

KDF1300 Ultrasonic Doppler Flow Velocity Meter



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1.Introduction

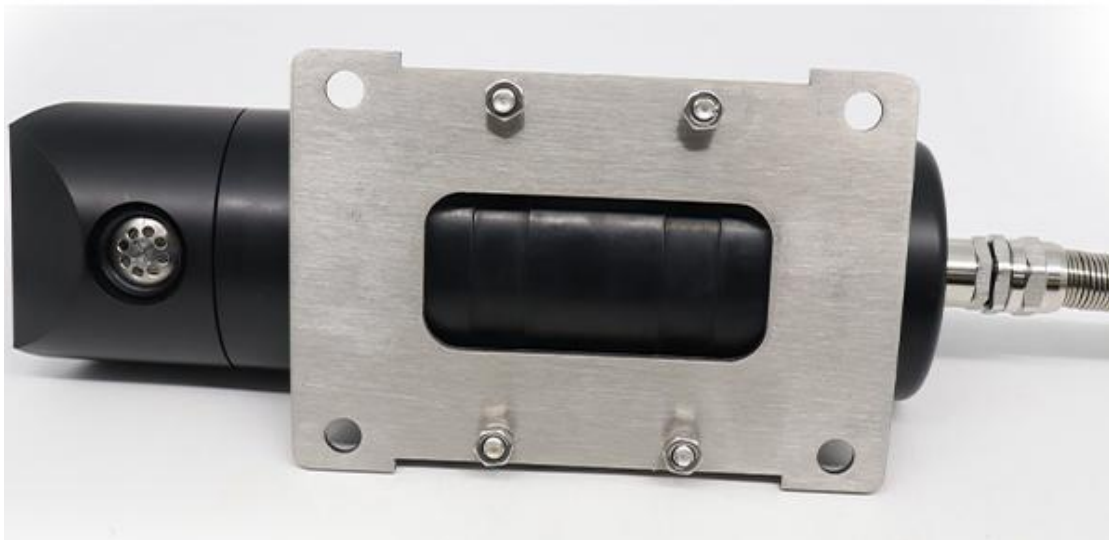
Ultrasonic Doppler Flow Velocity Meter measurement is based on the Doppler effect. The probe sends out a beam of ultrasonic waves obliquely upward. The ultrasonic waves propagate in the fluid. The fluid may contain impurities such as bubbles or particles (it can be considered that the impurities in the fluid have the same speed as the water flow). When the ultrasonic waves come into contact with the impurities in the fluid, the reflected ultrasonic waves will produce a Doppler frequency shift Δf . The Doppler frequency shift Δf is proportional to the flow velocity. The flow velocity of the fluid can be measured by measuring the Doppler frequency shift Δf .

