User's Manual Supmea

Multi-parameter water analyzer

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U-SUP-MPP1000-EN1

Preface

Thank you for purchasing multi-parameter water analyzer. 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-SUP-MMP1000-EN1

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Chapter 1 Product Information

1.1. Overview

Multi-parameter water analyzer is a new generation of drinking water quality monitoring equipment independently developed and manufactured by our company. This equipment can be widely used in urban or rural water supply plants, tap water pipeline networks, tap water secondary water supply, user taps, indoor swimming pools, Online monitoring of water quality such as large-scale water purification equipment and direct drinking water is an indispensable online analysis equipment in the fields of water plant production process control, water conservancy and water management, and sanitation supervision. Our company masters the core sensor technology of the product, owns the core intellectual property rights of the product, and provides OEM customization services for the product.

The multi-parameter water analyzer is divided into standard version and customized version. The monitoring parameters of the standard version include turbidity, residual chlorine dioxide, pH and temperature. The customized version adds or reduces monitoring parameters according to customer needs. Customized version adds parameters including conductivity or TDS, dissolved oxygen, ORP, etc. At the same time, the customized version can customize the instrument shape, logo, system name and other items according to needs.

1.2. Product features

The characteristics of the multi-parameter water analyzer are as follows:

- **Integration：** Integrated design, unified water inlet and outlet, centralized data display, wall-mounted installation to prevent flooding and ground moisture, does not occupy ground space, which is convenient for installation, operation and maintenance;
- **Multi-parameters：** Adopt integrated design to monitor four parameters of turbidity, residual chlorine dioxide, pH and temperature at the same time, and expand the conductivity/TDS, dissolved oxygen, ORP and other parameters;

- **High precision:** Long-term stable and accurate measurement in the order of tap water (0.1～1NTU) and purified water (0.001～0.1NTU);
- **High reliability:** Imported components are used for sensors and instrument components, which are optimized for online analysis of water quality with high reliability;
- **Low maintenance:** Support remote control functions such as automatic sewage discharge and remote adjustment, which can effectively reduce the frequency of on-site maintenance, low system operation and maintenance costs;
- **Self-protection:** The equipment supports built-in water ingress detection and automatic protection functions to effectively avoid accidental damage to the sensor, and built-in lightning protection devices to avoid lightning damage to the equipment;
- **Easy integration:** standard RS485 Modbus-RTU protocol and device wireless data transmission channel support on-site third-party device access;
- **Strong environmental adaptability:** optional temperature control heating antifreeze module, the equipment can be operated all year round outdoors in cold areas;
- **Highly customized:** The equipment can be customized with trademark, name, cabinet appearance, etc.

1.3. Appearance and size

The appearance and dimensions of the multi-parameter water quality online analyzer are shown in Figures 1 and 2.

Figure 1 Product appearance

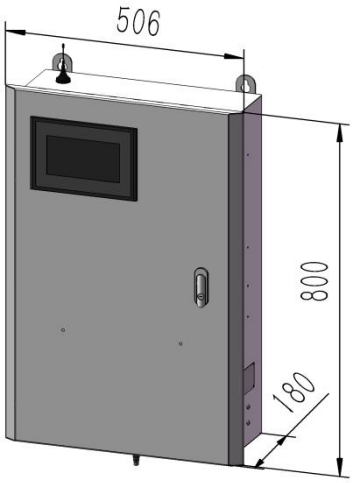

Figure 2 Product size drawing unit: mm

1.4. Technical parameters

The technical parameters of the multi-parameter water analyzer are shown in Table 1.

