

# Manual

## Turbidity / MLSS Concentration Controller

TU18.02-ZX-ZD0.1

## Introduction

- Thanks very much for choosing our company's online Turbidity / MLSS concentration analyzer. This Instruction gives a detailed description of the functions that can be realized by the instrument, the wiring methods, the setting methods, the operation methods and the troubleshooting methods. Before the instrument is put into operation, it is necessary to read this Instruction carefully and correctly master the use method before specific operation to avoid unnecessary losses due to wrong operation; if the instrument is operated using the method other than those described in this Instruction, the protection provided by this instrument may be damaged sometimes, and our company will not assume any responsibility or liability for the failure and accident caused by the violation of these precautions.
- Please read this Instruction carefully before using the instrument. On the premise of full understanding, the installation, operation and maintenance of the instrument must only be carried out by the on-site related electrical professionals. Incorrect installation or operation will cause damage to instrument or personal injury.
- No defects in the material and manufacturing process of the hardware and accessories that shall be supplied at the time of supply of this instrument. If the notification of such defects is received from the user during the warranty period calculated from the date of the purchase of the instrument, we will make unconditional free repair or free replacement for the defective products. All products are guaranteed for life-long maintenance.
- In order to follow the principle of sustainable development, we reserve the right to modify the performance parameters described in the Instruction without prior notification, and the right to revise or abolish this Instruction without prior notification. When the modification of some performance parameters of the instrument may lead to serious accidents, we will surely inform the user in advance. For the improved instrument, there will be a new version of instructions

for use or specification for improvement. If the description in this Instruction is deviant from the object, please take the material object as the criterion.

- Any modification of the instrument is strictly prohibited! The Company is not responsible for the accident caused by the unauthorized modification of this product.

### Indication of Signs in the Operation Manual

Sign	Name	Meaning
	DANGER	Serious personal injury, instrument destruction, great property losses or other accidents will be the consequence if no appropriate preventive measures have been adopted.
	ALERT	Pay special attention to the important information linked to product or particular part in the operation manual.
	WARNING	Operate with cautious. Any operation mistake may lead to big problems.
	NOTICE	Read carefully the annotation, which will provide substantial help to correct operation of the instrument.

 **DANGER**

- Do not use the instrument in a flammable and combustible or steam area.
- The instrument can work in general cases. If the failure of the instrument may result in major accident or destroy other equipment, emergency stop electric circuit and protection loop should be set up.
- Confirm if the supply voltage is in consistent with the rated voltage before operation.
- To prevent from electric shock, operation mistake, abnormal display or big deviation in measurement, a good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at iso-electric level, shielded, wires shall be located rationally, SPD surge protector shall be applied properly.
- Some inner parts may carry high voltage. Do not open the square panel in the front

except our company personnel or maintenance personnel acknowledged by our company, to avoid electric shock.

- Cut off electric powers before making any checks, to avoid electric shock.
- Check terminal screws and installation conditions on a regular basis. If it's loose, tighten it and then apply it.
- Unauthorized dismantling, processing, modification or repair of instrument can never be allowed. Otherwise, the instrument may move abnormally, or electric shock or fire accidents may be caused.
- Use dry cotton to wipe the instrument, instead of alcohol, gasoline or other organic solvent. Prevent any liquid from splashing onto the instrument. If the instrument falls into water, cut off power immediately, to avoid electric leakage, electric shock and fire accidents.
- Check grounding protection and fuse conditions on a regular basis. Do not run the equipment if grounding protection and fuse are not well equipped.
- The ventilation hole on the instrument casing must be kept unclogged, to avoid failure, abnormal movement, short lifetime and fire accident due to high temperature.
- Operate in strict accordance with the operation manual, otherwise, it's possible to damage the protection device of the instrument.



## ALERT

- Do not use the instrument if it is found damaged or deformed at opening of package.
- Prevent dust, wire end, iron fines or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, to modify configuration, signal output, startup, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment pollution.

## **User Notice**

Please respect the operation procedures and precautions in the operation manual to use the product.

The instrument can work in general cases. If the failure of the instrument may result in major accident or destroy other equipment, emergency stop electric circuit and protection loop should be set up.

- If the instrument is found to be working abnormally or damaged during the operation, please contact the manufacturer and do not repair it yourself.

