XMTN-800 series Multi-channel Independent Auto tuning PID Temperature Controller *Operation Manual*

Warning

1. Wiring warning

If the controller fails or an error occurs, the system may fail and an external protection circuit is installed to prevent such an accident.

To prevent the controller from damage or failure, use proper fuse to protect the power cord and input/output line from current shock.

2. Power supply of controller

To prevent electric shock or controller failure, please check the connection after all connection work is completed.

3. Use near flammable gas is prohibited

In order to prevent fire, explosion or controller damage, it is prohibited to use in places where inflammable, explosive gas or steam is discharged.

4. Do not touch the inside of the controller

Do not touch the inside of the controller to prevent electric shock or burning. If it occurs any quality problem, please contact Shanghai yatai instrument Co., LTD. Only the service engineer of yatai can check the internal circuit or change parts. The controller has high voltage and high temperature components inside, it is very dangerous to touch it without permission!

5. It is strictly forbidden to change the instrument

In order to prevent accidents or controller failure, it is strictly forbidden to change the controller.

6. Maintain

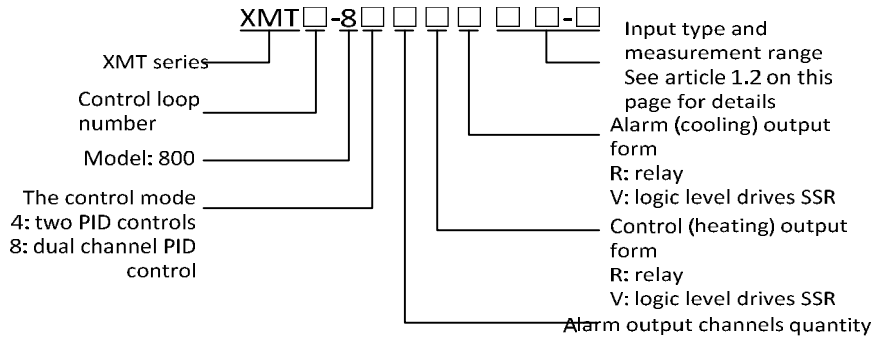
In order to prevent electric shock, the controller is useless or invalid. Only Yatai service engineer can replace the parts. The controller should be maintained regularly to ensure long-term safe operation. Some parts inside the controller may be damaged with the extension of time.

7. Clean

Wipe the controller after power off. To remove stains from the display, use a soft cloth or cotton paper. The display is prone to scratches. Don't rub or touch with hard objects. Do not use screwdriver or pen or other hard objects to operate the button, otherwise it will damage or scratch the button.

1. Product confirmation

1.1. Please refer to the following selection code to confirm whether the product delivered is completely consistent with the model you selected



1.2. List of common input types and Temperature ranges

No.	Input type	SN	Graduation	Maximum range of measurement	
				Degrees Celsius (℃)	Fahrenheit (℉)
1	thermocouple	1	E	-270～1000	-454～1832
2	thermocouple	2	J	-210～1200	-346～2192
3	thermocouple	3	K	-270～1372	-454～2501
4	thermocouple	4	N	-270～1300	-454～2372
5	RTD	15	Pt100	-200～0850	-328～1562
6	Other sensors	Customized		-500～4000	

1.3. Main technical indicators

1) measurement accuracy: + 0.5%FS + 1db; Cycle control cycle: 0.2 second/every 8 loops.

2) power supply: 24VDC + / - 10%Also can customize 100 ~ 240VAC power supply form.

3) operating environment: atmospheric pressure: 86 ~ 106kPa; 10 ~ 50 ℃ ambient temperature: -Relative humidity: 45 ~ 85% RH.

4) avoid:

Condensation that can be caused by a sharp change in ambient temperature.

