the water surface is calm or the velocity is very low, it is recommended to change the mounting position and try again).
d. Whether there are floating objects, water plants, or other moving objects in the signal covered area (false echo transplantation by observing echoes).
e. Whether the water level is too low and the radar is directly irradiated into the riverbed or rocks (it is recommended to change the mounting position).
f. Whether the installation is stable and the Angle is appropriate (it is recommended to fix the installation and adjust the installation Angle value of 45°).
g. Whether the data stuck or jump is related to the weather (it is recommended to adjust the installation Angle value of 45°).

(2) Why does the level measurement result stuck or jump?

a. Whether to choose the appropriate measurement mode, open channels recommended to use river mode. If the measuring range is small, such as within 2m, the well mode is recommended.
b. If the mode is correct, and the measurement result suddenly rises, it may be other interference signals within the beam Angle measured by the radar instrument, such as the shore, terrace, wall bulge, etc. It is recommended to adjust the installation Angle, avoid the interference, or adjust the installation position. If the measurement results stuck or jump to within 0.5m from the antenna, may be due to factory study is not done. It is recommended to set the dead band according to the field application, such as 0.3m, or do 0-1m area false echo study for shielding (ensure that the distance between the water surface and the radar antenna is much more than 1m, such as 2m).
c. If measuring for applications such as manholes and sewers, make sure to do a good job of shielding false echoes. This type application is usually narrow and long, and uneven walls tend to cause strong reflections. It is recommended to use Bluetooth to confirm the echo curve, confirm the interference position, and carry out the corresponding false echo shielding
d. The water level output information takes time to stabilize when the power is just powered on, which varies according to the damping and smoothing coefficients. If the power is off frequently, be sure to wait until the output data is stable before reading.

(3) Flow meter cannot communicate

a. Check the wiring. Check whether the cable is correctly connected according to Section 5.1.
b. Use a multimeter to check the power supply voltage and ensure that the power supply voltage on the power supply ranges from 9 to 30V.
c. Check the working current. Ensure that the standby current is 15-13mA@24v when no data is exchanged.
d. Check whether the serial port number and baud rate are correct.
e. Check whether the modbus address is the same as expected.

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