

Low-range Turbidity Meter

Committed to process automation solutions

Datasheet



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Chapter 1 Product Overview

1.1 Product Information

1.1.1 Low-range Turbidity Sensor

The parallel light from the light source is directed into the water sample in the sensor by the low-range turbidity sensor and scattered by the suspended particles in the water sample. The scattered light forming a 90-degree angle with the incident light will be received by the silicon photocell receiver which is immersed into the water sample. The turbidity value of the water sample will be calculated according to the relationship between the 90-degree scattered light and the incident beam.

It is widely used in such fields as sewage plants, Drinking water plants, water stations, surface water, and industries for inspecting the turbidity.

Specification	Details
Size	Length 310mm*Width 210mm*Height 410mm
Weight	2.1KG
Main Material	Machine: ABS + SUS316 L
	Sealing Element: Acrylonitrile Butadiene Rubber
	Cable: PVC
Waterproof Grade	IP 66 / NEMA4
Measuring Range	0.01-100NTU
Measurement Accuracy	The deviation of reading in 0.001~40NTU is $\pm 2\%$ or $\pm 0.015\text{NTU}$, choose the bigger one; and it is $\pm 5\%$ in the range of 40-100NTU.
Flow Rate	$300\text{ml}/\text{min} \leq X \leq 700\text{ml}/\text{min}$
Pipe Fitting	Injection Port: 1/4NPT; Discharge Outlet: 1/2NPT
Storage Temperature	-15~65°C
Environmental Temperature Range	0~45°C
Calibration	Standard Solution Calibration, Water Sample Calibration, Zero Point Calibration
Length of Cable	Three-meter standard cable, it is not recommended to extend.
Warranty	One year

Table 1 The Specification of Low-range Turbidity Sensor

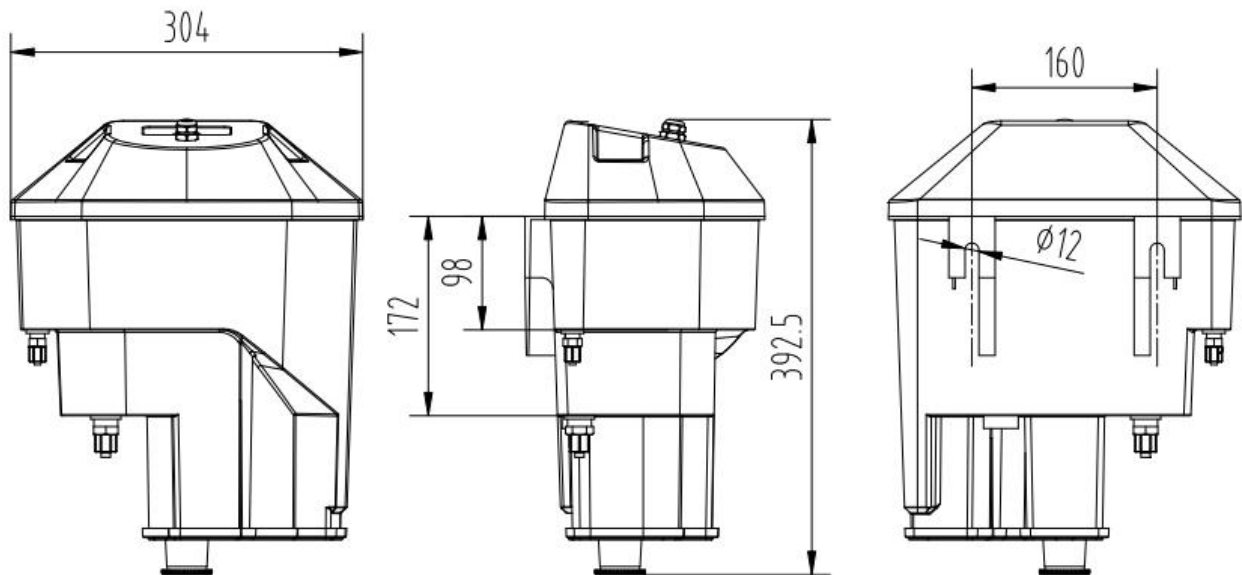
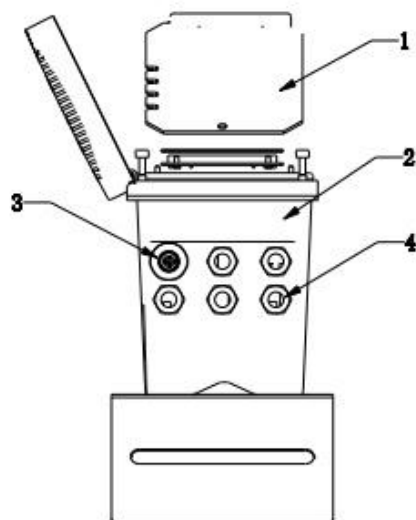


Figure 1 The Dimensions of Low-range Turbidity Sensor

1.1.2 Low-range Turbidity Transmitter

The transmitter can be used to display data measured by the sensor, so the user can get the 4-20mA analog output by transmitter's interface configuration and calibration. And it can make relay control, digital communications, and other functions a reality. The transmitter diagram is shown as figure 2.



- 1-High pressure protection board
- 2-transmitter
- 3- quick joint
- 4-cable joint

Figure 2 Transmitter

Specification	Details
Size	145*125*162mm L*W*H
Weight	1.3KG
Material of outside shell	lower casing: Aluminum with powder covering
	cover: PA66+GF25+FR
Waterproof Rate	IP65/NEMA4X
Storage Temperature	-20 to 70℃
Operation Temperature	-15 to 60℃
Power Supply	AC: AC220V, 50HZ, 5W DC: DC24V
Output	two-way analog output 4-20mA, response parameters and corresponding scope can be programmed Note: the maximum load is 500 ohms
Relay	three-way relay can be set up, and response parameters and response values can be programmed
Display Output	128 * 64 dot matrix LCD with LED backlight, which can be operated under the direct sunlight
Digital Communication	MODBUS RS485 communication function, which can transmit real-time measurements
Warranty Period	1 year

Table 2 Transmitter Specification

1.2 Safety Information

Please read this manual completely before opening the package, installing or using. Otherwise it may cause personal injury to the operator, or cause damage to equipment.

Warning labels

Please read all labels and signs on the instrument, and comply with the security label instructions, otherwise it may cause personal injury or equipment damage.



When this symbol appears in the instrument, please refer to the operation or safety information in the reference manual.



While this symbol indicates an electric shock or risk of death from electric shock.

Please read this manual completely. Pay particular attention to some notes or warnings, etc. To ensure that the protective measures provided by the equipment are not destroyed.

Chapter 2 Installation

2.1 Transmitter Installtion

You can install the transmitter in a variety of ways, please refer to the instructions of this manual for installation details.

2.1.1 Installation Components and Size

- ① Figure 3 shows the transmitter installation components.