## Content

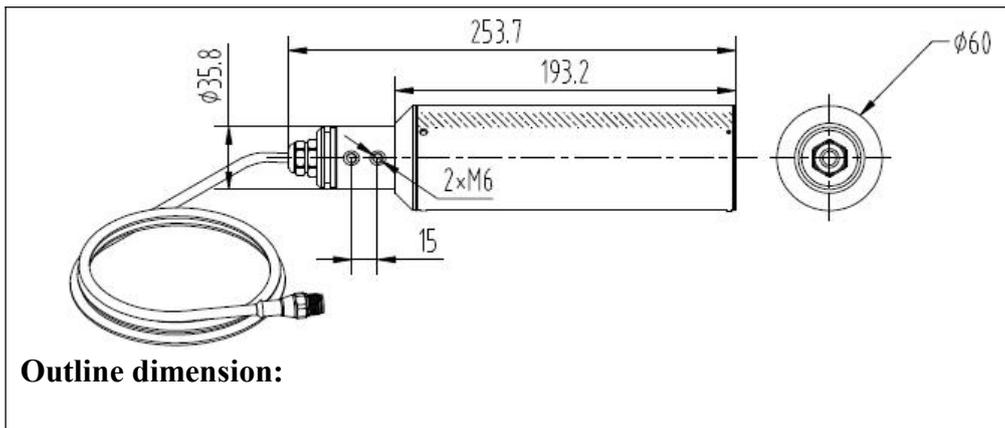
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## Chapter I Product introduction

### Turbidity (MLSS concentration) sensor

The sensor is based on the combined infrared absorption and scattering light method, and the ISO7027 method can be used to accurately determine the turbidity and MLSS concentration.

Specification	Detailed Information
Size	D 60mm* L 256mm
Weight	1.65KG
Material	Body: PVC
	O-ring: Fluorine rubber
	Cable: PVC
Waterproof grade	IP68/NEMA6P
Measuring range	Turbidity:0.00 ~ 4000NTU/ MLSS concentration: 0.1 ~ 20000 mg/L, 0.1 ~ 45000 mg/L, 0.1 ~ 120000 mg/L
Display accuracy	Turbidity: Less than $\pm 2\%$ of the measured value or $\pm 0.1\text{NTU}$ , whichever is larger / MLSS concentration: less than $\pm 5\%$ of the measured value (depending on the homogeneity of the MLSS)
Velocity of flow	$\leq 2.5\text{m/s}$ , $8.2\text{ft/s}$
Pressure range	$\leq 0.4\text{Mpa}$
Storage temperature	$-15 \sim 65^{\circ}\text{C}$
Ambient temperature for measurement	$0 \sim 45^{\circ}\text{C}$
Calibration	Calibration of sample, slope calibration
Cable length	10m standard cable, can be extended up to 100m



Specification of Turbidity (MLSS Concentration) Sensor

## Transmitter

The online turbidity / MLSS concentration analyzer is an intelligent online chemical analyzer, which is widely used for continuous monitoring of turbidity, MLSS concentration and temperature in such solutions as thermal power, chemical, fertilizer, metallurgical, environmental protection, pharmaceutical, biochemical solutions, food, and tap water.

Remote transmission monitoring and recording of continuous monitoring data is realized through the transmitting output connection recorder, and the monitoring and recording can also be realized by connecting the RS485 interface which can easily link it to computer through MODBUS - RTU protocol.

## Features

- Using 2.8 inch 128\*64 lattice screen
- Using isolated transmitting output, which has less interference
- Using isolated RS485 communication
- TUR/TLSS measurement, upper and lower limit control, transmitting output and RS485 communication can be made
- High and low alarm functions and retardation can be set
- The buzzer and LCD backlight switch on and off function
- Operation language selectable, English or Chinese
- Correction and calibration of are available

## Technical indicators

- Measurement : Turbidity, MLSS concentration  
Measuring range:0.00 ~ 4000NTU, 0.00 ~ 120000mg/L
- Type of output: 4 ~ 20mA current transmitting output  
Maximum loop resistance: 750Ω  
Accuracy: 0.1%FS
- Type of output: RS485 digital signal output  
Communication protocol: Standard MODBUS – RTU (Customizable)
- Power supply: AC220V±10%,50Hz/60Hz ( DC24V±10% optional)
- Alarm relay: AC250V, 3A

## Chapter II Fixed Installation

### Instrument installation

Specify the installation site and installation method of this instrument. Please be sure to read this part when installing.

