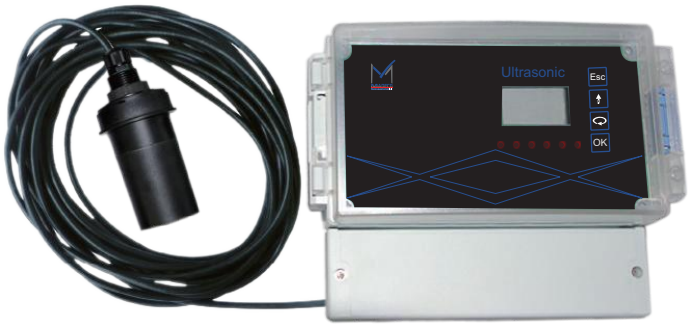
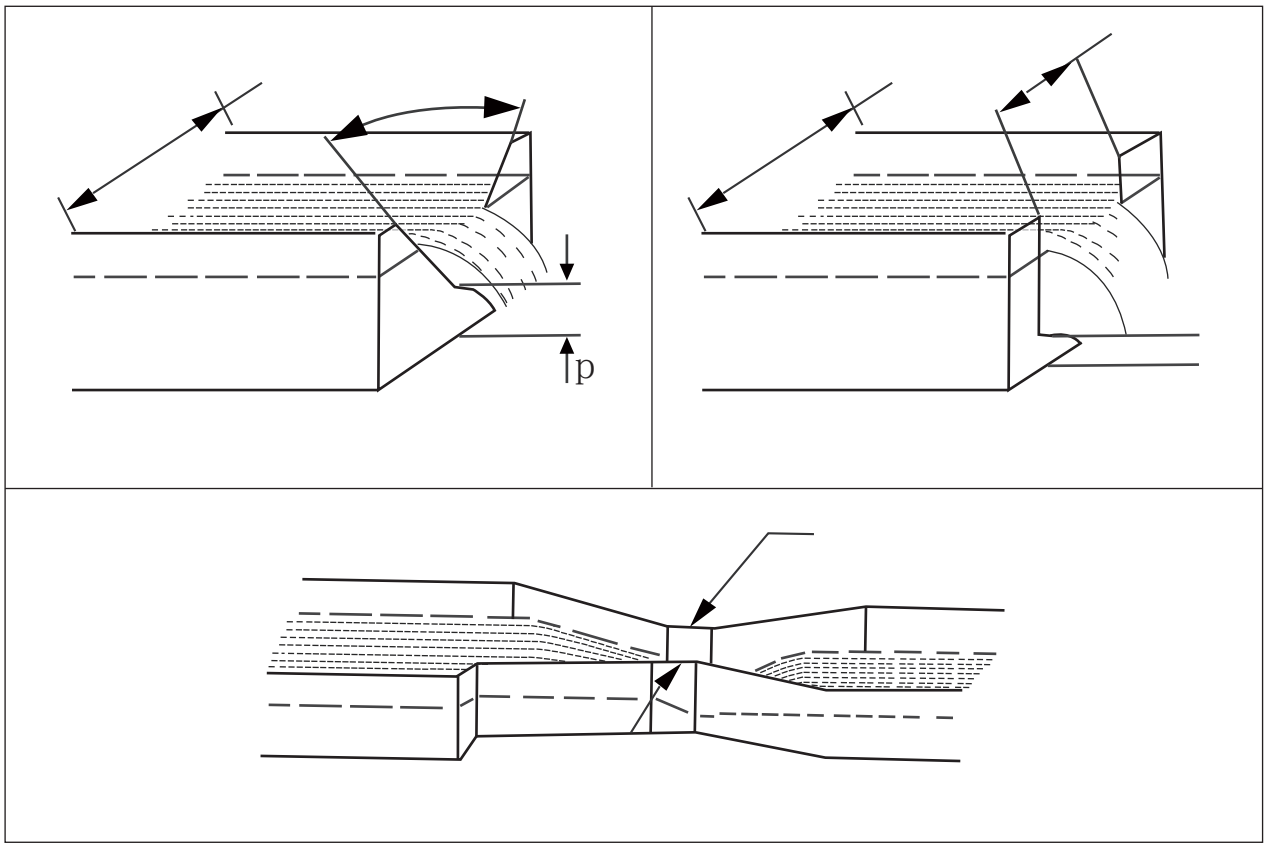
MADECO Split Ultrasonic Open Channel Flowmeter

Operating Instruction

Model : MDLA7





Chapter II Instrument Introduction

Application: Parshall ume non-throat trough,
rectangular trough and other weirs ow measurement.
Flow range: 0.1L/s~10m³/s
Water level accuracy: ±0.25% (full scale)
Flow accuracy: ±0.5% (depending on the weir plate type)
Process temperature: -40~80℃
Signal output: 4~20mA+RS485 Modbus protocol
Power supply: 110V~230V AC
Protection level: control table IP65
sensor IP68

MDRA7 (open channel owmeter)

(2)e water outlet must be lower than the bottom of the tank where the Parshall tank is installed

Chapter III Installation

3.1 Parshall ume installation requirements

(1)The Parshall ume must be installed horizontally in the channel and lled with concrete around it.

to ensure that the water owing through the Parshall tank cannot be stagnant and must be discharged immediately. Rectangular weirs and right-angled triangular weirs must also be satised!
(3)The installation of instruments and probes should avoid frequency conversion and power line interference as much as possible.
(4)The water ow in the channel should be stable and there should be no foam or the like.