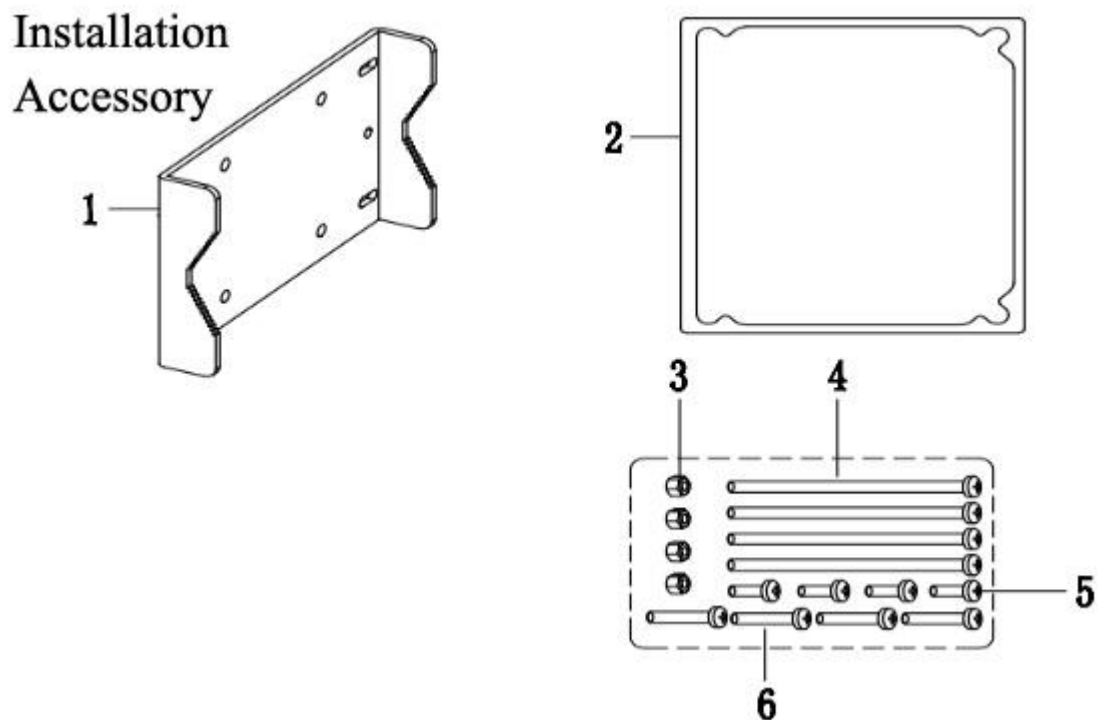


Figure 3 Installation Components

1- mounting plate	2- sealing ring of mounting plate
3- M5 nut	4- M5*100 bolt
5- M5*8 bolt	6- M5*40 bolt

② Figure 4 shows the transmitter installation size.

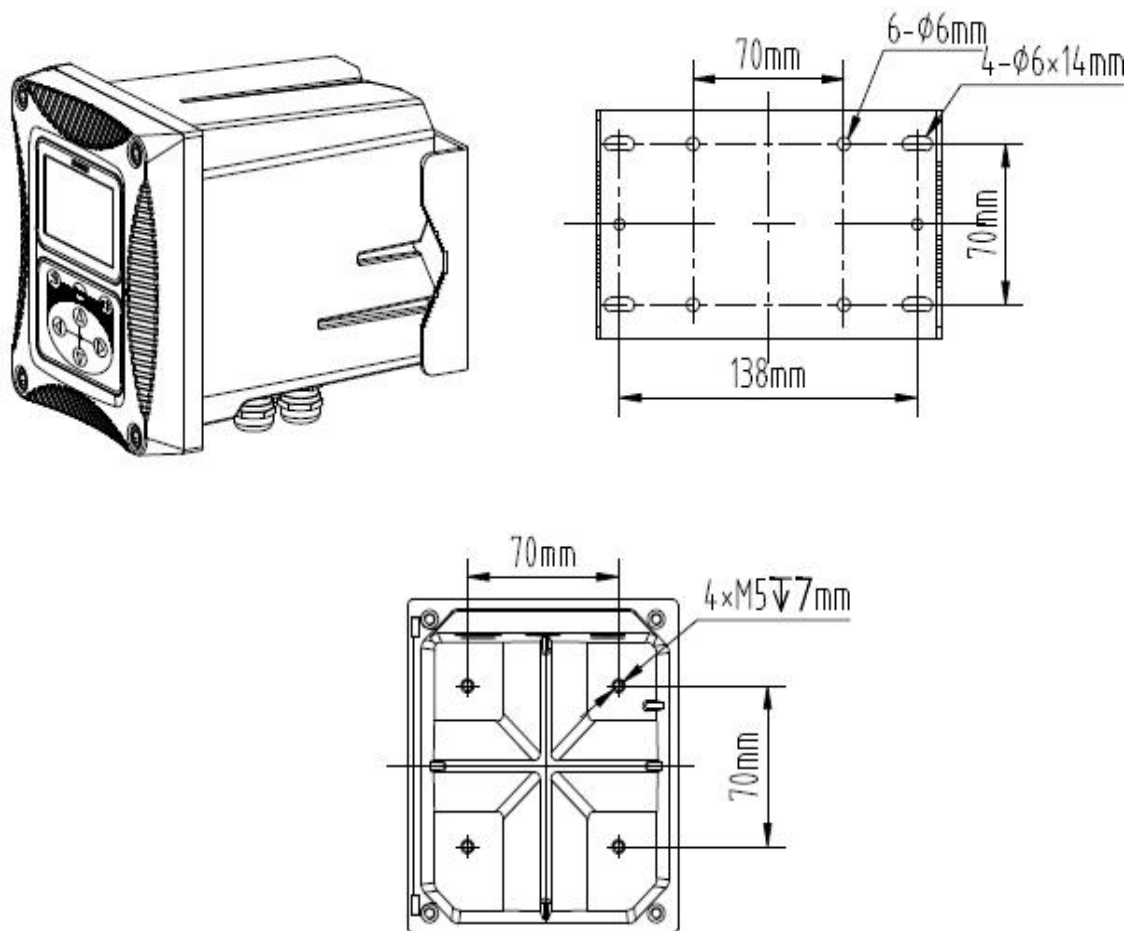


Figure 4 Installation Size

2.1.2 Installation Instructions

a. Pinch Tube Installation Method

Place the transmitter and mounting plate on both sides of the pinch tube, and then use the mounting bolts and nuts to fix them onto the Pinch Tube as shown in Figure 5.

b. Wall-mounted Installation Method

Mount the transmitter with mounting bolts and nuts onto the mounting plate, and then fix the mounting plate on the wall or plate.

c. Panel Installation Method

Firstly, set the transmitter into the panel, and then fixed the transmitter and install tableting with screws as shown in Figure 6. Bottom view and top view are shown in Figure 7.

In the installation way of clamp, the diameter of clamp is 1 inch to 2.5 inches.