### Installation precautions

The functions of this instrument are mainly detecting and transmitting, and it is not an instrument specially used for control. This instrument is equipped with a relay switch output, which is generally used as alarm and reminding mainly; if the user uses this function for loop control and if the fault of the instrument may cause major accidents or damage to other devices, **emergency stop circuit** and **protection circuit** need to be set up; otherwise, we are not responsible for the consequences.

This instrument is installed in the panel mounted way.

Please install it indoors and avoid wind and rain and direct sunlight.

Please install it in a well-ventilated place to prevent rise of the internal temperature of this instrument.

When installing this instrument, please install it horizontally as far as possible and do not tilt left and right (can be tilted back  $<30^\circ$ ).

### Keep away from the following place when installing

Places with direct sunlight and near heat appliances.

Places with an ambient temperature of over  $60^\circ\text{C}$  during operating.

Places with an ambient humidity of over 85% during operating.

Near the electromagnetic source.

Places where mechanical vibration is strong.

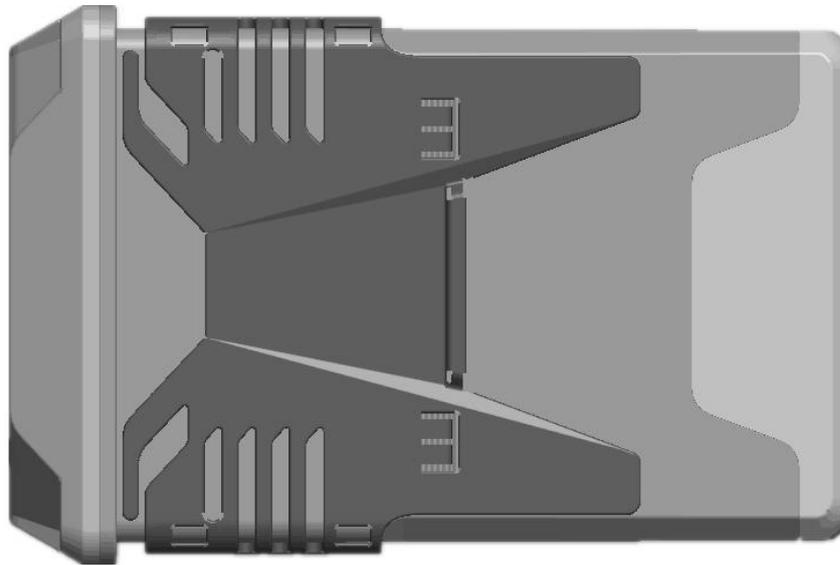
Places with great temperature changes and easy condensation.

Places with a lot of oily fume, steam, moisture, dust and corrosive gas.

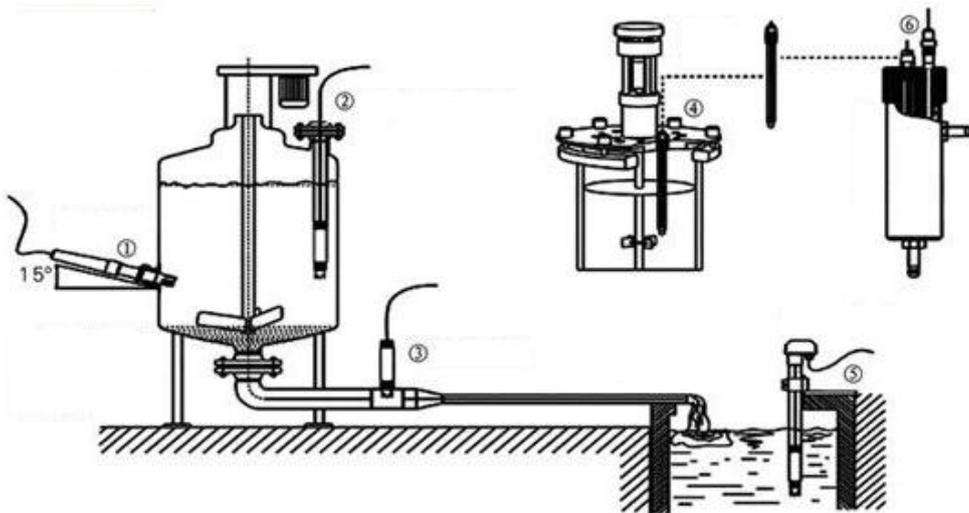
### Installation method

Open a  $92.5\text{mm} * 92.5\text{mm}$  mounting hole on the instrument cabinet or mounting panel (the outline dimension of this product is  $100\text{mm} * 100\text{mm} * 150\text{mm}$ )