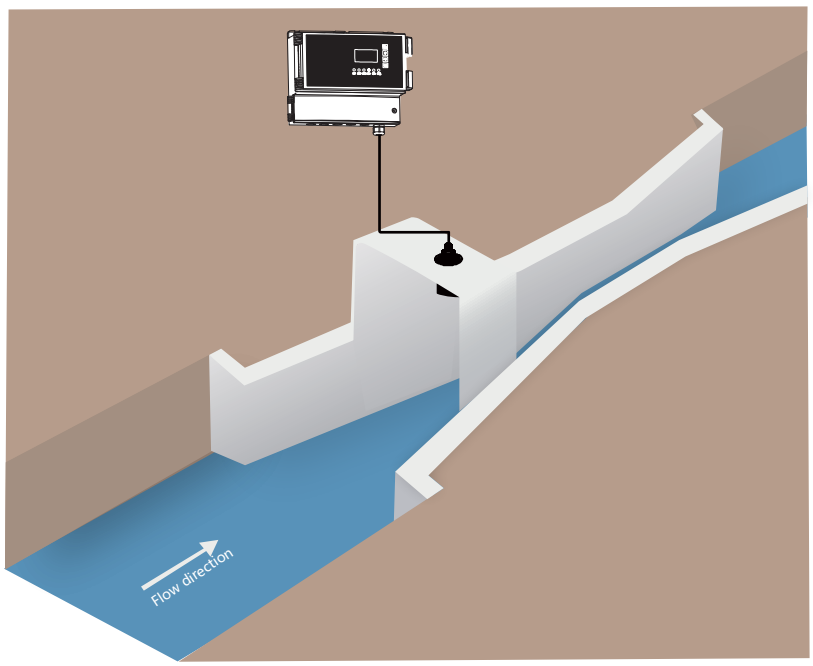


Figure 2 Schematic diagram of Parshall Flume installation

Commonly used models and specifications of open channel flowmeter installation dimensions (unit:mm)

s	thick section			Contraction section			Diffusion section			Wall height	Flow parameters		Flow range (t/h)
	b	L	N	B1	L1	La	B2	L2	K	D	C	N	Q
1	25	76	29	167	356	237	93	203	19	230	217	1.550	0.3~20
2	51	114	43	214	406	271	135	254	22	254	435	1.550	0.6~48
3	76	152	57	259	457	305	178	305	25	457	638	1.550	2.8~115
4	152	305	114	400	610	407	394	610	76	610	1372	1.580	5.4~400
5	228	305	114	575	864	576	381	457	76	762	1927	1.530	9~903
6	250	600	114	400	610	883	550	920	80	800	2020	1.513	10.8~900
7	300	600	230	840	1350	902	600	920	80	950	2444	1.521	12.6~1440
8	450	600	230	1020	1425	948	750	920	80	950	3736	1.537	16.2~2268
9	600	600	230	1200	1500	1000	900	920	80	950	5051	1.548	45~3060

Table Parshall fume parameters

3.2 Installation requirements for right-angle triangular weirs and rectangular weirs

(1) The height of the bracket is generally 400 mm.

(2) There should be no unevenness at the connection between the bracket and the ground.

(3) The installation of instruments and probes should avoid frequency conversion and power line interference as much as possible.

(4) The water flow in the channel should be stable, and there should be no foam or the like.

3.2.1 Installation and parameters of right angle triangular weir

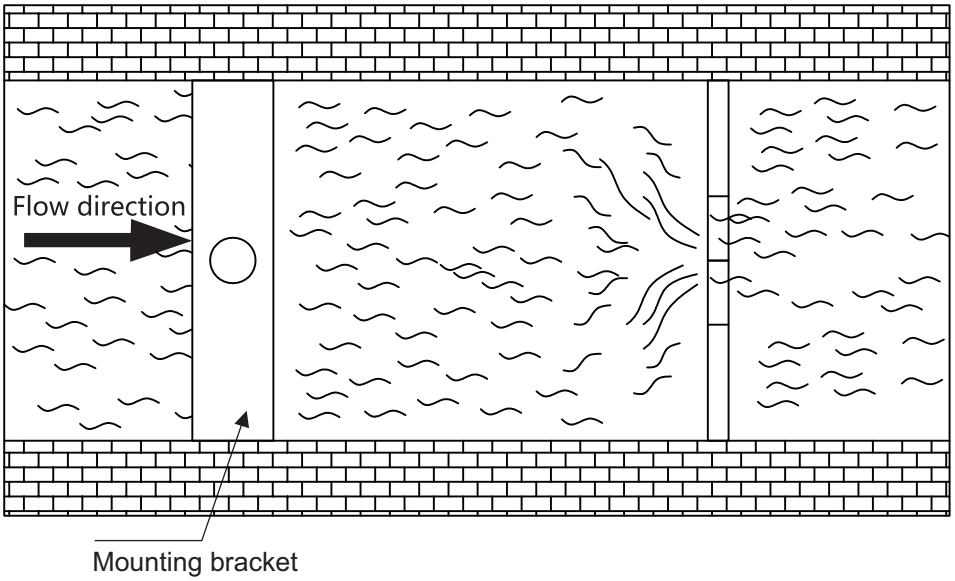


Figure 4 schematic diagram for the installation of a right-angled triangular weir

Commonly used models and specifications of open channel flowmeter installation dimensions (unit:mm)

S/N	Flow range(ton/hour)		Applicable channel	B	He	P	Flow parameters	
	Q(min)	Q(max)	width x height				n	c
1	0	20	275X220	275	110	110	2.5	5083
2	0	40	360X288	360	144	144	2.5	5083
3	0	80	475X380	475	190	190	2.5	5083
4	0	121	560X448	560	224	224	2.5	5083
5	0	182	660X528	660	264	264	2.5	5083
6	0	272	775X620	775	310	310	2.5	5083
7	0	395	900X720	900	360	360	2.5	5083
8	0	616	1075X860	1075	430	430	2.5	5083
9	0	899	1250X1000	1250	500	500	2.5	5083
10	0	1359	1475X1180	1475	590	590	2.5	5083