2.Technical Specifications

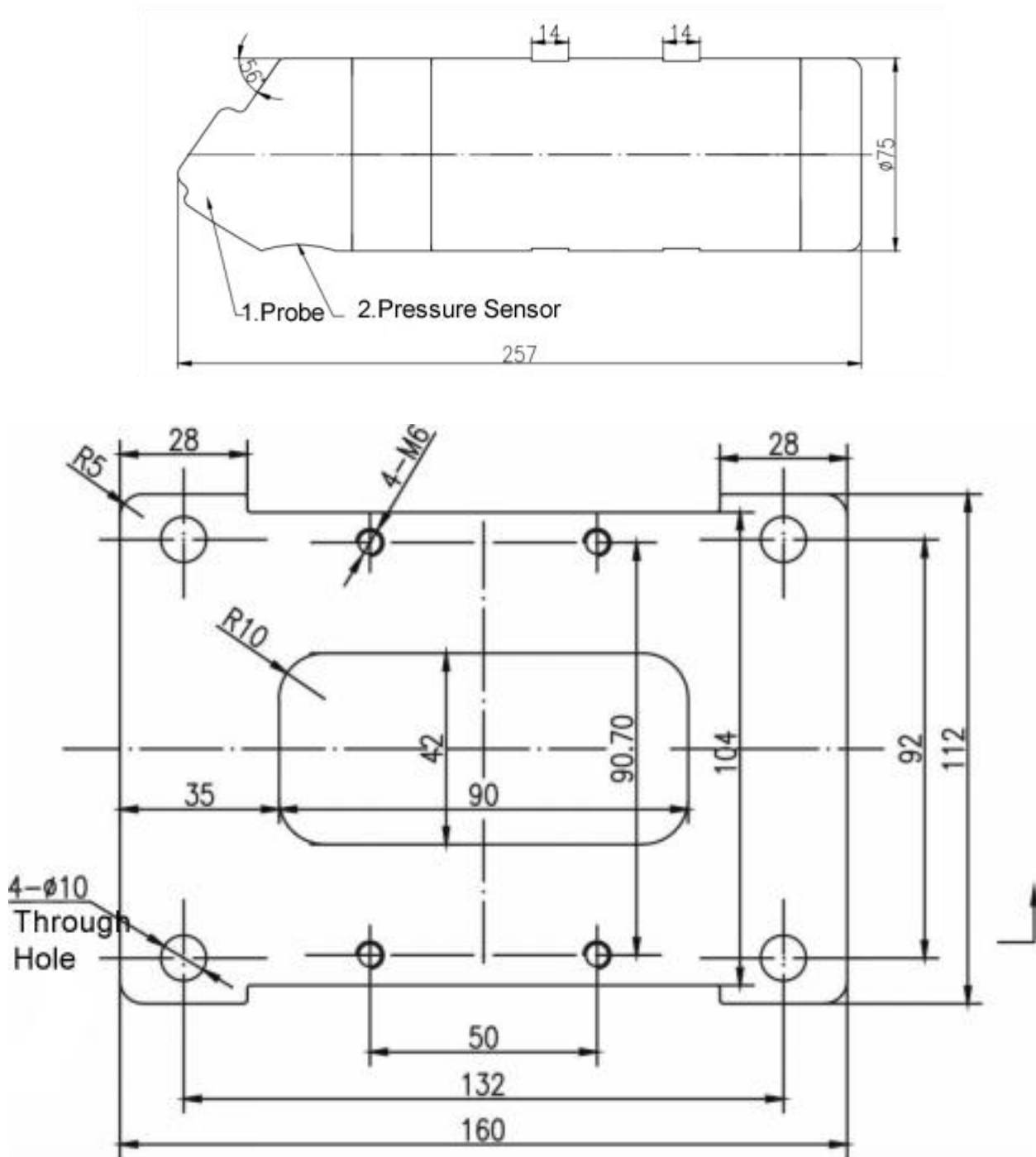
Power Supply	Power supply range: 10 VDC~30 VDC; 12V power consumption: 45mA±1mA (about 0.54W) 24V power consumption: 26mA±1mA (about 0.62W)
Output Characteristics	RS485/ModBus standard protocol
Measurement Performance	Flow velocity range: ±0.03m/s~±5m/s (customizable ±0.03m/s~±10m/s); Water depth range: 0.02~3m, 0.02~10m (please confirm the maximum water depth before ordering); Flow velocity accuracy: ± 1% ; Flow velocity accuracy: ±1~3% (measurement accuracy varies due to the on-site working environment); Water depth accuracy: ±3cm; Flow velocity resolution: 1mm/s; Temperature resolution: 0.1℃; Water depth resolution: 1mm (3m range), 3mm (10m range).
Physical Properties	Material: POM;Cable material: PU; Weight: 2.6±0.1kg; Protection level: IP68; Cable: 4-core (single core 0.21 m ²) shielded cable with air duct, factory default length 10 meters, wire diameter 8mm (other wire lengths need to be customized).
Working Environment	Working temperature: -5 ~60℃ (non-freezing state); Storage temperature: -25~80℃; Sand content: 20mg/L ~ 20g/L ; Acidity: pH value is between 6 and 10.

3.Dimensions

3.1 Product picture



3.2 Structural dimensions



4.Application

Ultrasonic Doppler Flow Velocity Meter is a device that measures the flow rate of water in pipes, channels or rivers. It is mainly used in the following areas:

- Flood disaster monitoring
- Sewage discharge
- Natural rivers
- Municipal water supply and drainage
- Water loss/infiltration monitoring
- Irrigation process monitoring
- Estuary and tidal research
- Fisheries/water conservancy
- Coastal erosion research
- Culvert process monitoring
- Road drainage monitoring
- Canal process research
- River process monitoring

5.Installation

Tips: Before installation on site, please connect the wires correctly according to the instructions, and install it on site only after the flow velocity meter is tested and the communication is normal.

