Turbidity/TSS/MLSS Controller

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U-TU1-MYEN2

Preface

Thank you for purchasing Turbidity/TSS/MLSS controller. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- This product is forbidden to use in explosion-proof occasions.

Version

U-TU1-MYEN2

Safety Precautions

In order to use this product safely, be sure to follow the safety precautions described.

About this manual

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before applying the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The company does not guarantee that the product will be suitable for a particular use by the user.

Precautions for protection, safety and modification of this product

- To ensure safe use of this product and the systems it controls, Please read carefully the operation manual and understand the correct application methods before putting into operation, to avoid unnecessary losses due to operation mistakes. If the instrument is operated in other ways not described in the manual, the protections that the instrument give may be destroyed, and the failures and accidents incurred due to violation of precautions shall not be borne by our company.
- When installing lightning protection devices for this product and its control system, or designing and installing separate safety protection circuits for this product and its control system, it needs to be implemented by other devices.
- If you need to replace parts of the product, please use the model specifications specified by the company.
- This product is not intended for use in systems that are directly related to personal safety.Such as nuclear power equipment, equipment using radioactivity, railway systems, aviation equipment, marine equipment, aviation equipment and medical equipment.If applied, it is the responsibility of the user to use additional equipment or systems to ensure personal safety.

- Do not modify this product.
- The following safety signs are used in this manual:

⚡ Hazard, if not taken with appropriate precautions, will result in serious personal injury, product damage or major property damage.

⚠ Warning:Pay special attention to the important information linked to product or particular part in the operation manual.

⚡

- Confirm if the supply voltage is in consistent with the rated voltage before operation.
- Don't use the instrument in a flammable and combustible or steam area.
- To prevent from electric shock, operation mistake, a good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at is-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 the condition of the terminal screws regularly. If it is loose, please tighten it before use.
- It is not allowed to disassemble, process, modify or repair the product without authorization, otherwise it may cause abnormal operation, electric shock or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine or other organic solvents. Prevent all kinds of liquid from splashing on the product. If the product falls into the water, please cut off the power

immediately, otherwise there will be leakage, electric shock or even a fire accident.

- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life and fire.
- Please strictly follow the instructions in this manual, otherwise the product's protective device may be damaged.

⚠

- Don't 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.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for the terms outside the scope of this product warranty.
- This company is not responsible for damage to the instrument or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

No.	Name	Quantity	Note
1	Turbidity/TSS/MLSS Sensor	1	
2	Turbidity/TSS/MLSS controller	1	
3	Manual	1	
4	Certificate	1	

After opening the box, please confirm the package contents before starting the operation.If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

Contents

Chapter 1 Introduction

1.1. Turbidity/TSS/MLSS 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, TSS and MLSS. The main parameters of the sensor showed as table 2:

Table 2 the parameters of the Turbidity/TSS/MLSS sensor

Dimension	60mm*256mm (D*L)
Weight	1.65KG
Material	Body: SUS316L + PVC, Ti alloy (For seawater)
	O-ring: Fluorine rubber
	Cable: PVC
Ingress protection	IP68/NEMA6P
Measure range	Turbidity: 0.00 ~ 4000NTU
	MLSS/TSS: 0.1 ~ 20000 mg/L, 0.1 ~ 45000 mg/L,
	0.1 ~ 120000 mg/L
Accuracy	Turbidity: Less than ±2% of the measured value or ±0.1NTU, whichever is larger
	MLSS/TSS: less than ±5% of the measured value (depending on the homogeneity of the MLSS/TSS)
Flow rate	≤2.5m/s, 8.2ft/s
Pressure range	≤0.4 MPa
Operating temperature	0 ~ 45℃
Storage conditions	Temperature（-15 ~ 65℃）
	Humidity （5 ~ 95）%RH（no condensation）
	Altitude: <2000m
Calibration	Buffer solution calibration, Slope calibration

Cable length	10m standard cable, can be extended up to 100m
Sensor dimension	

1.2. Turbidity/TSS/MLSS controller

This Turbidity/TSS/MLSS controller is a smart online chemical analyzer, widely used in Thermal power, chemical fertilizer, metallurgy, environmental protection, pharmaceutical, biochemical, food, tap water and other industries. The main parameters of the controller showed as table 3:

Table 3 main parameters of the Turbidity/TSS/MLSS controller

Display	2.8 inch monochrome LCD with a resolution of 128*64
Dimension	Overall dimension：100mm * 100mm * 150mm Cutout dimension：92.5mm*92.5mm
Weight	0.65Kg
Ingress protection	IP54
Measuring variable	Turbidity/TSS/MLSS
Measuring range	Turbidity：0.00～4000NTU TSS/MLSS：0.1～20000 mg/L、0.1～45000 mg/L 、0.1～120000 mg/L