Table 2 Parameters of right-angled triangular weirs

3.2.2 Installation and parameters of rectangular weir

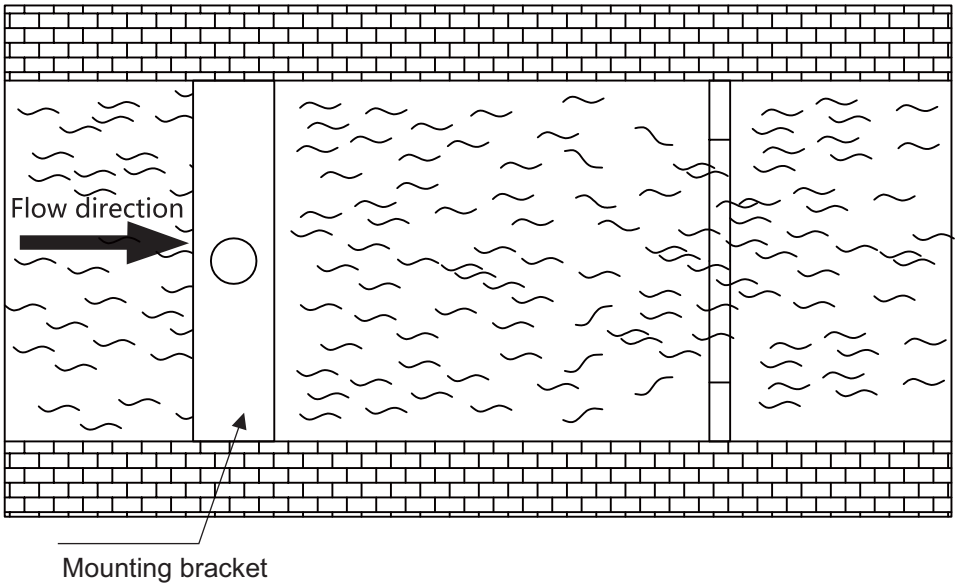


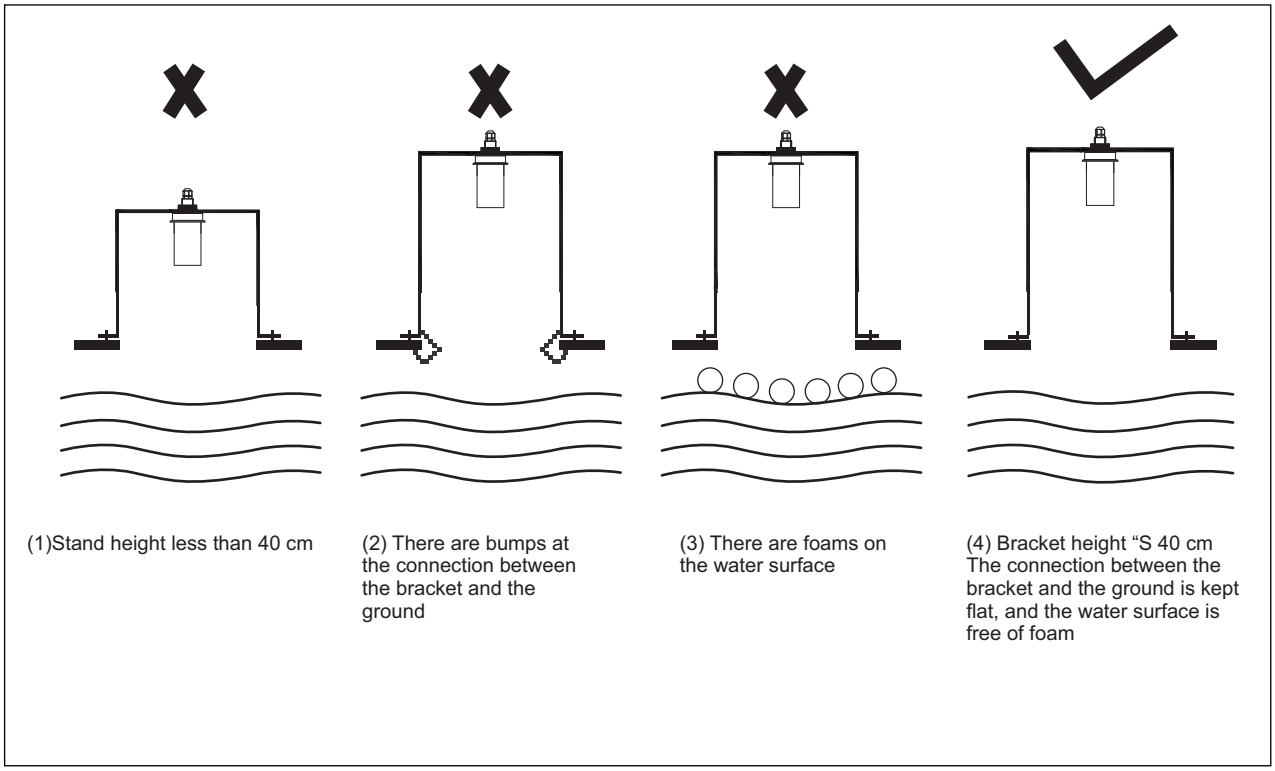
Figure 4 schematic diagram of rectangular weir installation

Commonly used models and specifications of open channel flowmeter installation dimensions (unit:mm)