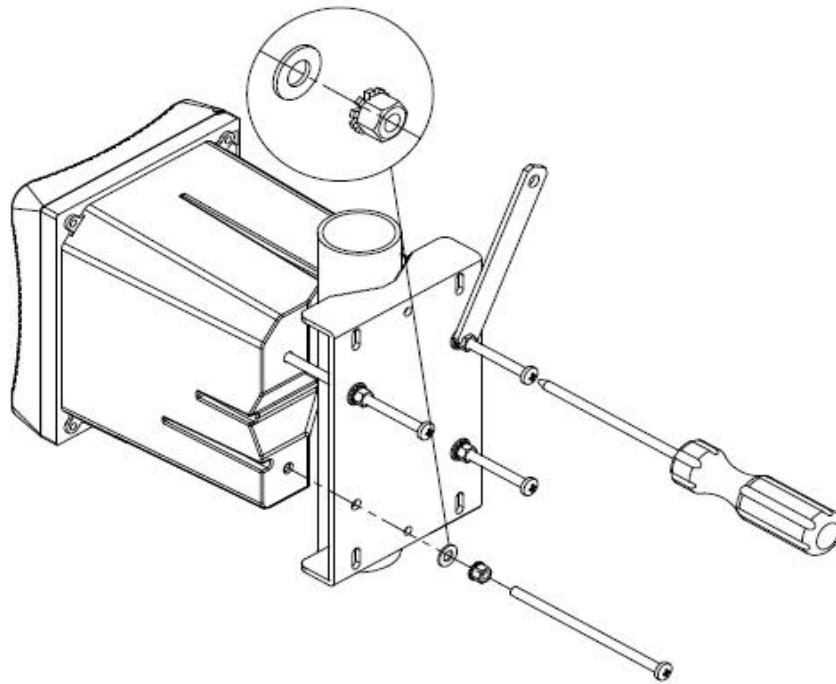


Figure 5 Installation Way of Clamp

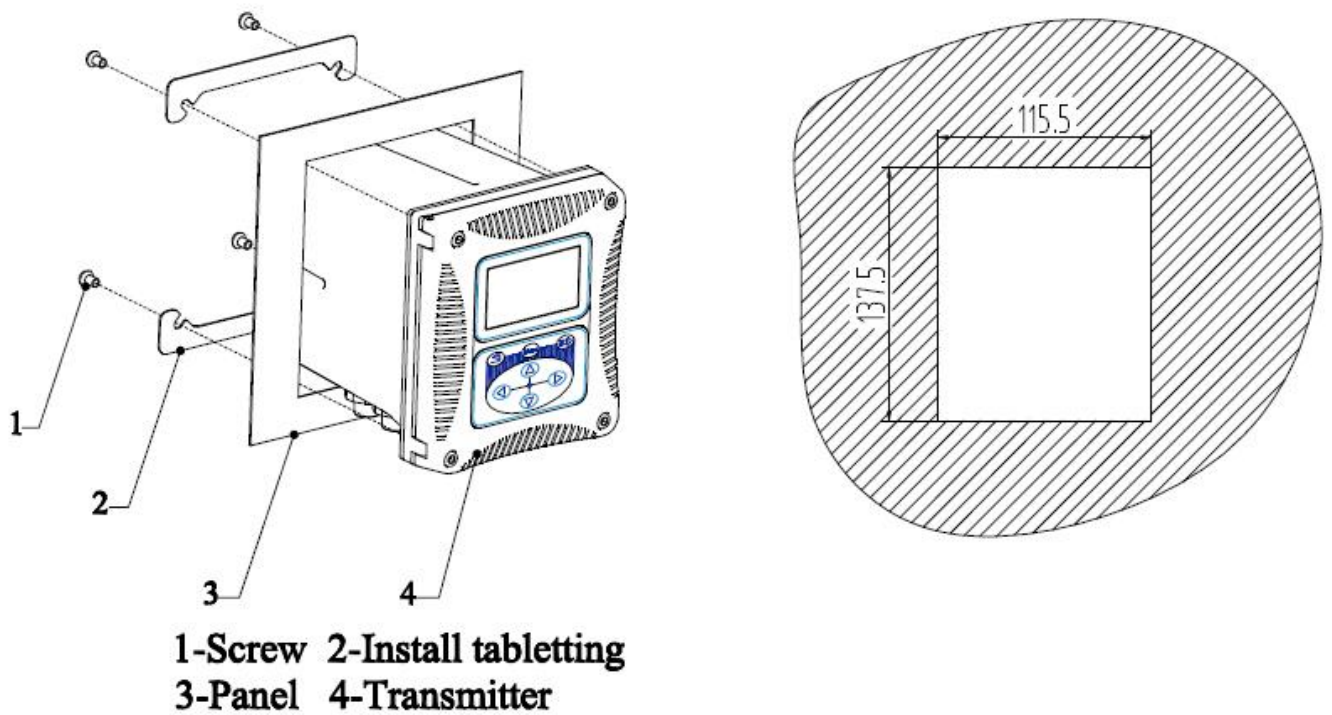


Figure 6 Panel Installation

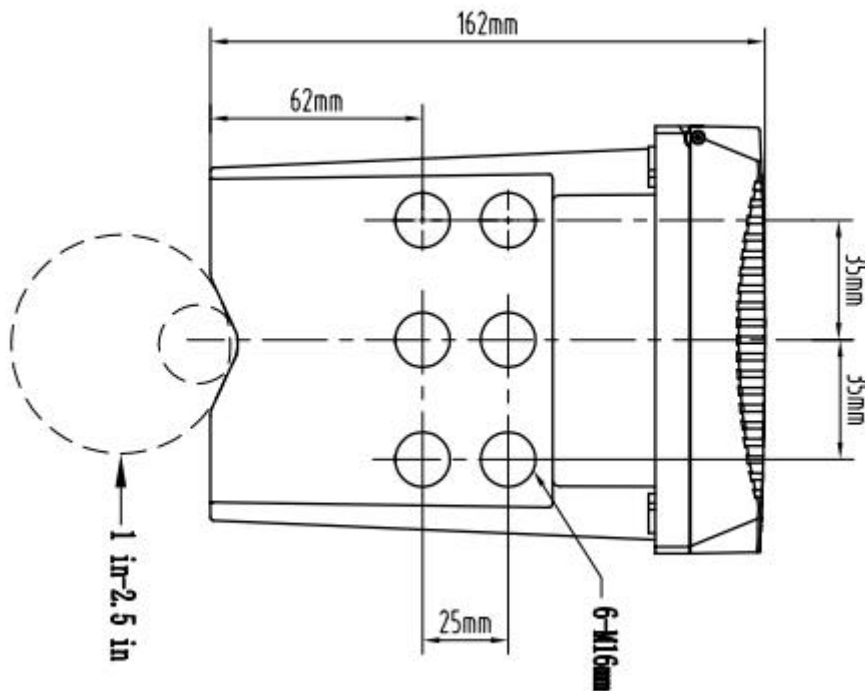
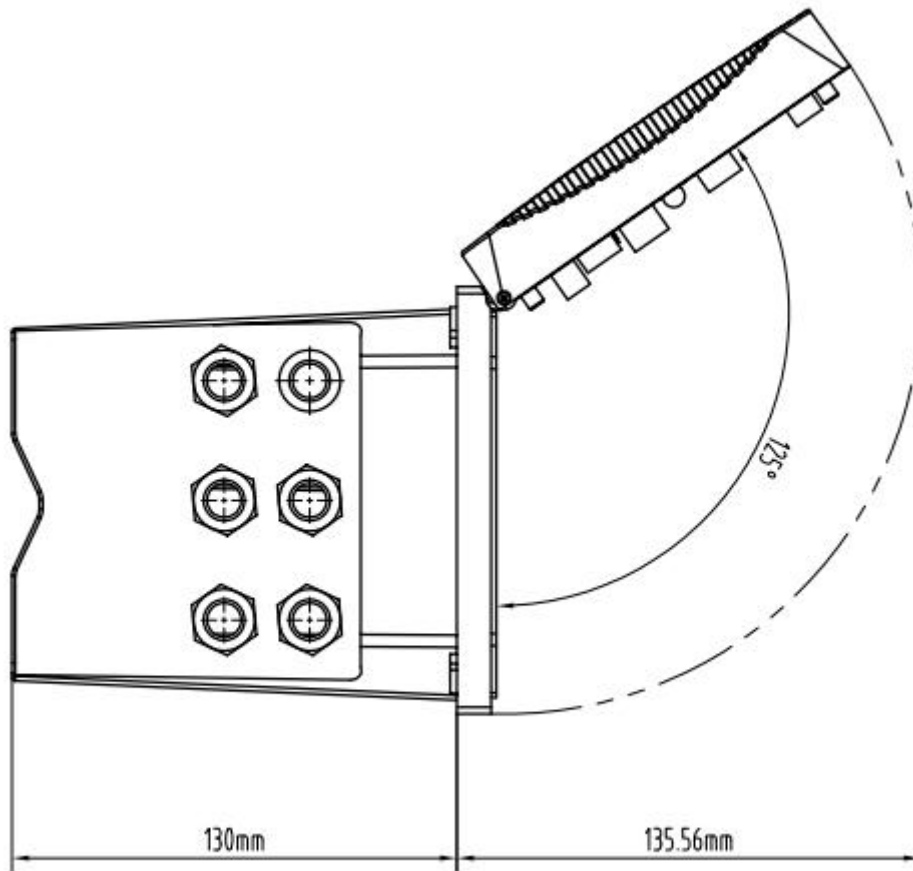


Figure 7 Bottom View, Top View

2.1.3 Wiring Installation

Figure 8 is the preview of internal wiring of the transmitter. Table is the wiring signal of the transmitter.