Table 1. Product technical index table

Item	Index	Value
System	Working power	(220±22)V AC，(50±1)Hz
	Power	30W
	Cabinet size	800mm*506mm*180mm (standard version)
	Weight	About 15kg
	Storage temperature	4℃~+50℃
	Working temperature	4℃~+50℃ / -25℃~+50℃ (optional temperature control heating antifreeze module)
	Working humidity	≤95%RH (no condensation)
	Inlet flow	500～1000 mL/min
	Inlet pressure	< 3kg/cm^2
	Communication interface	RS485 Modbus RTU communication protocol + air data interface
	Display	7-inch color touch screen, Chinese/English menu
Turbidity	measurement method	90° light scattering method
	Range	0-1NTU / 0-20NTU / 0-100NTU / 0-4000NTU
	Resolution	0-1NTU/0-20NTU/0-100NTU：0.001NTU 0-4000NTU：0.01NTU
	Lower detection limit	0.02NTU；0.1NTU（0-4000NTU）
	Zero drift	≤1.5%
	Indication stability	≤1.5%
	Accuracy	2%or±0.02NTU；2%or0.1NTU（0-4000NTU）

	Repeatability	≤3%
	Response time	≤120s
	Recommended maintenance period	3-12 months (depending on the water quality on site)
Residual chlorine/ chlorine dioxide	Measurement method	Amperometric method/ polarography (automatic temperature and pH compensation) Chlorine dioxide adopts special membrane head and electrolyte, which can effectively shield the interference of residual chlorine, and the maximum shielding amount is 2mg/L.
	Range	0-5mg/L / 0-20mg/L
	Resolution	0.01mg/L
	Lower detection limit	0.05mg/L
	Accuracy	±0.05mg/L or ±5% (DPD comparison error ±10%)
	Response time	≤120 seconds
	Recommended maintenance period	1-3 months or weekly calibration, 3-6 months to replace consumables
PH / ORP (optional)	Measurement method	Electrode method (automatic temperature compensation)
	Range	0-14pH, ±2000mV（ORP）
	Resolution	0.01pH, ±1mV（ORP）
	Accuracy	±0.1pH, ±20mV（ORP）or ±2%
	Repeatability	±0.1pH, ±10mV（ORP）
	Response time	≤60 seconds
	Recommended maintenance period	1-3 months
Temperature	measurement method	Thermistor method
	Range	-20℃ - 85℃
	Resolution	0.1℃
	Accuracy	±0.5℃

	Repeatability	≤0.5℃
	Response time	≤25 seconds
	Recommended maintenance period	12 months
Conductivity (Optional)	Measurement method	Conductivity cell method (automatic temperature compensation)
	Range	1-2000uS/cm / 1~200mS/m
	Accuracy	±1.5%FS
	Repeatability	≤0.5%FS
	Response time	≤30 seconds
	Recommended maintenance period	3-6 months
Dissolved oxygen (Optional)	Measuring method	Fluorescence method (Optional coating ampere current method)
	Range	0-20mg/L
	Accuracy	±0.3mg/L
	Repeatability	≤±1.5%
	Response time	≤30 seconds
	Recommended maintenance period	1-3 months
Expansion port	Port type	RS485、4-20mA

- Note: The above measurement accuracy is based on laboratory standard solution.

1.5. Main internal structure

The main structure of the multi-parameter water analyzer is shown in Figure 3.

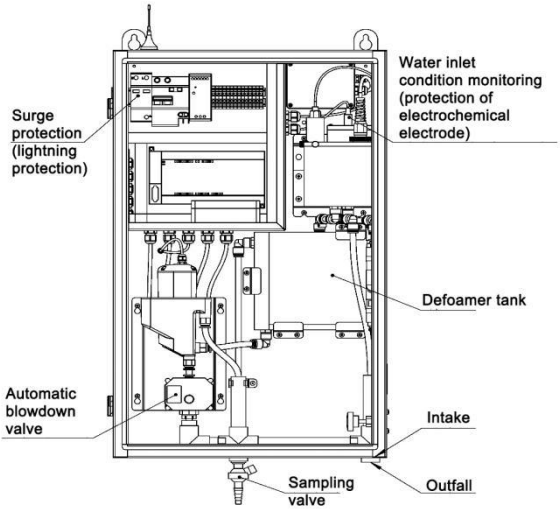

Figure 3 Main internal structure of multi-parameter water analyzer

Chapter 2 Installation Method

2.1. Unpacking inspection

After unpacking, first check whether the products and accessories are complete and whether they are damaged. The equipment list is shown in Table 2, and the product includes accessories as shown in Table 3.