S/N	Flow range(ton/hour)		Applicable channel	B	b	h	P	Flow parameters	
	Q(min)	Q(max)	＞width x height					n	c
1	0.04	85	＞500X500	500	200	163	337	1.5	1280
2	0.05	195	＞650X650	650	260	239	411	1.5	1660
3	0.08	414	＞750X750	750	375	308	442	1.5	2406
4	0.10	803	＞850X850	850	510	387	463	1.5	3318
5	0.15	1662	＞1000X1000	1000	700	501	499	1.5	4669
6	0.19	3332	＞1250X1250	1250	875	683	567	1.5	5886
7	0.26	6504	＞1450X1450	1450	1160	857	593	1.5	8178
8	0.33	12643	＞1800X1800	1800	1440	1142	658	1.5	10344
9	0.48	26396	＞2150X2150	2150	1935	1453	697	1.5	15060
10	0.62	52524	＞2700X2700	2700	2430	1929	771	1.5	19596

Table 3 Parameters of rectangular weirs

3.3 Common installation errors of the mounting bracket



(1)Stand height less than 40 cm

(2) There are bumps at the connection between the bracket and the ground

(3) There are foams on the water surface

(4) Bracket height “S 40 cm The connection between the bracket and the ground is kept flat, and the water surface is free of foam

Figure 5 wrong installation

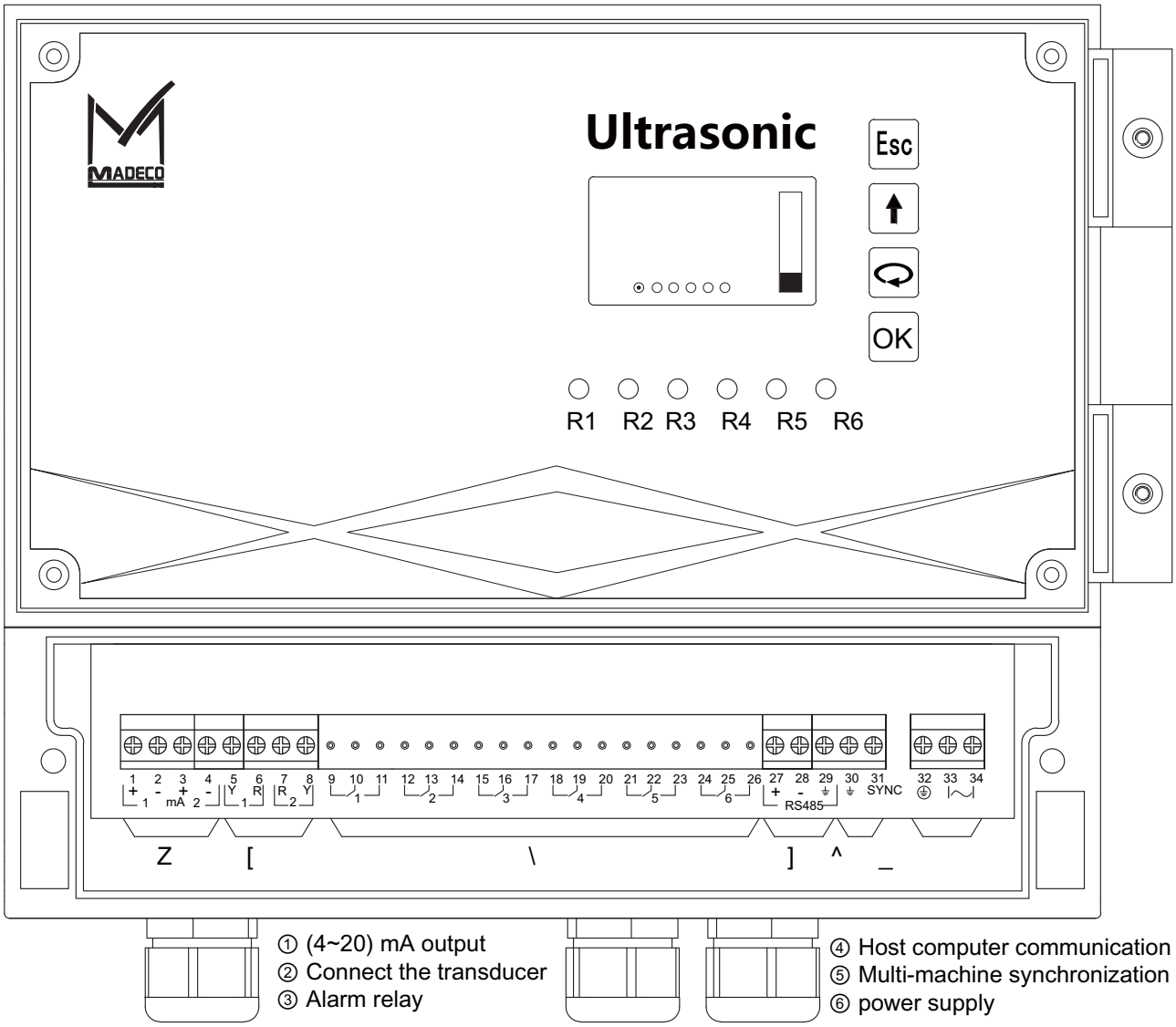

Ultrasonic
Esc
OK
R1 R2 R3 R4 R5 R6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 SYNC 32 33 34
mA
RS485
Z [\ ] ^ _
① (4~20) mA output
② Connect the transducer
③ Alarm relay
④ Host computer communication
⑤ Multi-machine synchronization
⑥ power supply

