

ULTRASONIC OPEN CHANNEL FLOW METER

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1. INTRODUCTION

1.1 Application

The UF series is a remote version ultrasonic open channel flow meters (O.C.M.). It consists of two elements, a wall mounted host, which has a display and an integral keypad for programming, and a probe, which must be mounted directly above the surface to be monitored. Both of the host and the probe are plastic leak-proof structure.

The UF series OCM can be widely applied to the environmental protection, water treatment, irrigation, chemical, and other industries.

1.2 Features

UF series O.C.M. is capable of the following functions:

- High detection accuracy, the flow meter measurement changes with 1mm, the accuracy of change in level is 1 mm;
- Suitable for a variety of weirs and flumes, Parshall flumes (ISO), Right-angle triangle weir, Rectangular weir;
- Displays flow rate in L/S or M³/h;
- Excellent anti-interference capability;
- Clear display with enhanced 14 digit two line backlit LCD;
- The cable length between probe and host up to 1000m;
- The probe with leak-proof structure and IP68 protect grade;
- Chemically resistant probe materials for maximum application flexibility;
- Provided 4-20mA output and RS485 serial communication (MODBUS-RTU) output;
- Provided programmable 6 relays at most for alarms;
- Three button for programming or remote control for easy configuration and operation (opt.) ;

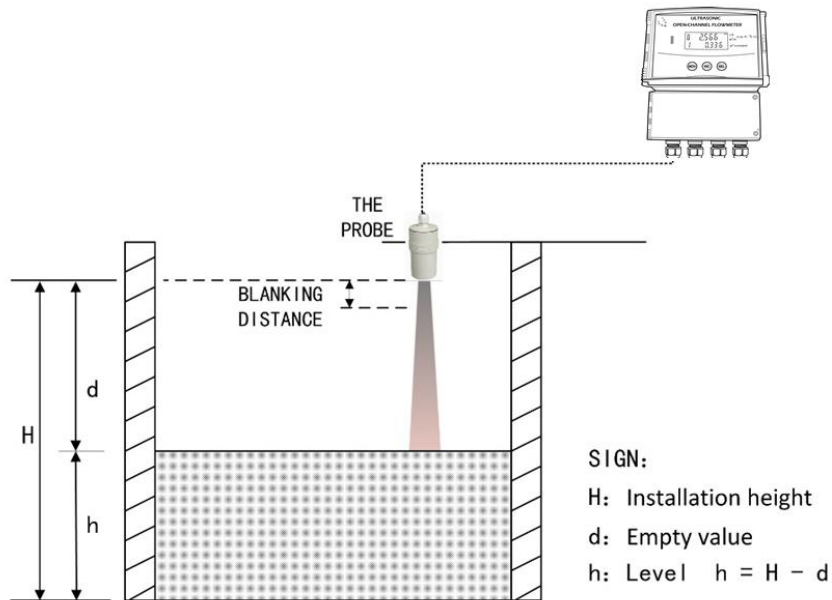
1.4 Measuring principle: Time-of-flight method

The probe is mounted on the top of the flume, and ultrasonic pulses is transmitted by the probe to the surface of the monitored material. There, they are reflected back and received by the probe. The host measures the time t between pulse transmission and reception. The host uses the time t (and the velocity of sound c) to calculate the distance d between the sensor bottom and the monitored liquid surface: $d = c \cdot t / 2$. As the host knows the installation height H from parameters setting, it can calculate the level as follows: $h = H - d$.

Since speed of sound through air is affected by changes in temperature, the UF O.C.M. has integrated a temperature sensor to improve accuracy.

For determined flumes, there is a fixed functional relationship between the instantaneous flow and liquid level. The formula is $Q=h(x)$. Q means instantaneous flow, h means liquid level in flumes. So the host can calculate the flow rate though determined flumes and the level value.

It is very important to understanding the working principle for further installation and operation.



Blind zone: Level echo from the blind zone cannot be evaluated due to the transient characteristics of the sensor. Span F may not extend into the blanking distance B.

1.5 Technical data

1.5.1 The host

Type	UF (host)
Power supply	DC24V (±5%) 0.2A; AC220V (±20%) 0.1A
Display	2 lines 14 digit backlit LCD
The instantaneous flow rate range	0.0000~99999L/S or m ³ /h
The maximum of cumulative flow	9999999.9 m ³
Accuracy of change in level	1mm or 0.2% of measured distance from the probe at still water. (whichever is greater)
Resolution	1mm
Analogue output	4-20mA into 500 Ohms, corresponding to instantaneous flow rate.
Relays outputs	6 multi-function SPDT relays at most (optional) , rated 5A /250VAC/30VDC, high, low and failsafe alarm and control corresponding to instantaneous flow rate or level.
Serial communication	RS485, MODBUS-RTU standard protocol
Ambient temperature	-40°C~70°C
Temperature compensation	Integral in probe
Pressure range	±0.1MP (press definitely)
Measure cycle	1 second (changeable)
Parameter setting	3 induction buttons / remote control
Cable gland	PG9 /PG11/ PG13.5
Material	ABS
Protect grade	IP67
Fix	Hang
Dimensions	248H*184W*122D(mm)