Table 2 List of equipment

No.	Name	Quantity	Installation location
1	Cabinet	1	overall
2	7-inch touch screen	1	Cabinet door
3	Online turbidity monitoring unit (including flow defoaming cylinder, measuring cylinder, sensor, drain valve, optional temperature control heating antifreeze module, etc.)	1	Inside the cabinet
4	Online residual chlorine/chlorine dioxide, PH, temperature monitoring unit (including flow cell, residual chlorine electrode, pH electrode, sewage valve, etc.), optional sensors and transmitters	1	Inside the cabinet
5	Data collector	1	Inside the cabinet
6	GPRS - DTU	1	Inside the cabinet
7	SIM card	1	GPRS - DTU card slot
8	GPRS antenna	1	External top surface of the cabinet
9	Flow pool, defoaming pool	1	Inside the cabinet
10	Water level sensor	1	Inside the buffer tank
11	Air switch	1	Inside the cabinet
12	Lightning protector	1	Inside the cabinet
13	AC - DC power supply	1	Inside the cabinet
14	Needle water valve	1	Inside the cabinet
15	Several pipe fittings	1	Inside the cabinet

16	Other optional measuring units	-	Inside the cabinet

Table 3 Accessories list

No	Name	quantity	purpose
1	6mm or 10mm outer diameter water inlet pipe	1m	water inlet pipe
2	Sampling valve	1m	Sampling comparison calibration
3	4 point adapter	1	connected to water inlet

2.2. Installation steps

2.2.1. Fixed equipment

Hang the device vertically on a flat wall and fix it firmly.

- Note: The device must be installed upright, otherwise the measurement accuracy of the sensor will be affected, and the sensor may even be damaged.

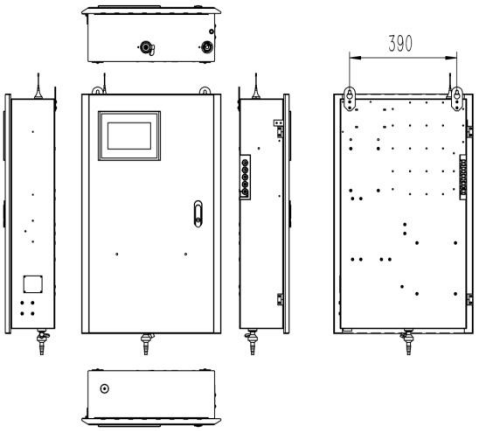

Figure 4. Views of all aspects of equipment (unit: mm)

2.2.2. Drainage installation

Drainage is discharged by the water's own gravity. Therefore, the drainage pipe should be as short and straight as possible, and should not be arched or circled in the middle.

2.2.3. Water inlet installation

The water inlet pipe of the equipment is a 6mm or 10mm water pipe, which uses a 4-point adaptor connect to a 4-point water inlet pipe pair. An external valve is set before the adapter to facilitate equipment maintenance.

After connecting, open the external water valve, and drain the external water pipe for 10 minutes before connecting the water to the equipment to prevent the dirty water deposited in the pipeline from entering the equipment. Rotate the inner needle valve to adjust the size of the water flow so that there is a continuous water flow out of the overflow of the flow tank, and the 7-inch display panel shows that the water is normal.

- Important issues：In poor water quality or unstable environment, it is recommended that users install a pre-filter by themselves to prevent impurities from entering the equipment, blocking the internal waterway of the equipment and causing malfunctions.

2.2.4. Install electrodes

Remove the electrode protective cap and carefully insert the corresponding mounting hole of the flow cell.