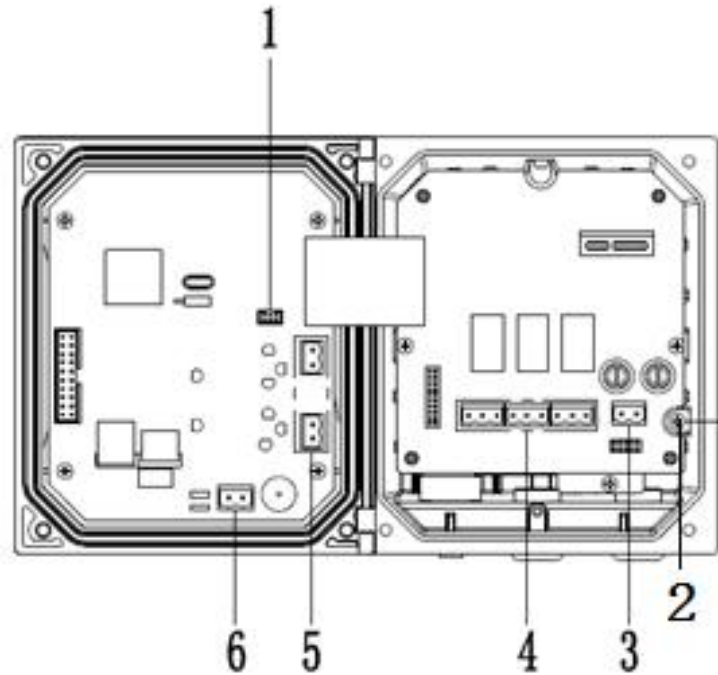


Figure 8 Preview of the Wiring

1- sensor interface	2- grounding
3- power supply interface	4- three-way relay
5- 4-20mA two-way interface	6- 485 communication interface

Table 3 Wiring Signal of the Transmitter.

2.1.4 Power Supply Wiring

The transmitter can use AC220V power supply. Please operate in strict accordance with the wiring instructions.

For the sake of safety and relevant electrical specification, there should be a local disconnect design, and it shall be suitable for all installation types. The connection mode of the power cord is shown as figure 9.

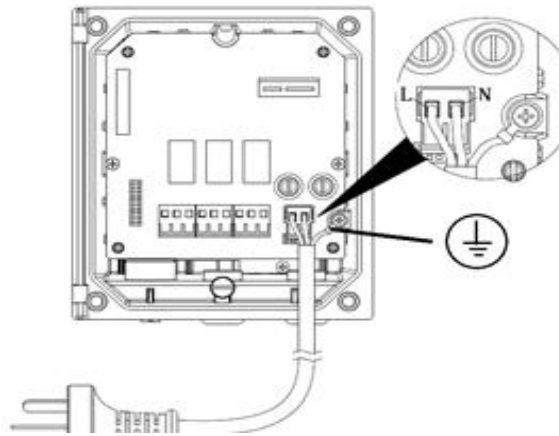


Figure 9 Power Supply Wiring

To ensure the safety in use, please be sure to be grounded.



Note: before any electrical connections, voltage protective layer must be pulled down. After all the connection, and before closing the shell of transmitter, the voltage protective layer should be back the place.

2.1.5 Relay

The transmitter is equipped with three-way relay, and the main measurements or temperature response can be set up. Each relay can be configured individually for timing or alarming, moreover the relay switch and relay response values can also be set. Please be sure to disconnect the power supply, while wiring. The connection mode of the relay is shown as figure 10.

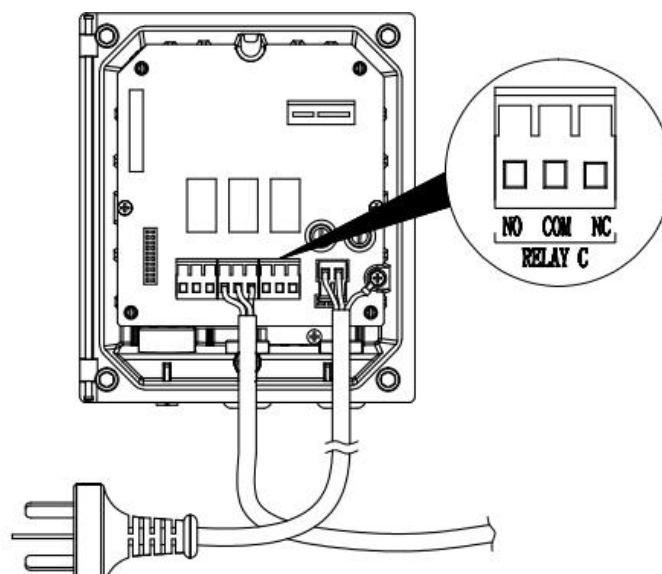


Figure 10 Relay Wiring

2.1.6 Analog Output

Output current should be configured, to use it rationally. The parameters configured includes response parameters and corresponding measured value of 4mA and 20 mA.

2.2 Installation of Sensor

2.2.1 Connection of Sensor

As shown in Figure 11, connect turbidity sensor with the transmitter.

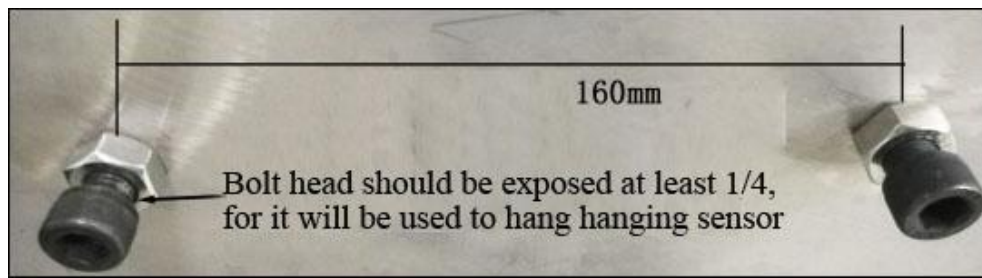


Figure 11 The Diagram of Sensor connection

2.2.2 Installation of the Sensor

Install the sensor as close as possible to the sampling point. A shorter distance will result in a faster response time. Clean the inside of the sensor before installing it. Install the sensor according to the standard installation environment specified below.

1. Install the sensor in a place isolated from the vibration.
2. The two $\text{Ø}12$ bolts are horizontally fixed on the mounting surface and are spaced 160mm apart. Bolt head should be exposed at least $1/4$, for it will be used to hang hanging sensor (as shown below)。



3. Reserve at least 260mm above the instrument in order to remove the sensor cover. It should also have sufficient space below the sensor in case of removing the bottom plugged cotton at the time of calibration or cleaning and place a container at the discharge outlet.