Accuracy	Turbidity：<±2% FS or ±0.1NTU (max value) MLSS/TSS：<±5% FS（depending on the sludge homogeneity）
Output	Isolated, 4~20mA output maximum loop is 750Ω,±0.2%FS
Communication protocol	Isolated, MODBUS-RTU RS485
Alarm relay	Pickup/Breakaway AC250V/3A
Relative humidity	（10～85）%RH（no condensation）
Operating temperature	0～50℃
Power supply	AC220V±10%，5W Max，50Hz/60Hz
Storage conditions	Temperature（-15～65℃） Humidity（5～95）%RH（no condensation ） Altitude：<2000m

Chapter 2 Installation

2.1. Instrument installation

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

Notes for installation

- The instrument is panel mounted.
- 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 and do not tilt left and right (can be tilted back <30°).

**The following places shall be avoided during the installation**

- Places with an ambient temperature of over 50℃ during operating.
- Places with an ambient humidity of over 85% during operating.
- Near the electromagnetic source.
- Places where mechanical vibration is strong.
- The site where the temperature is changed a lot and the moisture condensation is easily formed.
- Places with a lot of oily fume, steam, moisture, dust and corrosive gas.

2.1.3 Installation methods

Install a 92.5 * 92.5 mounting hole on the instrument cabinet or mounting panel the thickness of the mounting panel is 1.5mm～13mm
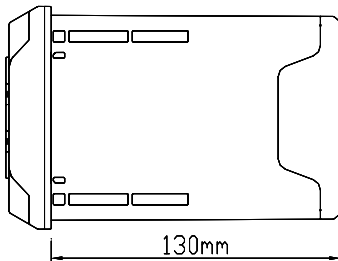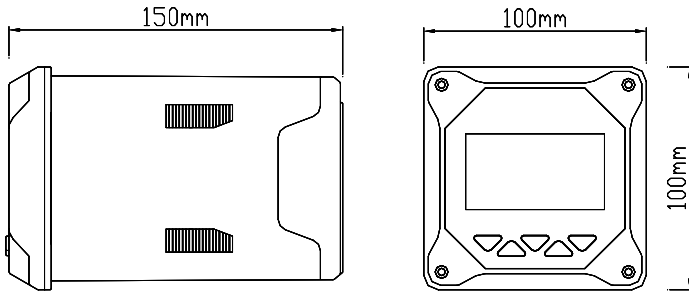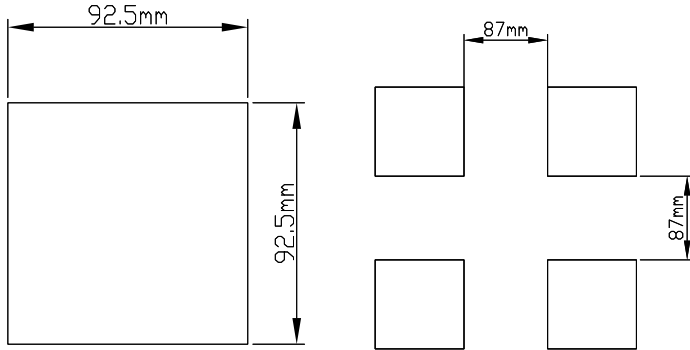
The instrument into the mounting hole and then buckle on the butterfly, as shown below:
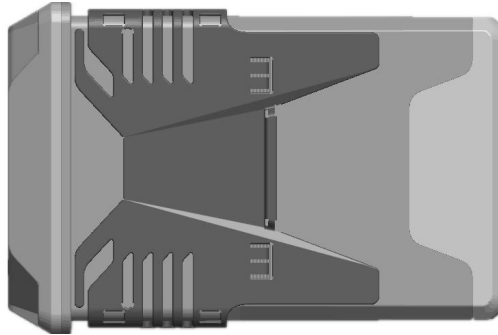
2.2 Electrode installation

Install steps

Specific install steps showed as figure 4:

1. Use 1 (M8U buckle) to fix 8 (installation panel) on the pipe near the pool where the sensor is installed.

2. Connect 9 (converter) and 2 (DN40) PVC pipe with glue, and put the sensor cable through PVC pipe, screw the sensor into 9 (converter), and make sure that water resistance has been done.