Figure 6

Chapter V Technical Parameters

(1) General data

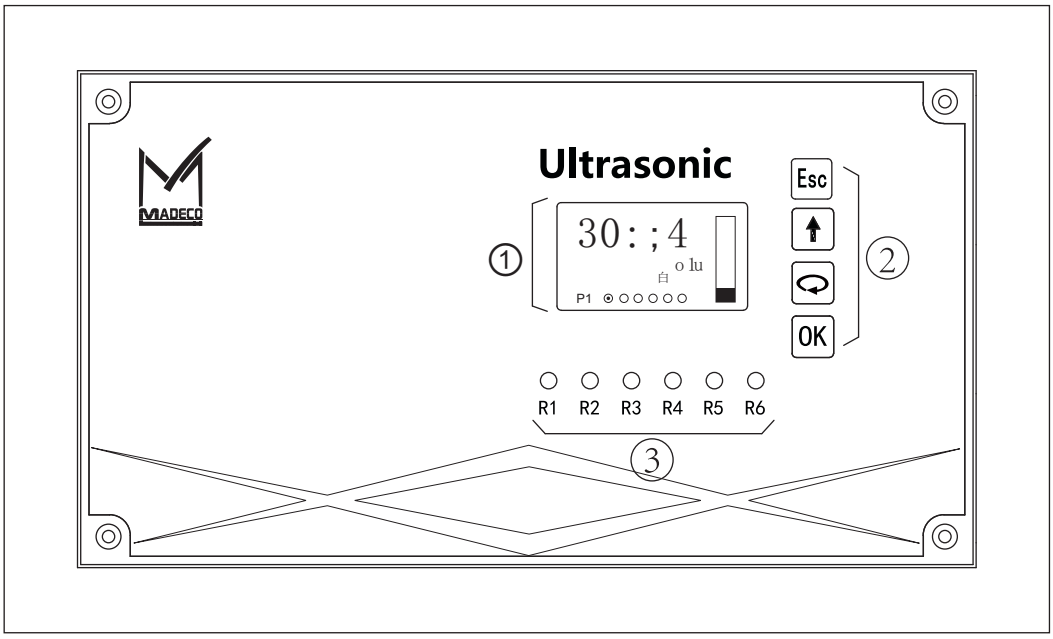
Ultrasonic parameters	Water level accuracy	≥0.25% (full scale)
	Flow accuracy	≥0.5% (depending on the weir plate type)
	Flow range	0.1L/s ~ 10m^3/s
	Relative humidity	100%
	Process temperature	-40~80℃
	Work pressure	0.1MPa
	Process connection	G1"A external pipe thread
Control Table Parameters	Display/Program	Dot matrix LCD display echo curve, English menu system
	resolution	1mm
	voltage	110V~230V AC
	Load Resistance	500L (Max)
	alarm relay	2 SPDT relays, contact capacity 5A/250V (optional)
	signal output	4~20mA (transmit instantaneous flow) RS485 (transmit instantaneous and cumulative flow)
Transducer parameters	blind spot	0.25m
	frequency	55K
	launch angle	5°
	degree of protection	IP65
	Probe protection class	IP68
	Shell material	PC

Chapter VI Instrument Debugging

6.1 Programmer debugging

6.1.1 Key functions

There are 4 buttons on the instrument panel, through which the instrument can be debugged. The language of the debug menu is selectable. After debugging, the LCD screen displays the measured value, and the measured value can be read out very clearly through the glass window.



①LCD display ②button ③Alarm indicator light

Figure 7

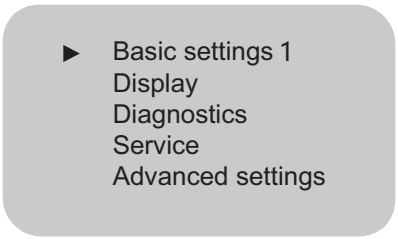
Esc mg {	mg {	mg {	OK mg {
- Exit programming state - Escape to previous menu level - During operation, echo waveform display	- modify parameter value - Select the point number - Single-transducer/dual-transducer display mode switching at runtime	- Select programming item - select the edit parameter bit - Parameter item content display - Single-transducer/dual-transducer display mode switching at runtime	- Enter programming state - Confirm programming item - Confirm parameter modification

6.1.2 Commissioningsteps

(1) Enter the main menu:

In the running state, press the OK key to display the programming main menu. ere is a triangular cursor on the le side of the main menu. Press the key to change the position of the triangular cursor. Press OK key to enter the menu pointed by the cursor. Press the ESC key to exit the current menu. Each menu has a corresponding menu number in the upper right corner.

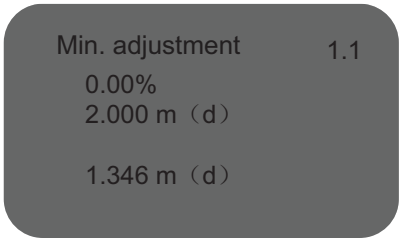
e display interface is as follows:

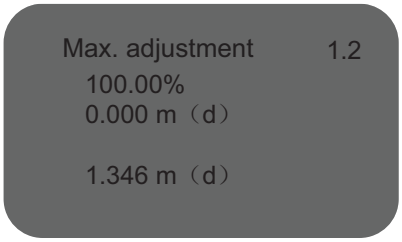


(2) Set the range

Enter the "Basic Settings" menu, the programmer will directly display the rst submenu "Low Position Adjustment". e dierence between this setting and the next submenu "High Adjustment" jointly determines the 4-20mA current output range of the meter.