1.5.2 The probe

Type	LB-4 (probe)
Range	0.00-4.00m
Blind zone	0.20m
Ambient temperature	-40°C~70°C
Temperature compensation	Integral in probe
Pressure range	0.2MPa
Beam angle	10 (3db)
Cable length	10m standard (can be extended to 1000m)
Material	ABS, PVC or PTFE (optional)
Protect grade	IP68
Fix	Screw (G2) or flange (DN65/DN80/etc.)

2. INSTALLATION

Reasonable installation is critical factor of the instrument’s normal working. Installation must be carried out by trained person in accordance with the manual.

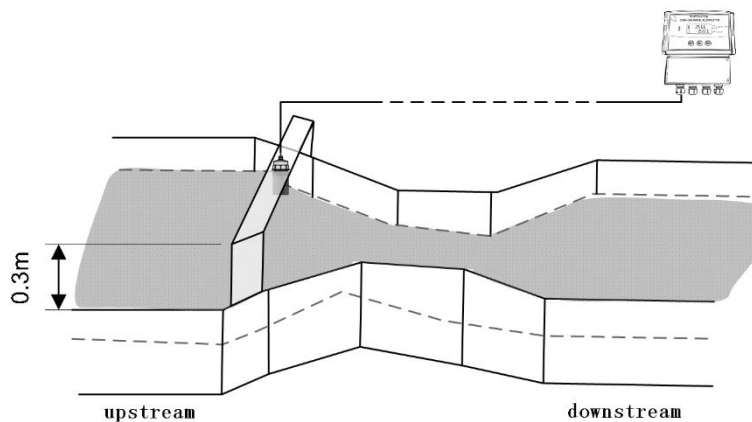
2.1 Installation considerations

2.1.1 hints for the host mounting

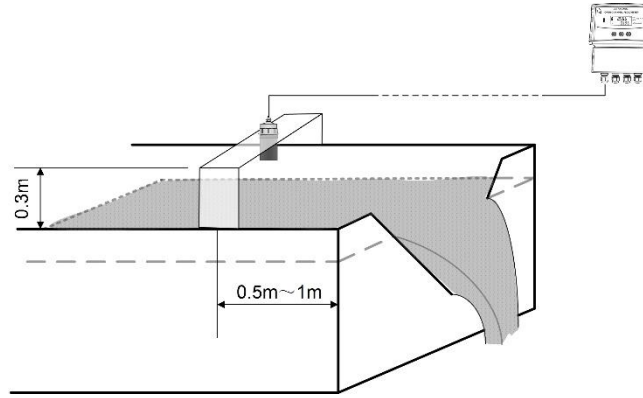
- The host should not be mounted in a confined space where temperatures may exceed the normal working temperature (-40~+70), if the host is mounted outside, it must be protected from direct sunlight or severe weather conditions.
- Ensure that the mounting surface is not subject to vibration and is not in close proximity to high voltage cables, contactors or drive controls.
- Select appropriate knockouts in the base of the enclosure and fit appropriate cable glands to maintain the IP67 rating.
- Do not use excessive force when tightening the fixing and avoid any distortion of the enclosure.
- Pay attentions to the dimensions of the host and the enclosure.

2.1.2 Hints for probe mounting

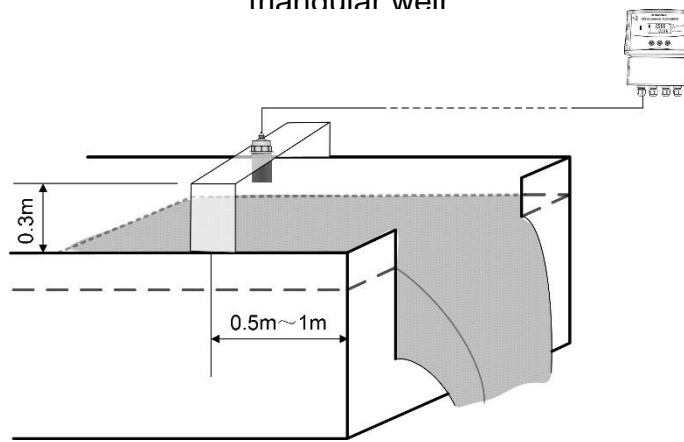
- The probe can be supplied as standard or with a screw nut or with an ordered flange.
- For applications requiring chemical compatibility the probe is available fully enclosed in PTFE.
- The use of metallic fittings or flanges is not recommended.
- For exposed or sunny locations a protective hood is recommended.
- Make sure that the probe is mounted perpendicular to the monitored surface and ideally, at least 0.25 meters above it, because the probe cannot get response in the blind zone.
- The probe has a 10 inclusive conical beam angel at 3 db and must be mounted with a clear unobstructed sight of the liquid to be measured. But smooth vertical sidewalls weir tank will not cause false signals.
- The probe must be mounted upstream of the flume or weir.
- Do not over-tighten the bolts on flange.
- The stilling well can be used when there is volatility in the water or needs to improve the accuracy of level measurement. The still well connect with the bottom of the weir or flume, and the probe measures the level in the well.
- When install to the cold area, should choose the lengthen sensor and make the sensor extend into the container, shun frost and icing.
- For Parshall flume, the probe should be installed in a position the 2/3 contraction away from the throat.
- For triangular weir and rectangular weir, the probe should be installed on the upstream side, the maximum water depths over the weir and 3~4 times away from the weir plate.