5.1 Installation instructions (Notes)

- (1) The lowest water level on site must be **5cm** higher than the top of the sensor to measure the Flow velocity normally. If it is lower than 5cm, the Flow velocity will have a large error with the actual Flow velocity. If there is silt, sand and gravel on the bottom of the water, the sensor needs to be raised by more than 5cm (depending on the size of the stones on site);
- (2) The turbidity of the river water needs to be considered. If the river water is relatively turbid and the water flow is slow, it is recommended to use the Flow Velocity Meter in combination with a non-contact level meter to solve the problem of pressure transmitter blockage;
- (3) Considering the resistance of the bracket, it is recommended to use a round tube for the bracket to reduce resistance;
- (4) The cable cannot withstand the impact of the water flow. The cable is easily damaged or broken if it is impacted for a long time. The cable should be passed through the inside of the bracket to avoid being directly impacted by the water flow. If a wire pipe is connected separately, the water resistance will increase;
- (5) Consider whether there will be branches, weeds, or stones on site. If there are debris, it is best to build a fence 5 meters in front of the sensor;
- (6) Sensor installation prerequisite: Ensure that there are no obstacles within 3.0 meters in front of the sensor and within 1.0 meters behind it. Try to choose to install it in the middle of the channel, but consider the bearing capacity of the bracket.

☆ Tools required: tape measure, flat screwdriver, adjustable wrench (depending on the site environment, impact drills and other tools may be used to fix the bracket)

5.2 Wiring

Power wire:

Red wire connected to the positive pole of the power supply (12V+ or 24V+);

Green wire connected to the negative pole of the power supply (12V- or 24V-);

Signal wire:

White wire connected to RS485A (T/R+);

Yellow wire connected to RS485B (T/R-);

Transparent air duct:

※ **Must be kept unobstructed with the atmosphere, and pay attention to protection during installation**, especially when passing through the threading tube, it is necessary to protect it with tape before threading to avoid water ingress. If water ingress occurs, it may cause water depth errors and other phenomena.

The transparent air duct cannot be folded, and the bending angle cannot be $<90^\circ$ when threading the tube.



5.3 Sensor assembly diagram



Sensor before assembly (including all accessories)



Picture after assembly



After being fixed to the bracket,
the sensor base can be fixed to the bracket with M8 or M10 bolts for later maintenance

6.Communication Description

6.1 Serial port parameters

- (1) The hardware uses RS485, master-slave half-duplex communication, the master calls the slave address, and the slave responds to the communication.
- (2) Data frame 10 bits, 1 start bit, 8 data bits, 1 stop bit, no check;
- (3) Baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 128000, 256000 (default is 9600).

6.2 Read a single register

Function code: 03H

Host sending							
1	2	3	4	5	6	7	8
ADDR	03H	Starting register high byte	Starting register low byte	Register quantity high byte	Register quantity low byte	CRC code low bytes	CRC code high bytes

Byte 1 ADDR: slave machine address code (0x01 ~ 0xFE);

Byte 2 03H: function code;

Bytes 3 and 4: address of the register to read;

Bytes 5 and 6: the number of registers to read, read a single register is 0x0001;

Bytes 7 and 8: CRC16 check code from byte 1 to byte 6.

Slave returns						
1	2	3	4	5	6	7
ADDR	03H	Total bytes	Data high byte	Data low byte	CRC code low byte	CRC code high byte

Byte 1 ADDR: slave machine address code (0x01 ~ 0xFE);

Byte 2 03H: function code;

Byte 3: the total number of bytes received. If a single register is read, the total number of bytes is 02;

Bytes 4 and 5 bytes: register data, each data of 2 bytes;

Bytes 6 and 7: CRC16 check code from byte 1 to byte 5.

6.3 Read multiple registers

Function code: 03H

Host Sending							
1	2	3	4	5	6	7	8
ADDR	03H	Starting register high byte	Starting register low byte	Register quantity high byte	Register quantity low byte	CRC code low byte	CRC code high byte

Referring to the way of reading a single register, when distance and temperature are read at the same time, the number of registers is 0x0002;

Slave returns									
1	2	3	4、5		...	N-1、N		N+1	N+2
ADDR	03H	Total bytes	Data 1 high bytes	Data 1 low bytes	...	Data N high bytes	Data N low bytes	CRC code low bytes	CRC code high bytes

Referring to the way of reading a single register, data 1 is the starting register value of reading, each data occupies 2 bytes, and how many data are returned according to the number of registers read by the user.

6.4 Write a single register

Function code: 06H

Host Sending							
1	2	3	4	5	6	7	8
ADDR	06H	Register address high bytes	Register address low bytes	Data high byte	Data low byte	CRC code low byte	CRC code high byte

Byte 1 ADDR: slave machine address code (0x01 ~ 0xFE);

Byte 2 06H: function code;

Bytes 3 and 4: the address of the written register;

Bytes 5 and 6: register address of the register data;

Bytes 7 and 8: CRC16 check code from byte 1 to byte 6.