- Important issues：After the electrochemical electrode is installed, water must be passed to keep the electrochemical electrode sensitive parts moist (the residual chlorine/chlorine dioxide electrode also needs to maintain a continuous disinfectant in the water sample to prevent microorganisms from clogging the electrode sensitive device).

2.2.5. Power installation

Connect the power cord to the AC220V power supply. Red is the live wire, black is the zero wire, and yellow is the ground wire.

2.2.6. Start-up operation

After completing the installation of drainage, water intake and power supply, open the water valve, adjust the flow of the water intake, and after the power supply is connected, open the internal air switch and the system is powered on.

- Pay attention to the following three aspects:
  1) Check whether the water level is normal-the normal water level is that the water level monitoring electrode is submerged by water, and there is continuous water flowing out from the overflow of the flow tank, and the 7-inch display panel indicates that the water is normal;
  2) See if there is data on the device-5 minutes after water and power, the 7-inch display panel displays the measurement stage, and multiple parameters have data display. After the first power on for 2 hours, the electrode sensor hydration polarization is completed and the device enters a stable operation state；
  3) Check whether the wireless data transmission is normal-the network connection indicator is always on, and the connection status is displayed on the 7-inch display panel as connected. Log in to the website and WeChat, and the field data can be displayed normally.
- Note: Due to the different characteristics of the water quality of each site, it is generally necessary to recalibrate the residual chlorine/chlorine dioxide value on site. Before calibrating the residual chlorine/chlorine dioxide value, the system must be preheated for more than 2 hours before the residual chlorine/chlorine dioxide electrode is hydrated and polarized. The calibration instrument adopts DPD method portable residual chlorine/chlorine dioxide analyzer.
- Note: During on-site calibration, the residual chlorine/chlorine dioxide content in the water sample should not be less than 0.3mg/L (or the average value of the residual chlorine in the water sample), otherwise the calibration error will be too large.
- Note: When comparing and calibrating, the content of the water sample must be stable and the water must be taken from the sampling port of the

equipment for comparison. Sampling and calibration at other locations may have uncertain errors.

Figure 5 Equipment installation effect diagram

Chapter 3 Data Interface

3.1. Physical interface

The device field interface is RS485 interface, baud rate 9600, data bit: 8, stop bit: 1, parity bit: none, flow control: none. The 485 wiring diagram is shown in Figure 6.

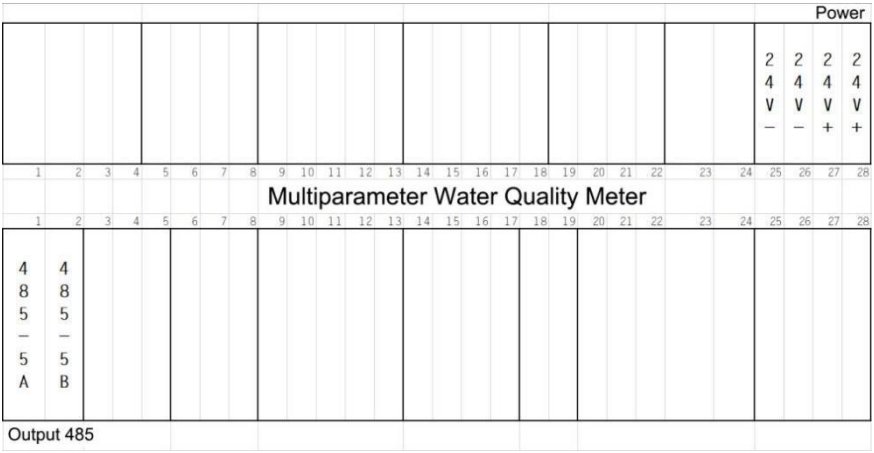

Figure 6 Wiring diagram of multi-parameter water analyzer 485

The 485 interface is the bottom row of wiring terminals for the multi-parameter water analyzer controller. The first and second wiring terminals from left to right are output 485A and output 485B.