Example: In general, if the distance from the zero point of the instrument to the tank bottom is 2m, the "low adjustment" should be set to 0.00%, 2.000m (d); the "high adjustment" generally defaults to 100%, 0.000m (d). e display interface is as follows:

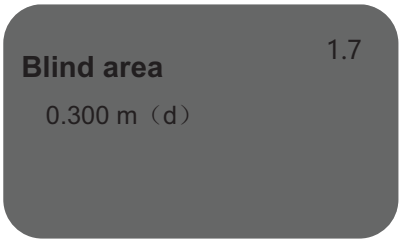




(3) Set blind area

Press the key several times to cycle through the menu until the “Blind Zone Range” interface is displayed. Due to the multiple overlapping of the short-distance part of the transmitted signal and the echo signal, it cannot be identied, resulting in the inability to measure, which we call "blind area". Each meter has a corresponding set point, which represents the unmeasurable distance down from the zero point of the meter. is value can be set according to the eld application, but the area accessible to the liquid level cannot be included in this range. e meter species the set value as the minimum set value.

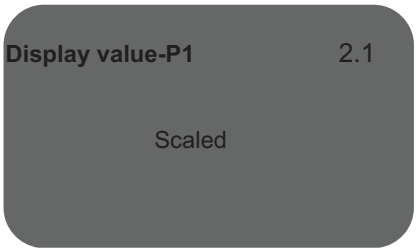
e display interface is as follows:

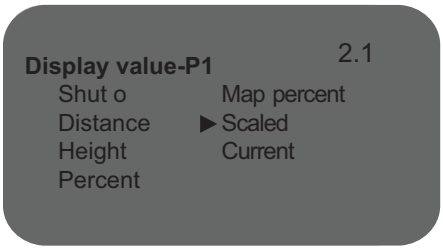


(4) Display content

Aer entering the "Display" menu, the rst submenu is "Display value". Aer setting the options, the instrument programmer will display the corresponding content. e factory default value is "**Scaled**", which cannot be changed here, otherwise the port cannot output trac.e

display interface is as follows:



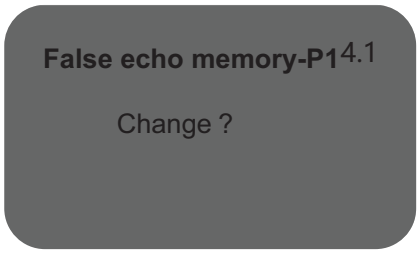


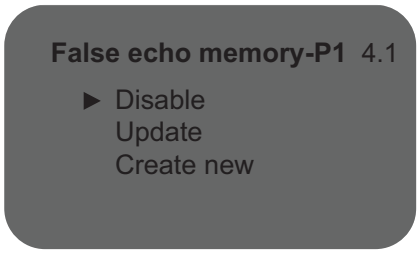
Explanation of display content:

① Not working: the display is not working (the instrument does not measure distance at this time);
② Empty height: the distance from the instrument zero point to the medium surface;
③ Material height: liquid level height, its value is equal to "low level adjustment" minus "empty height";
④ Percentage: the percentage of the liquid level in the measuring range;
⑤ Mapping percentage: the percentage of the current mapping amount to the maximum mapping amount;
⑥ Calibration amount: Convert height to other units, such as: ow, weight, volume, etc. (need to turn on the calibration amount function);
⑦ Current: e current value that the instrument should output at the current liquid level.
⑧ Display dierence: the liquid level dierence that the instrument should output under the current liquid level height of the two transducers.
⑨ Display average value: the average value of the liquid level that the instrument should output under the current liquid level height of the two transducers.

(5) False echo storage function:

e false echo storage function can eliminate the inuence of interference waves on real signals under certain circumstances.
Enter the "Service" menu, the rst submenu is "False Echo", click to enter the setting interface and display four options.
e display interface is as follows:

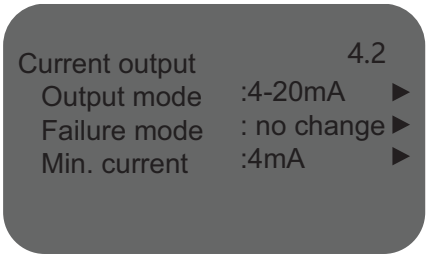




① Disable Disableall existing false echoes;
②Update: update the false echo, which has no eect on the existing false echo. Aer the input distance is saved, it will automatically learn the echo intensity and store it;
③Create new: Start to create or re-create false echoes. Aer new creation, it will replace the previous false echoes. Aer the input distance is saved, it will automatically learn the echo strength and store it;

(6) Select current output mode

Aer the setting of "false echo" is completed, press the button to cycle through the menu to display "current output". ere are three setting items, and the display interface is as follows:



① Output mode: You can choose the output direction of the current when the meter is working. e factory default setting is 4-20mA, and the output current is proportional to the instantaneous ow rate; aer selecting 20-4mA, the output current is inversely proportional to the instantaneous ow rate.
② Fault mode: e output mode of the current when the instrument displays a non-hardware fault. e four modes are: no change, 20.5mA, 22mA and 4mA. e factory default is no change mode, which is to maintain the output current of the previous normal working state.
③ Min. current: limit the minimum output current of the instrument, optional 4mA or 3.9mA

6.2 Serial communication debugging

6.2.1 Hardware and data format

Hardware interface: RS485
Communication protocol: Standard Modbus Baud rate: 9600
Data format RTU 8N1
Check CRC16 polynomial A0

6.2.2 Station number range 0~15 can be set

Hex is 0-F

6.2.3 Protocol Details

(1) Modbus communication protocol function code 03:

Use the 03 function code of the Modbus communication protocol to read the value of the sensor register (instrument).