Insert the instrument into the mounting hole and then buckle up the butterfly style buckle, as shown below



## Electrode installation

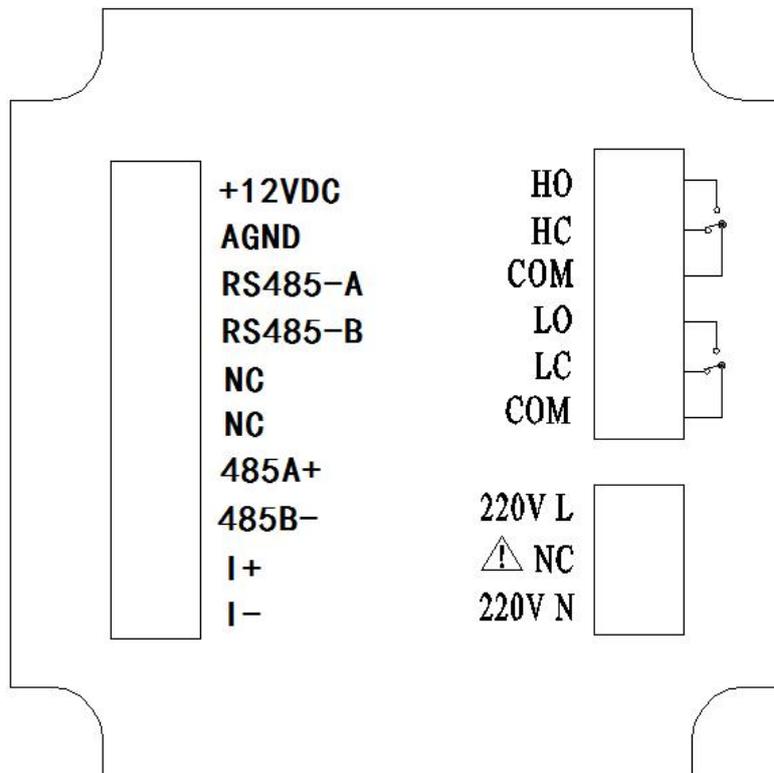


Schematic diagram of common installation method

1. Side wall installation. 2. Top flange type installation. 3. Pipe installation. 4. Top type installation. 5. Immersed type installation. 6. Flow-through type installation.

The connector must be an oblique angle at 15 degree, otherwise, the normal test and use will be impacted, and the consequences will not be borne by our company.

## Instrument wiring



Wiring Diagram

## Terminal definition

- +12VDC: Turbidity / MLSS concentration electrode power supply positive
- AGND: Turbidity / MLSS concentration electrode power supply negative
- RS485-A: Turbidity / MLSS concentration electrode communication positive
- RS485-B: Turbidity / MLSS concentration electrode communication negative
- NC: null
- NC: null
- 485A+: RS485 communication output terminal A+
- 485B-: RS485 communication output terminal B-
- I+: 4-20mA output terminal +
- I-: 4-20mA output terminal -
- HO: High alarm normally open relay
- HC: High alarm normally closed relay

- COM: Common terminal
- LO: Low alarm normally open relay
- LC: Low alarm normally closed relay
- COM: Common terminal
- 220V L: AC220V live line
- NC: null
- 220V N: AC220V zero line

## Note

To prevent electric shock, please confirm that the instrument is not energized before connecting the signal line.

In order to prevent fire, please use double insulated wire.

Please do not let the live product close to the signal terminal, which may cause failure.