3. Fix 2 (DN40 pipe) through 4 (DN42 u-shape clip) onto 8 (installation panel)
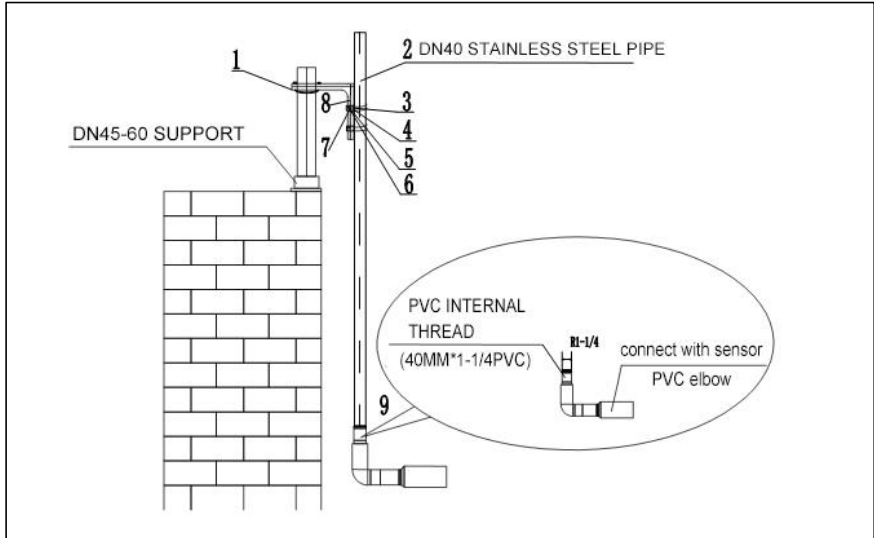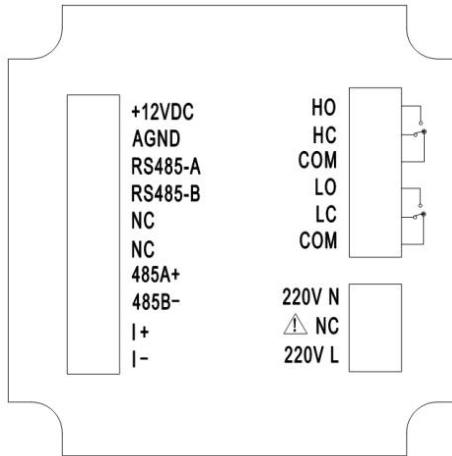
Table 4 accessories of sensor installation

1、M8 U shape buckle (DN60)	2、DN40 pipe
3、Hexagon socket bolt M6*120	4、DN42 U-shape pipe clip
5、M8 Gasket (8*16*1)	6、M8 Gasket（8*24*2）
7、M8 Spring Gasket	8、Installation panel
9、Thread converter	

2.3. Instrument wiring

Wiring Diagram

Terminal definition

- +12VDC: Turbidity / TSS/ MLSS electrode power supply +
- AGND: Turbidity / TSS/ MLSS electrode power supply -
- RS485-A: Turbidity / TSS/ MLSS electrode communication +
- RS485-B: Turbidity / TSS/ MLSS electrode communication -
- NC: Unidentified
- NC: Unidentified
- 485A+: RS485 communication interface A +
- 485B-: RS485 communication interface B -
- I+: 4-20mA output +
- I-: 4-20mA output -
- HO: High alarm normally open
- HC: High alarm normally closed
- COM: Common terminal
- LO: Low alarm normally open relay
- LC: Low alarm normally close relay
- COM: Common terminal

- 220V L: AC220V live wire
- NC: Unidentified
- 220V N: AC220V neutral wire

Note

- Confirm that the controller is not powered on before connected with signal wire, to avoid electric shock.
- Use double insulation wire to prevent fire accident.
- Do not put electric product close to signal terminal, which may cause failure.
- +12VDC and AGND is power output terminal, please don't short the circuit during wiring, to avoid any damage to the controller.

Chapter 3 Navigation keys

3.1 Button display

3.1.1 Definition of buttons

Sign	Button name	Key function
ESC	ESC	Under "Monitoring page" - Alarm view Under "Menu page" - Return to the previous page Under "Calibration page" - Skip this item
▶	RIGHT	Make a recurrent selection of digit of parameters modify the original indication value
MENU	MENU	Under "Monitoring page" - Enter the MENU Under "Menu page" - Exit the MENU
▼	DOWN	Under "menu page" - Select the related menu Modify the values in the configuration state
ENT	ENTER	Under "Menu page" - Enter the sub-menu or confirm modification