Optional 4-20mA interface, detailed interface definition see the logo on the device.

3.2. Data protocol

The communication protocol of the multi-parameter water analyzer adopts ModBus-RTU. The slave address defaults to 0x06, the read function code is 0x03, and the write function code is 0x10. The register address table is shown in Table 4.

Table 4 Register address table

No.	register name	register address	length	data type	operation	description
1	Turbidity	1	2	UINT32	Read only	Divide by 1000 to retain three decimal places, the unit is NTU.
2	Residual chlorine/ chlorine dioxide	3	2	UINT32	Read only	Divide by 1000 to retain three decimal places, the unit is mg/L.
3	Temperature	5	2	UINT32	Read only	Divide by 1000 to retain three decimal places, the unit is ℃.
4	pH	7	2	UINT32	Read only	Divide by 1000 to retain three decimal places.
5	4-20mA1 access value	9	2	UINT32	Read only	default connection conductivity, divided by 1000 to retain three decimal places.
6	4-20mA2 access value	11	2	UINT32	Read only	Can be connected to other 4-20mA output signals.
7	ModbusID	20	1	UINT16	Read and write	Modbus address, default 6.
8	Equipment working phase	39	1	UINT16	Read only	0: Initialization 1: Waiting for the water 2: Measurement 3: Drainage 4: Error
9	Transfer water time	63	2	UINT32	Read only	Unit: second
10	Measuring time	65	2	UINT32	Read only	Unit: second
11	Drainage time	67	2	UINT32	Read only	Unit: second

The host machines reads the parameter value of the slave Modbus command:

06 03 00 01 00 08 14 7B

The slave machines responds to the host value Modbus command (example)

06 03 10 00 00 00 A8 00 00 01 2C 00 00 55 F0 00 00 1D 4C 17 75

Turbidity value: 00 00 00 A8, converted to decimal 168, keep three decimal places to get a turbidity value of 0.168.

Residual chlorine value: 00 00 01 2C, converted to decimal 300, keep three decimal places to obtain the residual chlorine value 0.3.

Temperature value: 00 00 55 F0, converted to decimal 2200, keep three decimal places to get a temperature value of 22.0.

PH value: 00 00 1D 4C, converted to decimal 7500, keep three decimal places to get a PH value of 7.5.

3.3. Air interface

Contact our technical support staff for customization according to specific needs.

Chapter 4 Maintenance Work

Important matters: The equipment must be powered off for maintenance!

The equipment is maintained every 1 to 3 months according to the water quality and usage on site. The maintenance content is as follows:

4.1. Clean

Regularly clean the dust and dirt inside and outside the equipment according to the site conditions. The residual chlorine/chlorine dioxide flow cell and the turbidity measuring cylinder can be cleaned with a test tube brush, and rinse with clean water after completion.

4.2. Water leakage inspection

Check each pool, water pipes, and joints for leaks, and replace or deal with them if any.

4.3. Maintenance of Turbidity Meter

Calibrate regularly. Take out the turbidity sensor probe regularly to observe whether the light source is dimmed or not bright. If there is a fault, replace it in time. Support on-site comparison and calibration.

Turbidity field comparison calibration: recommended to use low-point calibration within 1NTU.

Important matters: Please handle the turbidity sensor probe gently to prevent the light hole from being splashed with water!

4.4. Maintenance of ampere current electrode

Ampere current electrodes include: residual chlorine/chlorine dioxide electrodes

and dissolved oxygen electrodes. The electrodes need to be calibrated regularly. If the electrolyte is insufficient every month or the usage time exceeds 3 months, the electrolyte should be added or replaced in time, and calibration should be carried out. Regularly check and clean the membrane head. Generally, it is recommended to replace the membrane head every 6 months. If the membrane head is contaminated or damaged, replace the membrane head immediately and perform calibration. Support on-site comparison one-key calibration.