## Chapter III Key Operation

### Key locations



### Key definition

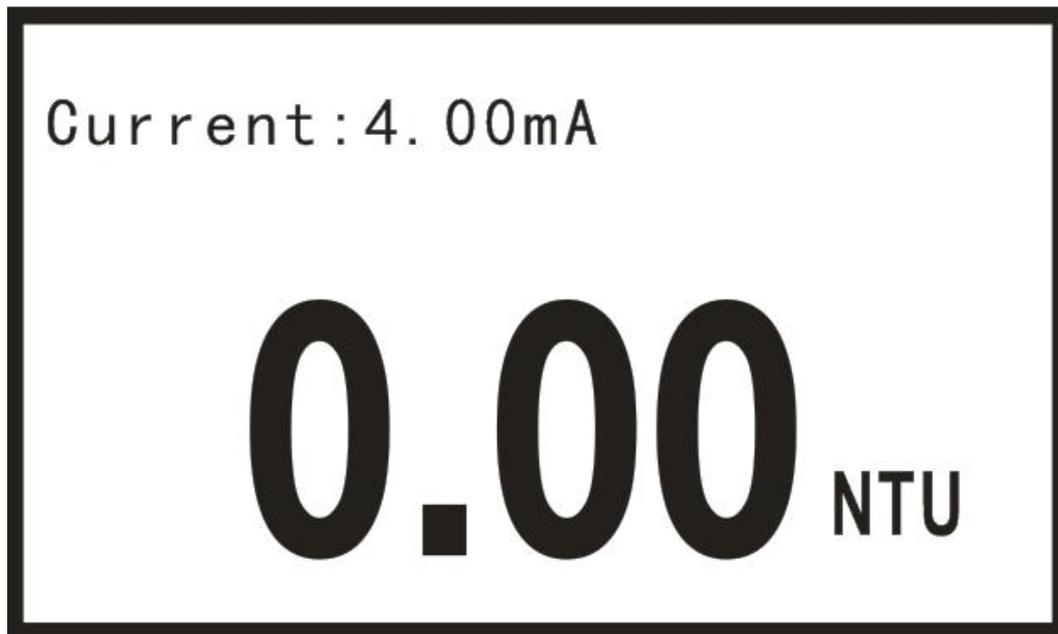
Sign	Key Name	Function description
	Menu	Enter the menu under the "Monitoring Interface" Exit the menu under the "Menu Interface"
	Escape	View the related alarm state under the "Monitoring Interface" Return to the upper layer between related upper and lower interfaces under the "Menu Interface"
	Shift right	Select digits of parameters cyclically View the display values in other units under the "Monitoring Interface"
	Shift down	Select the related menu under the "Menu Interface" Modify the relative values in the setting status
	Enter	Enter the submenu or confirm the modification under the "Menu Interface"

## Chapter IV Instrument Screen and Operation

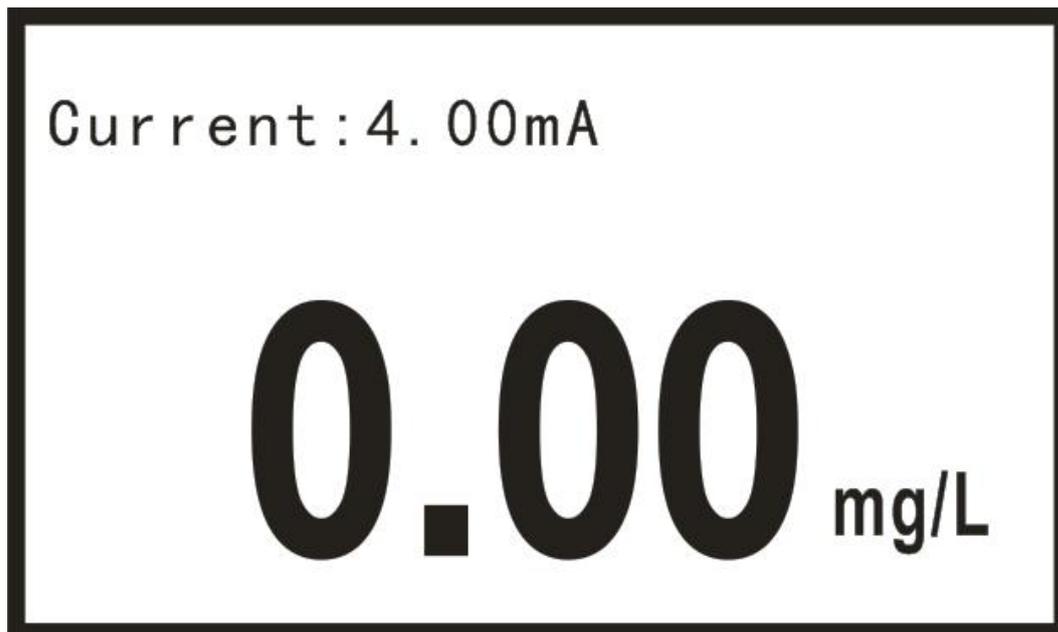
### Monitoring screen

Use the [Menu key] to enter the password verification screen; enter the password to enter the main menu screen.