4. Hang the sensor properly, and then place the upper cover of the sensor on the low-turbidity sensor, move forward and backward slightly to make sure that the upper cover of the sensor is just in the right place on the instrument. Failure to make the sensor cover (head) in the accurate place will cause light leakage and erroneous readings. Note: **Make sure that the turbidity meter is on the horizontal level.**

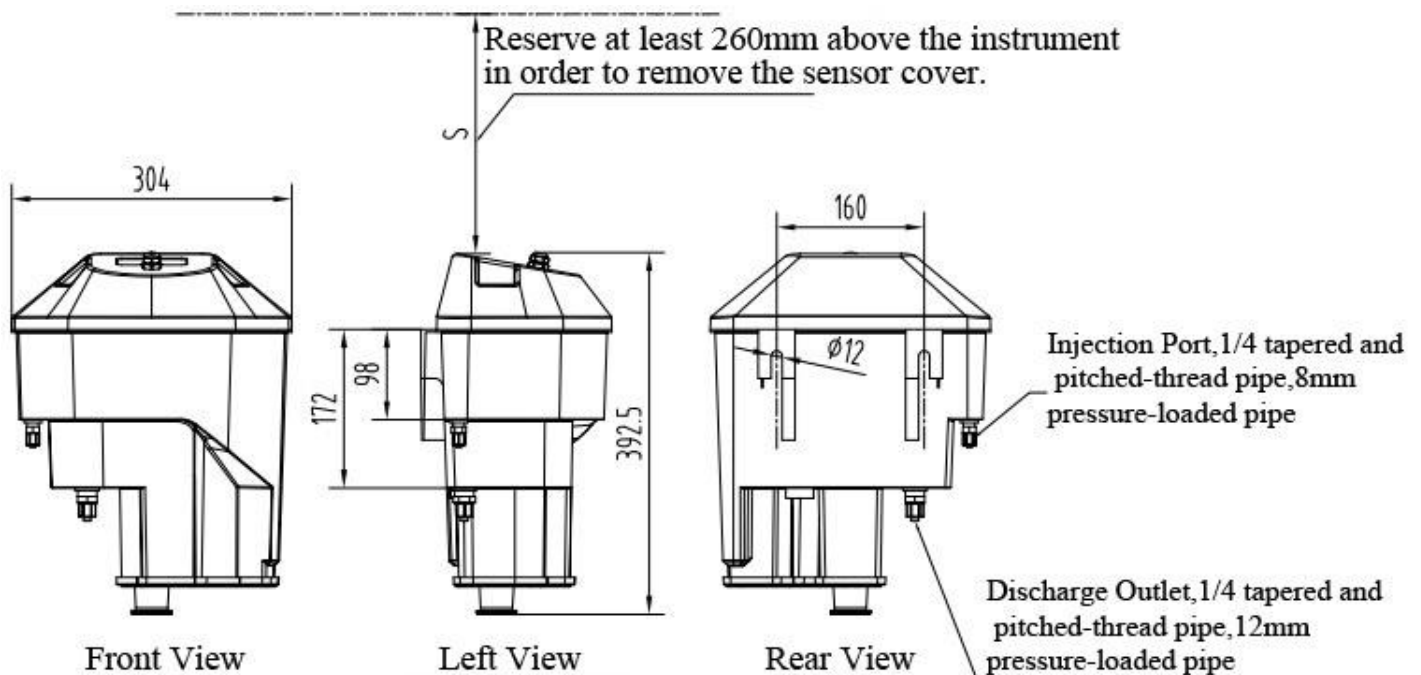


Figure 12 Installation Drawing of Sensor

5. Installation of Water Sample Pipeline (User-supplied)

It is recommended that the water sample pipeline be a quarter of a rigid or semi-rigid tapered pipe with pitched-thread outer. The wiring arrangement of the pipe should be connected directly to the low turbidity sensor and the sampling point as much as possible to minimize the delayed time of the flow.

6. The Connection for Injection Port and Discharge Outlet

There is an injection port and discharge outlet for water sample. The injection port pipe fitting for water sample is a pressure-loaded pipe fitting with 1/4 tapered and pitched-thread pipe, measuring 8mm. For the discharge outlet of the water sample is a pressure-loaded pipe fitting with 1/4 tapered and pitched-thread pipe, measuring 12mm.

Steps for installation are as follows:



a. Find Injection Port and Discharge Outlet first as shown above on the picture.

b. Unscrew the injection port and discharge outlet of the pressure-loaded pipe, and then plug the matching hose into the pipe, as shown above, and finally tighten the tube.

c. Cut the discharge outlet pipe into two parts, insert on both sides of the shutoff valve; Rotating the shutoff valve can be used to control the flow, as shown above. Connect the vacated terminal to the water sample pipeline

Notice:

The required flow is between 300 and 700 ml / min. The flow rate flowing into the turbidity meter can be controlled by the shutoff valve on the discharge outlet pipeline. Any flow at the rate of less than 300 ml / min will reduce the response time and cause incorrect readings. A higher flow rate over than 700 ml / min will cause the turbidity meter to overflow, indicating that the flow is too high.

Chapter 3 Product Interface and Operation

3.1 The User Interface

The user interface is shown as figure 13.

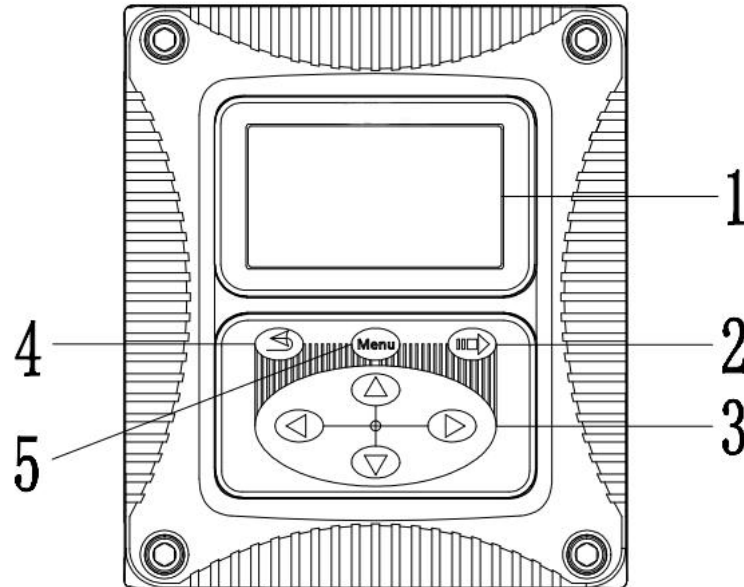


Figure 13 The User Interface

1- screen	2- enter key
3-guide key	4- Esc key
5-menu key	

The user can operate through the panel, setting up and configuring input/output, screen and so on.

No.	Key	Function
2	Enter key	Enter the next menu or accept typed value
3	Guide key	Browse the menu, change the settings, and add or reduce digits
4	Esc key	Return to previous menu
5	Menu key	Go to the main menu

Table 3 Each Key's Function of Transmitter Panel

3.2 The Main Screen

The main screen is shown as figure 14.

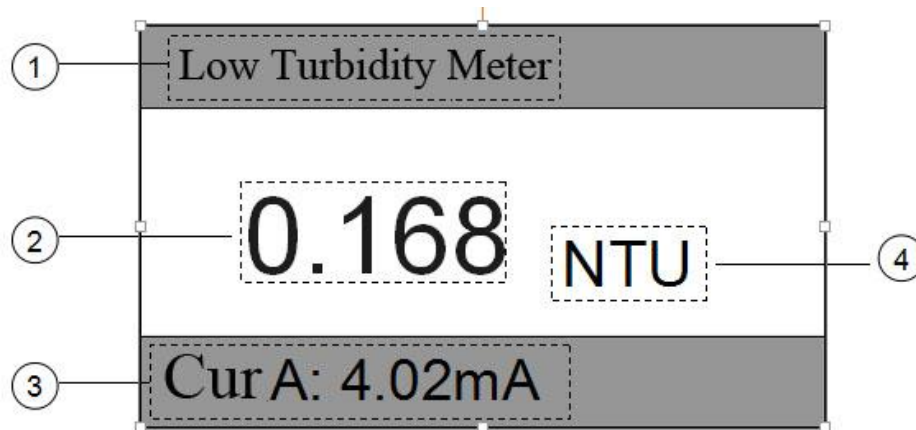


Figure 14 The Main Screen Interface

1- The name of the instrument	2- the measured data of sensor
3-fault display/current loop output/relay/ (main screen switch, right and left)	
4- the unit of measured data	

3.3 Control Set

"Device Info", "CAL OUT" and "SETUP" can be set in "Control Set". And in the "SETUP" we can check and set "Current 1/2", "Relay A/B/C", "485 Address", "Contrast" and "Language".