Residual chlorine/chlorine dioxide field comparison calibration: Click the gear button in the upper right corner of the device screen, select the recommended high-point calibration, and the calibration point is not less than 0.3mg/L.

Residual chlorine/chlorine dioxide replacement electrolyte steps:

(1) Unscrew the membrane head from the sensor, discard the original electrolyte, and add electrolyte to at least 2/3 of the inside of the membrane head.

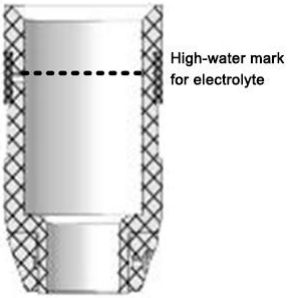

Figure 7 Sketch map of electrolyte filling position

(2) Pull down the rubber ring on the membrane head to leak the vent hole.

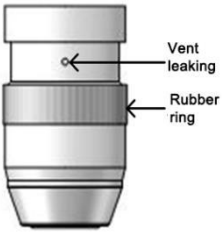

Figure 8 Schematic diagram of the vent leaking out of the rubber ring

(3) Screw the membrane head to the sensor, the excess electrolyte will overflow from the vent, you can wipe it dry with a paper towel, and finally pull the rubber ring upward to cover the vent.

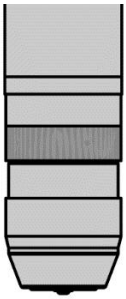

Figure 9 Schematic diagram of completion of replacement

4.5. PH/ORP electrode maintenance

The electrodes need to be cleaned and calibrated regularly. If there are deposits on the surface of the electrode, it can be washed with dilute hydrochloric acid and washed with water. If the pH/ORP value has a large deviation after calibration, the electrode should be replaced in time and calibration should be performed. The service life of the electrode is 1 year. The service life of the electrode may be reduced due to improper maintenance or poor site conditions.
PH/ORP calibration: please insert the electrode into the corresponding standard solution for calibration.

4.6. Maintenance of conductivity electrode

The electrode needs to be cleaned and calibrated regularly, and the alcohol cotton ball should be cleaned so as not to damage the platinum black surface of the electrode. If the data value has a large deviation, the electrode should be replaced in time and calibration should be carried out.
Conductivity calibration: please insert the electrode into the standard solution for calibration.

4.7. Buffer pool maintenance

If there is a lot of dirt inside the buffer tank, it should be cleaned or replaced with a test tube brush in time.

4.8. Maintenance of other optional electrodes

For the maintenance of other customized optional electrodes, please consult the manufacturer separately.

Chapter 5 Failure Analysis and Treatment

5.1. Common troubleshooting

For common equipment faults, please refer to Table 5 for troubleshooting. If the problem still cannot be resolved, please refer to the handling under special circumstances below.

Table 5 Failure reason table

Fault phenomenon	Possible cause analysis	Troubleshooting method
The turbidity value increases abnormally (exclude water source problems)	Improper installation makes the sensor light hole polluted 2. Pollution inside the flow cell	1. Clean the optical aperture glass of the sensor 2. Clean the flow cell
Turbidity value is too low	the light source is damaged Internal contamination of the sensor	Contact us to replace the light source 2. Clean the sensor
The electrode value is not accurate	Maintenance is not timely 2. Electrode is damaged	1. Maintain and recalibrate the electrode 2. Replace the electrode and recalibrate
Network communication failure	Poor field wireless signal 2. In arrears	1. Contact the operator to increase signal coverage or change the installation location 2. Contact us for data recharge
RS485 cannot communicate	1. The signal line is not connected properly	1. Reconnect the signal line after power off

- Note: The operator must pass relevant operation training!