Use the [Escape key] to enter the alarm query screen to query the current alarm setting information.



Turbidity monitoring screen



MLSS concentration monitoring screen

## Password verification screen

The initial password is 0000, which can be modified by using the password modification function.

-----User Password-----  
Password: 0000

## Main menu screen

----- Main Menu -----  
➡ 1.System Setting  
2.Signal Setting  
3.Online Calibrtion  
4.Remote Setting  
5.Alarm Setting  
6.Version Query

System Setting: Setting of language, buzzer and backlight.

Signal Setting:Electrode switching, and setting of turbidity and MLSS concentration factors, scraping and response time.

Online Calibration: Turbidity correction and calibration of MLSS concentration.

Remote Setting: RS485 parameter setting and the setting of current transmitting output parameters.

Alarm Setting: Setting of high alarm and low alarm parameters.

Version Query: current version number.

## Chapter V Configuration Setting

### System Setting

- System Setting -----
- ➔ 1. Language
  - 2. Buzzer
  - 3. Backlight Setting
  - 4. Change Password
  - 5. Factory Setting

Language: Setting of language type (Chinese and English optional).

Buzzer: Setting the buzzer switch when alarming.

Backlight Setting: Setting the backlight switch of the LCD screen.

Change Password: Modifying the password and logging in with the new password.

Factory Setting: Resuming to the factory setting.

### Signal Setting

- Signal Setting -----
- ➔ 1. Electrode Switch
  - 2. TUR Factor
  - 3. MLSS Factor
  - 4. Response Time
  - 5. Brush Time

Electrode Switch: switching the electrode type, turbidity or MLSS concentration factor.

TUR Factor: Setting the turbidity factor in the range of 0.1 ~ 10.

MLSS Factor: Setting the MLSS concentration factor in the range of 0.1 ~ 10.

Response Time: Setting the signal response time in the range of 1 ~ 60s.

Brush Time: Setting the time interval for electrode scraping (1, 5, 15, 30, 60(1h), 240(4h), 720(12h), 1440(1D), 4320(3D), 10080(7D) in min).

## Online Calibration

### — — — — Online Calibration — — — —

- ➡ 1.TUR Modification
- 2.MLSS Calibration

TUR Modification: Correct the turbidity with a correction range of  $\pm 100$ NTU.

MLSS Calibration: Two-point or four-point calibration of MLSS concentration may be chosen, and the specific process is as shown farther below.

## Remote Setting

### — — — — Remote Setting — — — —

- ➡ 1.RS485 Setting
- 2.Current Transmission

RS485 Setting: Set the address and baud rate of the 485 communication.

Current Transmission: Set the corresponding value of 4mA and the corresponding value of 20mA for the 4 ~ 20mA output.

## Alarm Setting

### — — — — Alarm Setting — — — —

- ➡ 1.TUR High Alarm
- 2.TUR Low Alarm
- 3.MLSS High Alarm
- 4.MLSS Low Alarm

TUR High Alarm: When the measured value is larger than the high alarm

pick-up value, the high alarm relay is picked up and when the measured value is less than the high alarm breaking value, the high alarm relay is disconnected.

TUR Low Alarm: When the measured value is less than the low alarm pick-up value, the low alarm relay is picked up and when the measured value is larger than the low alarm breaking value, the low alarm relay is disconnected.

MLSS High Alarm: When the measured value is larger than the high alarm pick-up value, the high alarm relay is picked up and when the measured value is less than the high alarm breaking value, the high alarm relay is disconnected.

MLSS Low Alarm: When the measured value is less than the low alarm pick-up value, the low alarm relay is picked up and when the measured value is larger than the low alarm breaking value, the low alarm relay is disconnected.

## Version Query

### — — — — Version Query — — — —

Version Query: Query the current hardware and software version, which has strong traceability.

## Chapter VI Communication

The instrument provides a standard RS485 serial communication interface, and uses the general international standard MODBUS - RTU communication protocol, which supports the No. 03 reading and holding register command.