(2) Information frame format: (all data below are in hexadecimal)

The command format of the host is slave address, function code, start address, byte number and CRC code. The command format of the slave machine response is the slave machine address, function code, data area and CRC code. The data in the data area is a binary code, two bytes, with the high bit first. CRC codes are two bytes, low order first:

Host send	Station No (1B)	Function code (1B)	Register star address (2B)	Read points (2B)	CRC (2B)
	01	03	00 0X	00 0XX	XX XX

Table 4 Host commamds

Station number (address): a byte "01"; Function code: one byte "03" (version 3 has function code "06"; register address: two bytes; 0000-000D is acceptable;

0000, return the current empty height value of instrument sensor P1, the unit is cm, and the returned value is a 32-bit integer;
0002, return the current empty height value of instrument sensor P1, the unit is mm, and the returned value is a 32-bit integer;
0004, return the instrument The current water level value of sensor PI, the unit is cm, and the returned value is a 32-bit integer
0006, the current water level value of the meter sensor PI is returned, the unit is mm, and the returned value is a 32-bit integer;
000A, the instantaneous flow value of the meter sensor PI is returned, The return value is a floatin
000C, returns the cumulative flow value of the instrument sensor P1, and the returned value is a floating point type;
Read points: two bytes, set to 0002;
CRC: check code, two bytes;

Slave answer	Station number (1B)	Function code (1B)	Read bytes (1B)	Data (4B)	CRC (2B)
	01	03	04	XX XX XX XX	XX XX

Table 5 Slave response

Among them, T1-T4 represents 4 quiet periods reserved at the beginning and end of each frame;
Station number (address): one byte "01", which is the same as the address sent by the host;
Function code: one byte "03", which is the same as the function code sent by the host;
Response data byte count: "04", that is followed by 4 bytes of data;
Data: The reading order of four bytes is the same as the standard modbus protocol;
CRC: check code, two bytes.

6.3 PC software

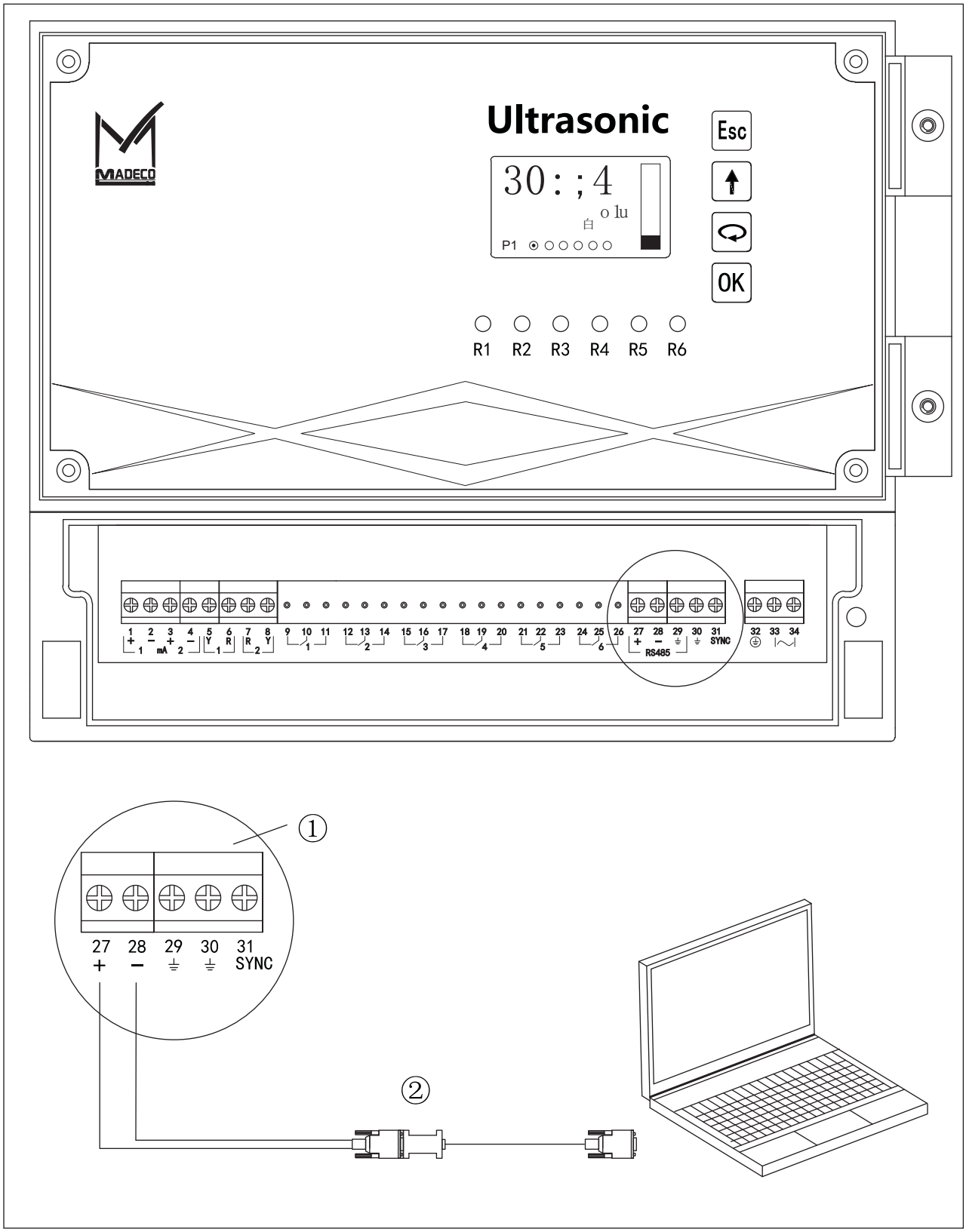
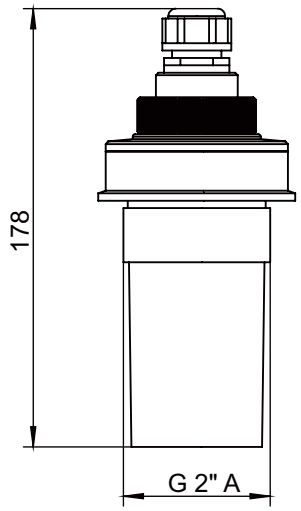