Slave returns							
1	2	3	4	5	6	7	8
ADDR	06H	Register high bytes	Register low bytes	Data high byte	Data low bytes	CRC code low bytes	CRC code high bytes

Byte 1 ADDR: slave machine address code (0x01 ~ 0xFE);

Byte 2 06H: function code;

Bytes 3 and 4: the address of the written register;

Bytes 5 and 6: register address of the register data;

Bytes 7 and 8: CRC16 check code from byte 1 to byte 6.

6.5 Error code

1	2	3	4	5
ADDR	Function code	Error message code	CRC code low bytes	CRC code high bytes

Byte 1 ADDR: slave machine address code (0x01 ~ 0xFE);

Byte 2 83H or 86H or 90H: function code (83H means read instruction error, 86H means write instruction error).

Byte 3: refer to the error message code table;

Bytes 4 and 5: CRC16 check code from byte 1 to byte 3.

Error Message Code Table	
Information code	Remarks
01H	Illegal function code
02H	Illegal data address
03H	Illegal data values
04H	CRC16 verification error
05H	Correct reception
06H	Receive error
07H	Error in parameters

6.6 Register definition table

Register Address	Function	Read/Write	Note
0x0000	Instantaneous value of water depth	RO	4-byte floating point number high 2 bytes
0x0001	Instantaneous value of water depth	RO	4-byte floating point number low 2 bytes
...	Reserved		
...	Reserved		
...	Reserved		
0x000A	Instantaneous value of temperature	RO	4-byte floating point number high 2 bytes
0x000B	Instantaneous value of temperature	RO	4-byte floating point number low 2 bytes
0x000C	instantaneous flow velocity	RO	4-byte floating point number high 2 bytes
0x000D	instantaneous flow velocity	RO	4-byte floating point number low 2 bytes
...	Reserved		
...	Reserved		
...	Reserved		
0x0020	Instrument address	R/W	0x0100~0xFE00 (default address: 01)
0x0021	Baud rate	R/W	0x0000 (default baud rate: 9600bps)
...	Reserved		

6.7 Example

Ultrasonic Doppler Flow Velocity Meter			
Instruction	Send	Receive	Notes
Read Instruction	01 03 00 00 00 02 C4 0B	01 03 04 3F 33 33 33 52 CD	Read water depth value: 0.70 meters
	01 03 00 0A 00 02 E4 09	01 03 04 41 D4 00 00 AE 37	Read temperature value: 26.5℃
	01 03 00 0C 00 02 04 08	01 03 04 3E 80 00 00 F6 33	Read flow velocity value: 0.25m/s
	01 03 00 20 00 01 85 C0	01 03 02 01 00 B9 D4	Read instrument address as 01
	01 03 00 21 00 01 D4 00	01 03 02 00 00 B8 44	Read baud rate as 9600
Write instruction	01 06 00 20 05 00 8B 50	01 06 00 20 05 00 8B 50	Change instrument address as 05
	01 06 00 21 05 00 DA 90	01 06 00 21 05 00 DA 90	Change baud rate as 19200
Error instruction	01 06 00 18 00 00 09 CD	01 86 02 C3 A1	02 indicates error code: illegal data address

6.8 Register description

(1) Instantaneous value of water depth (REG_ADDR: 0000H, 0001H)

The instantaneous value of water depth is represented by a 4-byte single-precision floating point number.
Unit: m.

(2) Instantaneous value of temperature (REG_ADDR: 000AH, 000BH)

The instantaneous value of water depth is represented by a 4-byte single-precision floating point number.
Unit: ℃.

(3) Instantaneous flow velocity (REG_ADDR: 000CH, 000DH)

The instantaneous value of flow rate and instantaneous value of water depth are represented by a 4-byte single-precision floating point number. Unit: m/s.

(4) Instrument address (REG_ADDR: 0021H)

Slave address: 0x0001~0x00FE, factory default address: 01.

(5) Baud rate (REG_ADDR: 0021H)

Default serial port baud rate: 9600bps.

Register Value	Baud Rate
0x0000	9600
0x0001	1200
0x0002	2400
0x0003	4800
0x0004	9600
0x0005	19200
0x0006	38400
0x0007	57600
0x0008	115200
0x0009	128000
0x000A	256000