**MODBUS standard format (No. 03 reading and holding register command)**

### Command format:

Definition	Address	Function code	Register address	Data number	CRC check
Data	ADDR	0x03	M	N	CRC 16
Number of bytes	1	1	2	2	2

### Return format:

Definition	Address	Function code	Data size	Data	CRC check
Data	ADDR	0x03	2*N	Data	CRC 16
Number of bytes	1	1	1	2*N	2

### Register address description:

Address	Data type	Data size	Function code	Description	Access authority
0x0000	long	4 bytes	0x03	Turbidity value (in NTU, the obtained value needs to be divided by 100).	Read-only
0x0002	long	4 bytes	0x03	MLSS concentration value (in mg/L, the obtained value needs to be divided by 10)	Read-only

### **Illustration of turbidity reading:**

Sent from computer: 00 03 00 00 00 02 C5 DA

Returned by dissolved oxygen meter: 00 03 04 00 00 00 00 EA F3

Return command annotation:

00 is the slave address, settable in the instrument;

03 is the function code, reading and holding register;

04 is the data length of returned turbidity value, which is 4 bytes;

00 00 00 00 is the returned turbidity value 0.00NTU, and the obtained value divided by 100 is the current turbidity value. The range is 0.00-4000.00NTU;

EA F3 is the CRC16 check code, varying with the previous data;

### **Illustration of MLSS concentration reading:**

Sent from computer: 00 03 00 02 00 02 64 1A

Returned by dissolved oxygen meter: 00 03 04 00 00 00 00 EA F3

Return command annotation:

00 is the slave address, settable in the instrument;

03 is the function code, reading and holding register;

04 is the data length of returned MLSS concentration value, which is 4 bytes;

00 00 00 00 is the returned MLSS concentration value 0.0mg/L, and the obtained value divided by 10 is the current MLSS concentration value. The range is 0.0-120000mg/L;

EA F3 is the CRC16 check code, varying with the previous data;

## Chapter VII Calibration of MLSS Concentration

The MLSS concentration sensor has been calibrated before delivered, and the self calibration can be carried out according to the following steps if required. The use of standard liquid is required for the calibration of the MLSS concentration, **taking two-point calibration as an example:**

1. Connect the sensor to the transmitter.
2. Set up the related parameters (set the MLSS concentration factor as 1 in the signal setting), enter the MLSS Concentration Calibration actual value measurement interface and clean the sensor.
3. Put the probe into the first point standard liquid (usually take the pure water as the first point). After the data is stable, read the actual value of the measurement and record the data.
4. Remove the probe from the first point standard liquid, rinse it with clean water, and wipe dry the sensor.
5. Put the probe into the second point standard liquid. After the data is stable, read the actual value of the measurement and record the data.
6. Click OK after recording the data; enter the standard point selection interface and select the two-point calibration; enter the first point target value setting interface.
7. Enter the target value of the first point standard liquid measured at the laboratory and click OK; enter the first point actual value setting interface and then enter the first point actual value recorded in step 3; click OK to enter the second point target value interface.
8. Enter the target value of the second point standard liquid measured at the laboratory and click OK; enter the second point actual value setting interface and then enter the second point actual value recorded in step 3; click OK to return the main menu.

The four-point correction step is basically the same as the two-point correction, and the selection of the correction points can be determined according to the actual measurement environment. They are usually the zero point, 0.25 times the range point,

0.5 times the range point and the full range point.

## Chapter VIII Maintenance

### Cleaning of sensors

Two lenses on the sensor need to be cleaned. Please regularly carry out cleaning and maintenance in accordance with actual use to ensure the accuracy of the measurement. Rinse it with clean water first and then wipe it with cleaners and rag to remove stubborn stains.

### Sensor damage inspection

Check the appearance of the sensor for any breakage. If there is any breakage, it is necessary to contact the after-sales service center timely for replacement to prevent water from getting into sensor due to breakage causing failure.

### Replacement of sensor scraper

For the sensor with scrapers, it is suggested to replace the rubber scraper once a quarter. The specific steps are as follows:



The position of the scraper is as shown in the left figure;

1. Unscrew the screw next to the scraper with a corresponding screwdriver;
2. Remove the scraper, then remove the rubber sheet inside and replace it with a new rubber scraper;
3. Finally, put the scraper back, and tighten the screw and the scraper with a screwdriver.

## **Chapter IX Failure Analysis and Troubleshooting**

1. No display of the controller?

A: Check whether the power line is connected correctly and whether the power supply is connected.

2. Displaying figures jumping up and down?

A: Check whether there is any interference equipment such as the frequency converter. Be careful to keep it away from these interference devices or take shielding measures.

3. Transmitter displaying horizontal bar?

A: The sensor is connected abnormally or water gets into the sensor; if water gets into the sensor, please send the probe to the After-sale Maintenance Department in time for checking and repair.