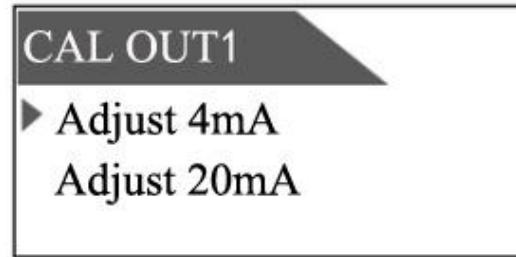
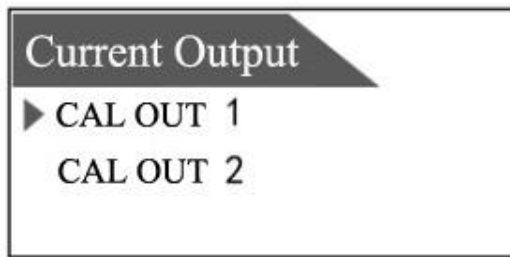
3.3.1 Device Information

If you want to check the device information, press "up" "down" key to choose the "Device info", then press the "enter" key. You can check the device information after seeing the screen showing "Device info".

3.3.2 Current Output

1) Press the menu key, press "up" "down" guide key to select "Control Set" on the interface.

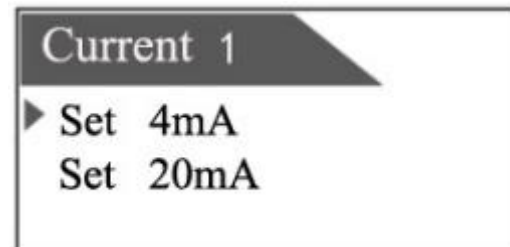
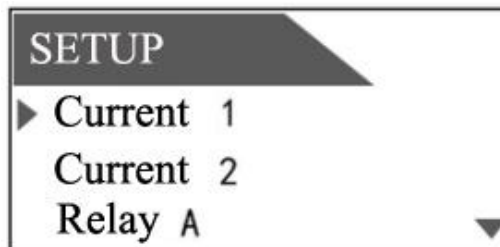
2) Then select "CAL OUT", and select the one of the two channels, by adjusting corresponding AD value of 4mA and 20mA to correct the current. (4 mA corresponds around 800 AD value, 20 mA corresponds around 4000 AD value.)



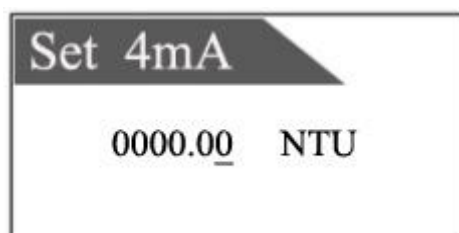
3.3.3 SETUP

3.3.3.1 Setting the current output 1/2

1. press the menu key, then press "up" "down" key to select "Control Set" in the interface;
2. press "up" "down" guide key to select " SETUP " in the "Control Set ";
3. press "up" "down" key to select "Current1/2", then press "enter " key;
4. enter the interface entered is as following;



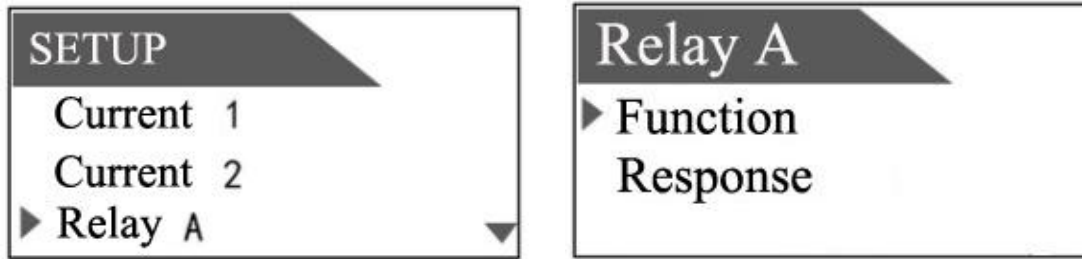
5. then press "up" "down" key to choose set output (4 mA or 20 mA), then enter;
6. pressing "left", "right", "up", "down" key to choose needed value, then enter to complete the set-up.



And the program regards 4 mA the lowest, 20 mA the highest in their corresponding value range.

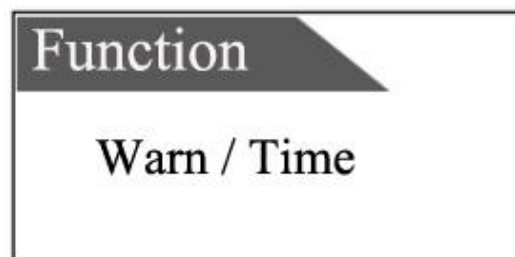
3.3.3.2 RelayA/B/C

1. press the menu key, then press "up" "down" key to select "Control Set" in the interface;
2. press "up" "down" guide key to select "SETUP" in the "Control Set";
3. press "up" "down" key to select "Relay A/B/C", then press "enter" key;



1) To Set Function

Relay can be individually configured for timer or alarm function. Specific steps are as followings: Press the "Function" in the "Relay A/B/C" interface, then select "Warn" or "Time" to enter.

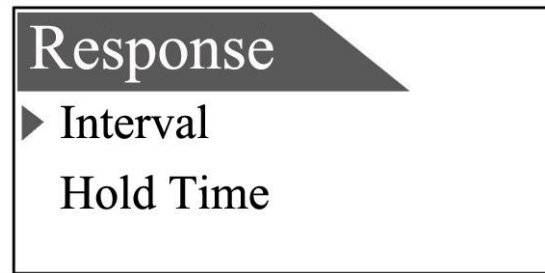
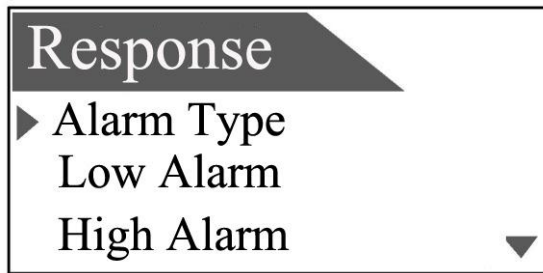


Time: The function of relay's timing is, it works in a specific period of time, which is set as "Keeping", while in the rest of time, it's closed, and the time is a designed period. If you want the relay to work for 10s, closed for 50s, then you can set the "Keeping" as 1min.

Warn: The relay's alarm works when it gets two measured values which are higher or lower than a specific threshold in a continuous interval, assigned by "on time delay", then it will be closed. And when the alarm ends, "the dead zone of threshold" happens: when measured value < high threshold value - high dead zone of threshold, "high threshold alarm" ends; while when measured value > low threshold value + low dead zone of threshold, "low high-threshold alarm" ends.

2) To Set Corresponding Values

The response values have "low alarm", "high alarm", "low deadband", "high deadband", "off time delay" and "on time delay relay" when you choose the "Warn" in "Function". The response values have "Interval" and "Hold time" when you choose the "Time" in "Function".