Parshall flume



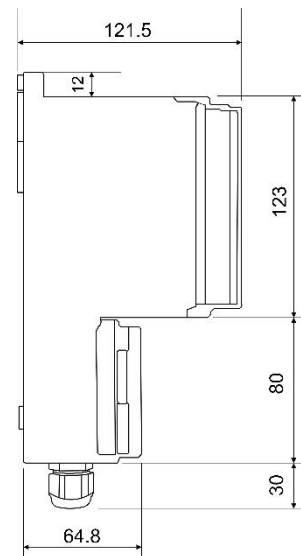
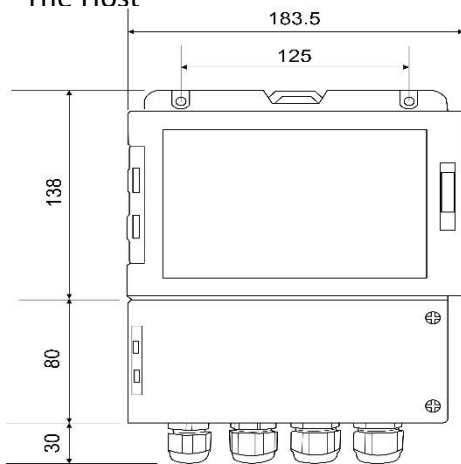
triangular weir



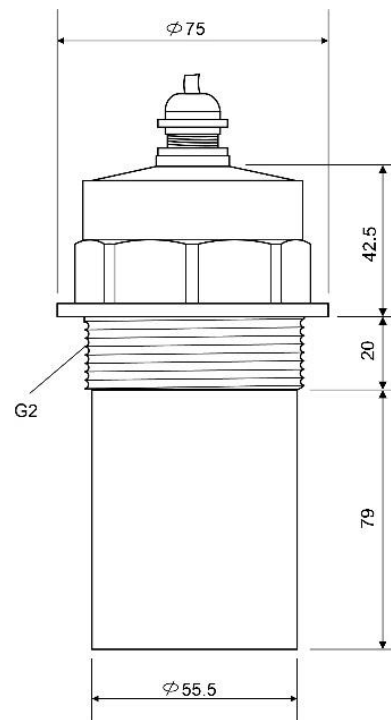
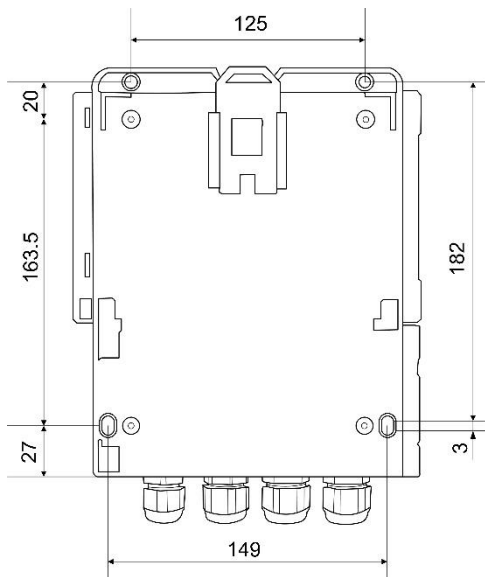
rectangular weir

2.2 Mounting dimensions

- The Host



- The probe



Measure range:
UF-4m
Power Supply
D DC24V(±10%) 0.1A A AC85~265V 50mA
Energy Transducer Material/Process Temperature/Protection Grade
A ABS/(-40-75)°C/IP67 B PVC/(-40-75)°C/IP67 C PTFE/(-40-75)°C/IP67
Process Connection/Material
G Thread D Flange /PP
Electronic Unit
2 4~20mA/24V DC Two Wire 3 4~20mA/24V DC /HART Two Wire 4 4~20mA/24V DC /RS485 Modbus Four Wire 5 4~20mA/24VDC /Alarm Output Four Wire
Shell / Protection Grade
L AL/ IP67
Cable Entry
M M20*1.5 N 1/2" NPT
Programmer/Display
A With Display



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