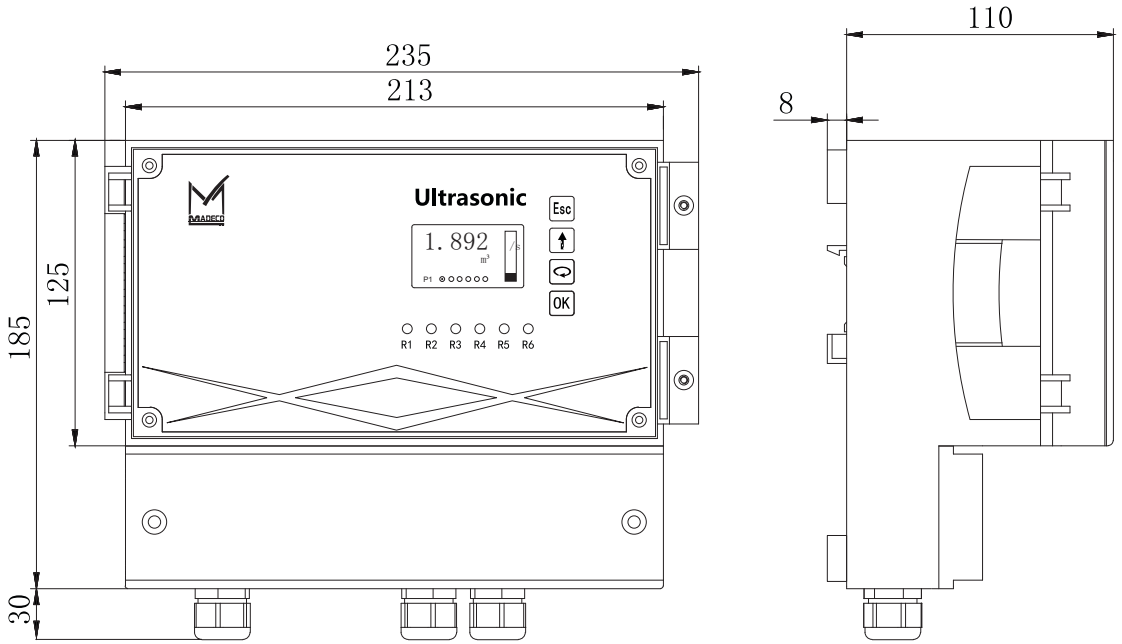
Figure 8

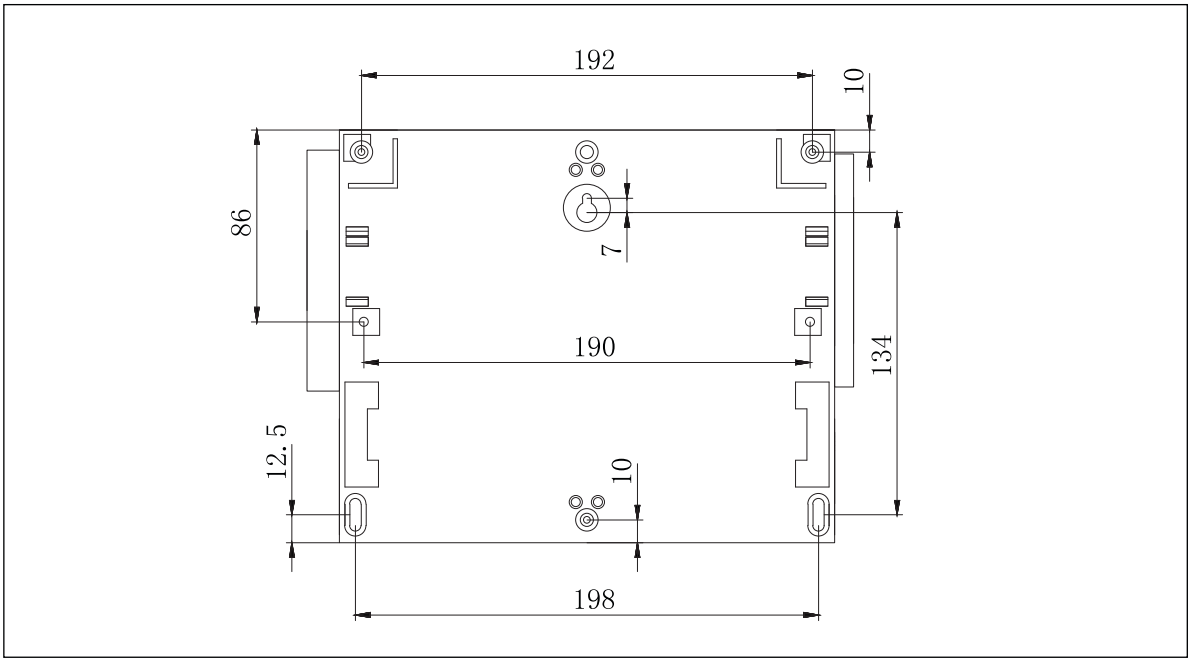
①Control meter terminal

②Converter

Chapter VII Structural Dimensions (Unit: mm)







Chapter VIII Transportation and Storagee

transportation and storage conditions of the open channel owmeter shall comply with the provisions of JB/T 9329, as well as the following provisions:

1. e open channel owmeter should be transported strictly according to the characteristics of the product and the requirements of the instructions during transportation.
2. e open channel owmeter should be stored in a dry and ventilated room with a relative humidity of not more than 80% at -20 to 60°C. Do not mix with corrosive substances. Instruments that have been stored for a long period of time should undergo corresponding tests before they can be sold or used.

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