① High Threshold Alarm

When the measured value goes high, the relay will set up corresponding higher limit value. When "alarm type" is set as "high threshold alarm", then the "high threshold value", "high dead zone of threshold", "on time delay" and "off time delay" should be set. The function of "high dead zone of threshold" is to end the alarming: for example, setting the "high threshold value" as 8, "high dead zone of threshold" as 0.2, so when the measured value is less than 7.8, then the alarm ends.

② Low Threshold Alarm

When the measured value lowers down, the relay will set up corresponding lower limit value. When "alarm type" is set as "low threshold alarm", then the "low threshold value", "low dead zone of threshold", "on time delay" and "off time delay" should be set. The function of "low dead zone of threshold" is to end the alarming: for example, setting the "low warning point" as 2, "low high dead zone of threshold" as 0.2, so when the measured value is more than 2.2, then the alarm ends.

③ Off Time Delay Relay

Set a time value, using it as the delay time from relay's closed to starting station.

④ On Time Delay Relay

Set a time value, using it as the delay time from relay's starting to closed station.

3.3.3.3 Communication Setting

A. the transmitter is equipped with MODBUS RS485 communication function, please refer to this manual section 2.1.3 figure 8 to check the communication wiring. The transmitter is with RTU mode of communication, and the default baud rate is 9600, the specific MODBUS RTU table is shown in the following table.

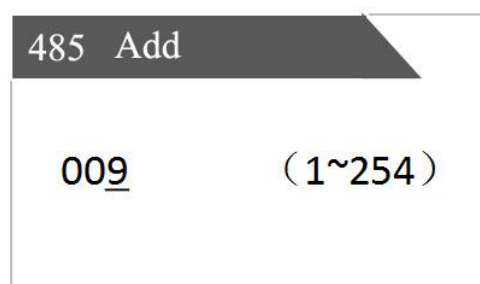
MODBUS-RTU	
Baud Rate	4800/9600/19200/38400
Data Bits	8 bit
Parity Check	no
Stop Bit	1bit

B. the transmitter adopts the MODBUS standard protocol. The specific agreement content is as the following table shows.

Register Name	Register Address	Data Type	Length	Read /Write	Function Code
the value of Sensor	00	float	2	read	03

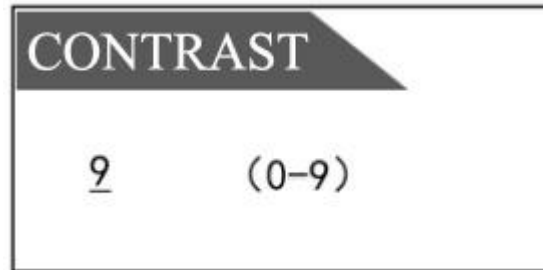
C. the device address is used as the communication setting, and specific steps are as followings:

- 1, press the menu key, then choose "Control Set" by pressing "up" "down" in the interface;
- 2, press "up" "down" guide key to select "SETUP" in the "Control Set";
- 3, press "up" "down" key in the "SETUP" menu to choose interface "485 address",
- 4, in the "485 Address", press "left" "right" to change "bit" information, and press "up" "down" to change "value" information. 1-254 can be adjustable.



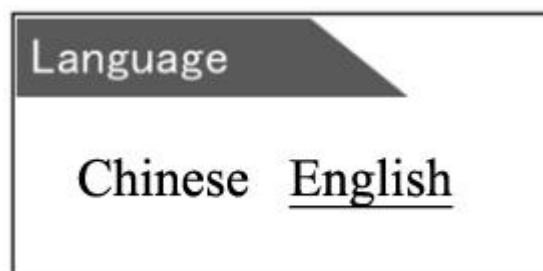
3.3.3.4 Contrast

1. press the menu key, press "up" "down" key to choose "Control Set" in the interface;
2. press "up" "down" key to choose "Contrast " in the "Control Set", then press "= >" to enter;
3. press "up" "down" key to adjust contrast , and the range is 0-9. Setting interface is as shown.



3.3.3.5 Language Settings

1. press the menu key, press "up" "down" key to choose "Control Set" in the interface;
2. press "up" "down" guide key to choose "Language" in the "Control Set";
3. press "left" "right" to choose the needed language in the "Language", then press "= >" to enter. There are two language options, Chinese and English. Setting interface is as shown.



3.4 Parameters Setting

Probe settings can be configured with such options as probe information, probe correction, signal averaging, power supply detection, internal temperature. Set the various parameters for the sensor by using the configuration menu.

The procedure is as follows:

1. Select "Menu", Press "Up" ,"Down" key to select "Probe Set".
2. Select the desired adjustment parameters in the parameter settings interface, after entering the appropriate setting interface, use the guide keys to set the required value, and finally press the "Enter" key to complete the configuration. The options that can be configured and viewed are shown in the following table.

Options	Descriptions
Probe Information	Query S/N, software version, and hardware version
Probe Calibration	Water Sample, Zero Point, Standard Calibration, Deviation Value ± 80 NTU, and Factors
Signal Averaging	0、 6、 30、 60、 90 seconds
Power Supply Detection	Lamp Voltage, Lamp Current and Input Voltage
Internal Temperature	Temperature of the Mainboard of the Sensor

Chapter 4 Calibration of Sensor

4.1 Zero Point Calibration and Standard Liquid Calibration

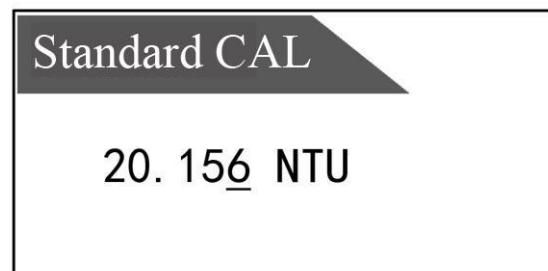
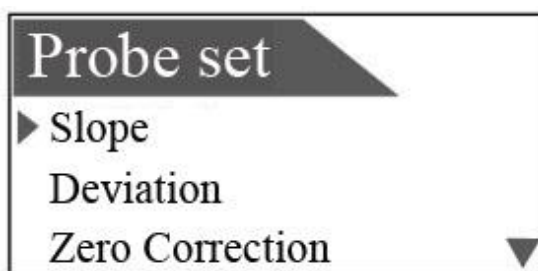
The low-range turbidity sensor has been calibrated at the factory and can be calibrated as follows. Turbidity calibration requires zero point calibration before executing standard liquid calibration. Specific steps are as follows:

Clean the photoelectric tube window, the sensor, or the calibration cylinder with deionized water before calibration, and dry it with a soft, lint-free cloth.

1. Connect the sensor to the transmitter;
2. Set the relevant parameters and clean the sensor;
3. Slowly immerse the sensor into deionized water, wait until the value to be stable, Select “Menu”> “Probe Settings”> “Zero Correction”, and press “Enter” to complete the calibration.

4. Dry the zero point calibration sensor, and then pour the calibration standard solution (we recommend using a standard solution of 20 NTU, the user can also choose other concentrations of standard solution) from the injection port into the sensor. In order to keep a consistent turbidity, whirl the cylinder before using the inside standard solution.

5. Waiting until the value to be stable, Select “Menu”> “Probe Settings”> “Standard Correction”, write the correction value, and press “Enter” to complete the calibration.

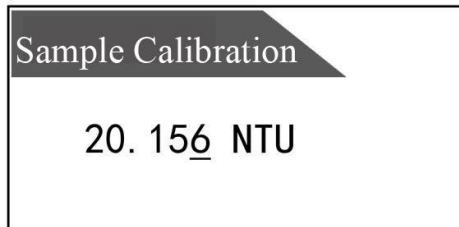


4.2 Water Sample Calibration

The steps of water sample calibration is same as that of standard solution calibration.