5.2. Handling of abnormal turbidity values under special circumstances

1) Laboratory equipment water samples are inconsistent with equipment water samples. Please take water measurement at the water outlet of the equipment.
2) There are too many micro-bubbles in the on-site water sample, the turbidity value measured directly by laboratory equipment is higher, and the measured value of the equipment is lower. After taking the water, please let the water sample stand until there are no bubbles, and then use laboratory equipment to measure.
3) The difference between on-site water temperature and room temperature is too large. In this case, water mist may be generated outside the measurement bottle of the laboratory equipment, which will affect the measurement of the laboratory equipment. The gap between the water temperature and the room temperature can be reduced and then the laboratory equipment can be used for measurement.

5.3. Treatment of abnormal residual chlorine/chlorine dioxide value under special circumstances

1) The value measured by the DPD method is less than 0.05, and the device display is less than the value measured by the DPD method or 0. In this case, do not calibrate, because the DPD method has almost reached the lower limit of measurement at this time, and the influence of errors will be great. Increase the dosage and calibrate when the measured value of DPD is greater than 0.3mg/L.
2) The electrode membrane head is covered by stains, and the device display value is much smaller than the value measured by the DPD method. Please use a cotton swab to gently wipe the electrode membrane head. Be careful not to wipe the membrane head too hard, and clean the electrode membrane head with clean water, then put the electrode back into the flow cell and perform calibration after two hours of normal operation. After this happens, it is recommended to clean and calibrate the membrane head of the residual

chlorine electrode every week. If it still does not solve the problem, please replace the membrane head and electrolyte.

3) The on-site water sample contains a lot of ammonia nitrogen, and ammonia will react with chlorine a lot:

NH+4+HOCl → NH2Cl+H2O+H+

NH2Cl+HOCl → NHCl2+H2O

NHCl2+HOCl → NCl3+H2O

2NH+4+3HOCl → N2+5H++3Cl-+3H2O

NH+4+4HOCl → NO-3+6H++4Cl-+H2O

And as the content of chlorine is different, the reaction may be different, generating various chloramines. Experiments have proved that monochloramine will cause the free chlorine value measured by DPD method to be higher. Reading within one minute, every 0.3ml/L of monochloramine will cause the free chlorine value measured by DPD method to be higher by 0.1, while the residual chlorine electrode of the device Cannot measure monochloramine. It is recommended to use high purity chlorine dioxide for disinfection.

4) There are many high-valent iron ions in the on-site water samples, which have strong oxidizing properties, which will make the value measured by the DPD method higher. In this case, the value can also be measured by using the DPD method to measure raw water. The electrode cannot measure iron ions.

Chlorine dioxide can oxidize iron ions to generate rust. Increasing the dosage of chlorine dioxide can oxidize some iron ions to produce free chlorine dioxide. The device can detect the value but is less than the value measured by the DPD method.

It takes several days for residual chlorine to oxidize high-valent iron ions, and most of the iron ions are not oxidized, and the value detected by the equipment will be far less than the value measured by the DPD method.

5) The on-site water sample contains a lot of nitrite ions, and the situation of containing nitrite is the same as that of iron ions.

6) There are more high-valent manganese ions in the on-site water samples. High-valent manganese ions have strong oxidizing properties, which will make the value measured by the DPD method higher. In this case, the value can be measured by using the DPD method to measure raw water. The electrode of the device cannot measure manganese ions.

Chlorine dioxide can oxidize high-valent manganese ions, and increasing the dosage of chlorine dioxide can oxidize part of high-valent manganese ions, thereby generating free chlorine dioxide. The device can detect the value but is less than the value measured by the DPD method.

The efficiency of residual chlorine to remove high-valent manganese ions is low, most of the manganese ions are not oxidized, and the equipment can read the value but it is far less than the value measured by the DPD method.

Chapter 6 Warranty & After-sales Service

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in material and manufacturing process. From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:

- During the warranty period, product faults caused by the following reasons are not in the scope of Three Guarantees service
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing and refitting the product.

After-sales service commitment:

- We promise to deal with the customer's technical questions within 2 hours.
- For the instruments returned to the factory for maintenance, we promise to issue the test results within 3 working days and the maintenance results within 7 working days after receiving them.