Chapter 4 Configuration

4.1 Monitoring page

Turbidity Monitoring screen

```
Current:4.00mA


         0.00 NTU
```
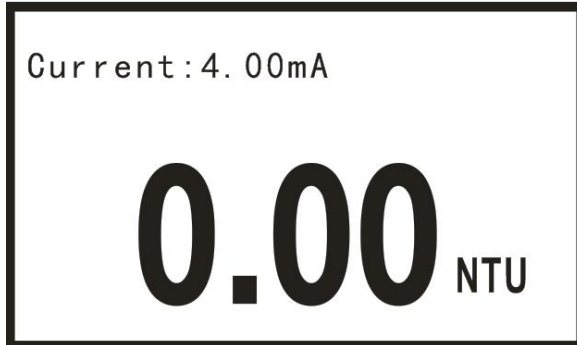
MLSS/TSS Monitoring screen

```
Current:4.00mA


         0.00 mg/L
```
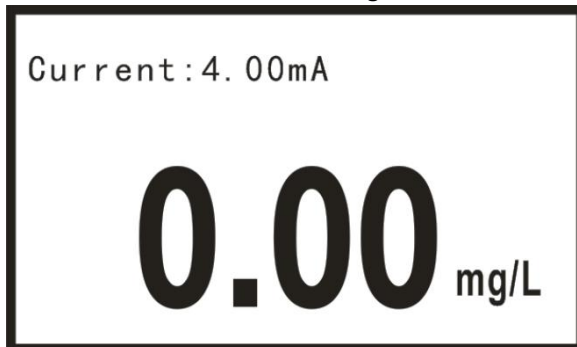
- Use **MENU** bottom to enter password page, enter the correct password to enter main menu.
- Use **ESC** bottom to enter alarm page, to see the current setting of alarm.

4.2 Password verification page

----User Password----

Password: 0000

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

4.3 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/TSS factors, scraping and response time.
- Online Calibration: Turbidity correction and calibration of MLSS/TSS.
- Remote Setting: RS485 parameter setting and the setting of current
- transmitting output parameters.
- Alarm Setting: settings of parameters of high and low warning.
- Version Query: current version number.

4.4 System Setting

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

- Language: Chinese or English.
- Buzzer: ON/OFF setting
- Backlight setting: ON/OFF setting
- Change Password: password modification and log-in with
- new password.
- Factory setting: return to factory settings

4.5 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/TSS.
- TUR Factor: Setting the turbidity factor in the range of 0.1～10.
- MLSS Factor: Setting the MLSS/TSS 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).

4.6 Online Calibration

```
― ― ― ―Online Calibrtion― ― ― ―
      ➡ 1.TUR Modification
        2.MLSS Calibration
```
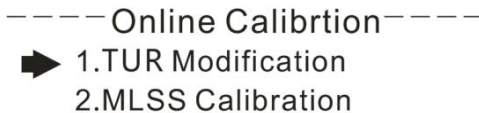
- TUR Modification: Correct the turbidity with a correction range of ±100NTU.
- MLSS Calibration: Two-point or four-point calibration of MLSS/TSS may be chosen, and the specific process is as shown farther below.

4.7 Remote Setting
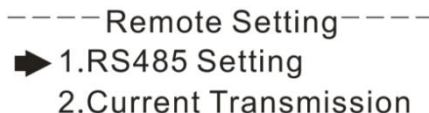
```
― ― ― ―Remote Setting― ― ― ―
      ➡ 1.RS485 Setting
        2.Current Transmission
```

- 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.

4.8 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.

4.9 Version Query

$$----\text{Version Query}----$$

Version Query: Query the current hardware and software version.

Chapter 5 Communication

The instrument provides a standard RS485 serial communication interface, and uses the general international standard MODBUS - RTU communication protocol.

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/TSS value (in mg/L, the obtained value needs to be divided by 10)	Read-only

Example 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

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

Example of MLSS/TSS 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/TSS value, which is 4 bytes;

00 00 00 00 is the returned MLSS/TSS value 0.0mg/L, and the obtained value

divided by 10 is the current MLSS/TSS value. The range is 0.0-120000mg/L;

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

Chapter 6 Calibration of MLSS/TSS

The MLSS/TSS sensor has been factory 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/TSS , taking two-point calibration as an example:

1. Connect the sensor to the transmitter.
2. Set up the related parameters (set the MLSS/TSS factoras1 in the signal setting), enter the MLSS/TSS 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 standard liquid, rinse it with clean water, and wipe the sensor.
5. Put the probe into the second 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 selection interface and select the two-point calibration; enter the first target value setting interface.
7. Enter the target value of the first 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 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.
9. 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 7 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 every quarter. Scraper position showed as figure 17, specific steps as follow:

The position of the scarper is as shown in the figure above;

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

Chapter 8 Troubleshooting

- No display of the controller?

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

- 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.

- 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.