When the water sample is calibrated, open the water sample control valve to let the water flow through the meter. Let the sensor operate long enough to make sure the pipe

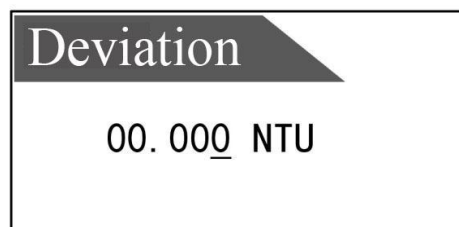
and the sensor to be completely wet and to stabilize the reading on the display. Make sure that all the readings become stable by adjusting the adjustment valve before completing the instrument settings or performing calibration. Then Select “Menu”> “Probe Settings”> “Sample Calibration”, and write the correction value of sample (the range of sample calibration is 0-60NTU), press “Enter” to complete the calibration.



4.3 Deviation Value

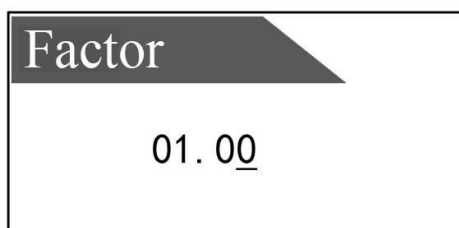
If there is a deviation between the measured value and the standard value, setting the deviation value for the calibration value is needed. The range of deviation value is ± 80 NTU. Select “Menu”> “Probe Settings”> “Deviation”, and write the deviation value what you need, and press “Enter” .

Do not disturb or mix the diluted water during the test, for it will cause a variety of noise (fluctuation) readings.



4.4 Factors

If factor correction is necessary to be done for the measurement results (factor correction range is 0.1~10). Select “Menu”> “Probe Settings”> “Slope”, and write the factor value what you need, and press “Enter”



Chapter 5 Maintenance

In order to obtain the best measurement results, it is very necessary to maintain the sensor regularly. Maintenance mainly includes cleaning, inspecting damage of the sensor, and periodic calibration. You can also view the sensor's status during maintenance and inspection.

5.1 Status of Sensor

Follow the steps "Menu"> "Detection "> "Status" to view the main status of the sensor, data, connection, replacemengt bulb, light leakage,and bulb.

(1) When each state is normal, the display of each parameter is as follows:

Parameters	Status	Parameters	Status
Connection	OK	Light Leakage	OK
Data	OK	Bulb	1 year
Replacement Bulb	1 year		

(2) When the sensor status is not normal or the alarm is displayed, it might be the following circumstances:

a. Loss of Sensor

Parameters	Status	Parameters	Status
Connection	LOST	Light Leakage	WARN
Data		Bulb	WARN
Replacement Bulb	1 year		

b. Main Value Outrange

Parameters	Status	Parameters	Status
Connection	OK	Light Leakage	OK
Data	BEYO	Bulb	OK
Replacement Bulb	1 year		

c. Light Leakage Alarm

Parameters	Status	Parameters	Status
Connection	OK	Light Leakage	WARN
Data	OK	Bulb	1 year
Replacement Bulb	1 year		

5.2 Sensor Cleaning

Photoelectric tube window of the sensor, sensor body or calibration cylinder need to be cleaned, make regular cleaning and maintenance according to the actual use so as to ensure the accuracy of the measurement. Wash with deionized water first, then wipe with a soft, lint-free cloth to remove stubborn stains.

5.3 Inspection on the Damage of Sensor

Check the appearance of the sensor to see whether there is damage, if it's damaged, please contact to the after-sales service center in time for replacement to prevent malfunction of sensor caused by water due to the damage. Light bulbs are consumables, without warranty.

5.4 Replacement of Sensor Bulb

The light bulb in the low turbidity sensor are consumable items without warranty, it is recommended to replace once a year to ensure the accuracy of the instrument. The specific replacement steps are as follows:



(a)

1. Remove the upper cover of the low turbidity sensor, and the back of the lamp is shown in the figure above.



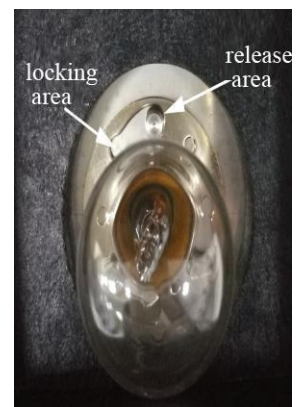
(b)

2. Locate the power cable of the lamp and disconnect it.



(c)

3. Rotate the lamp to the right (move the support column from the locking area to the release area.)
Note: Hold the spring washer behind the lamp when you rotate it.



(d)

4. Rotate as shown, then remove the lamp.

5. Install the new light bulb in accordance with the reverse process specified above. and leave the support column in the release area as shown in Figure (d), move it to the locking area as shown in Figure (c) (Note: It also needs to press the spring washer behind the light bulb), and at last connect the power supply wire in accordance with the positive connects with the anode, and the negative connects with cathode.

5.5 Fuse Replacement

If the fuse is burnt out, it indicates there exists a problem during installation or use. Be sure the problem is solved before replacing the new fuse. The specific steps are as follows:

1. Disconnect the transmitter from the power supply.
2. Loosen the four screws on the transmitter cover and then open it.
3. Remove the high voltage shield, unscrew the screws fixing the power supply board, and take out the power supply board.
4. Remove the fuse, install a similar one, and tighten it.
5. Install the power board back, and the high voltage shield too.
6. Close the cover and tighten the screws on it.
7. Re-connect to the power supply.

CAUTION: When replace the fuse, be sure to keep the transmitter out of power and prevent the risk of electric shock.

Chapter 6 Errors and Warning

If an error or warning occurs, the reading on the measurement screen will flash and "Fault" will be displayed at the bottom. The following are common mistakes and warnings:

1) Measured Value Outrange

When the measured value exceeds the range, the screen will appear flashing "++ • ++" words, in its next line will display "Fault" word.

2) Light Leakage Alarm

When there is a warning alarm, it indicates that the sensor is not covered properly and has caused light leakage or the power is unstable, the display screen will flash and shows the word "fault" on the next line. If the sensor is not covered properly, please cover it and press the "Menu"> Low Turbidity Channel> Probe Calibration> Zero Point Calibration; If the power is unstable, please restart the transmitter.

3) ERR3 Alarm

When the ERR3 alarm occurs, it indicates the current loop is out of range, at this time, the reading on the screen will flash continuously and "ERR3" will be displayed below the reading. In case of such warning, please contact technical support or after-sales service department.

4) Loss of Sensor

When the sensor is not connected to the transmitter or the connection between the probe and the transmitter is bad, there will be an alarm about the loss of probe, the screen will continue to flash and display "LOST", and it will display "Fault" word in its next line. When it happens, follow the steps below to scan the probe.

1.Press "Menu" to enter the main menu.

2.Press the navigation keys "Up"/ "Down" to select "Detection ", and Press "Confirm" to enter Setting.

3.Select the "Scan Probe" interface , and a prompt will ask you whether to continue. Select "Confirm" to complete the probe scan. The process is shown in the figure. If it's successful, it will display "Scan Completed! Success"; if it's failed, it will display "Scan Completed! Failed".

Chapter 7 Problems and Solutions

Common Problems and Solutions:

Malfunction	Solutions
Overweight Alarm	Reboot the transmitter to check if it is still overweight and contact technical support if it still appears.
Loss of Sensor	Check if the cable is plugged in and reconnect the cable; restart the transmitter or select the scan probe in the "Inspection / Maintenance Settings" and rescan the probe.
Light Leakage Alarm	If the sensor is not covered, please cover the reset and calibration zero again. If the power is not stable, please restart the transmitter

Note: In case of other unsolvable problems, please contact our after-sales service or technical support department.