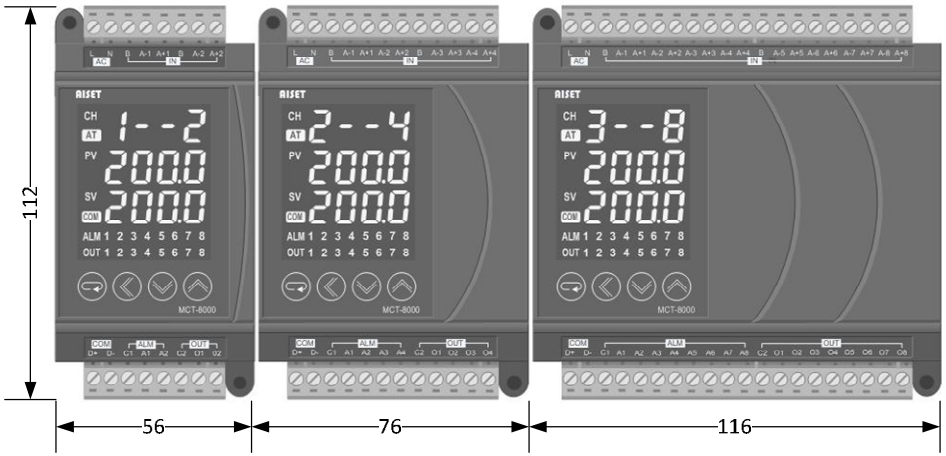
Direct vibration or impact of the main structure.

Water, oil, chemicals, smoke or steam pollution. Corrosive and flammable gases.

Too much dust, salt, or metal powder.

2. Appearance and installation

2.1. **Controller appearance**

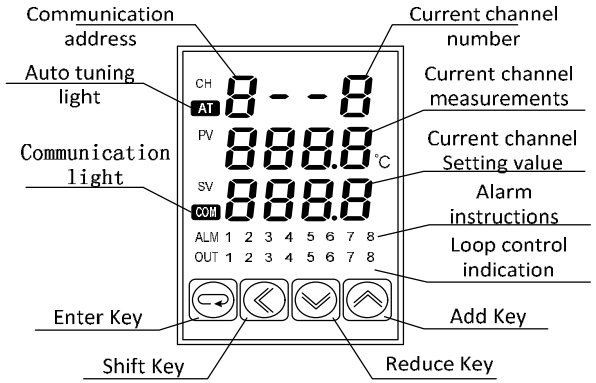


The maximum height of the controller (including the terminal) is 112mm;
The width of the controller is 56mm, 76mm and 116mm.
The depth of the controller is 78mm.

2.2. Controller installation

M3 screw installation, mounting hole is 102mm X (width -10mm) rectangular diagonal point. DIN46277 rail (35mm wide) rail mounting. Remove the controller by pulling down the assembly hook of the guide rail。

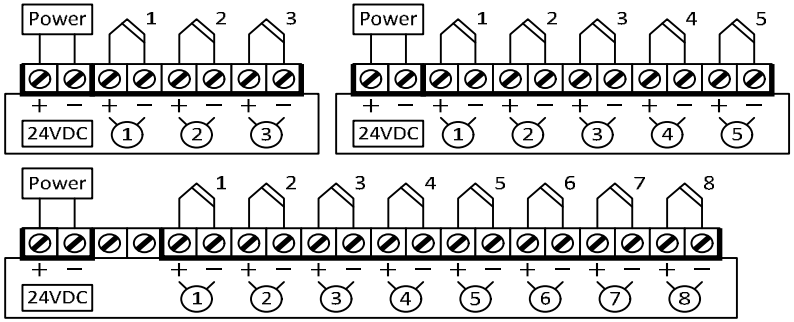
2.3. Display and operation panel



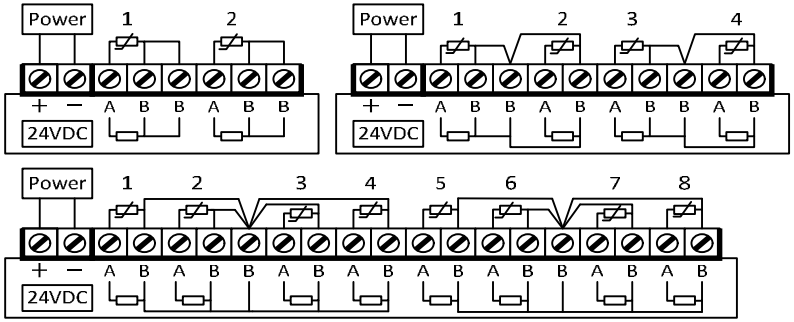
3. Terminal blocks

3.1. Wiring diagram of upper terminal

1) Power and thermocouple or standard signal input

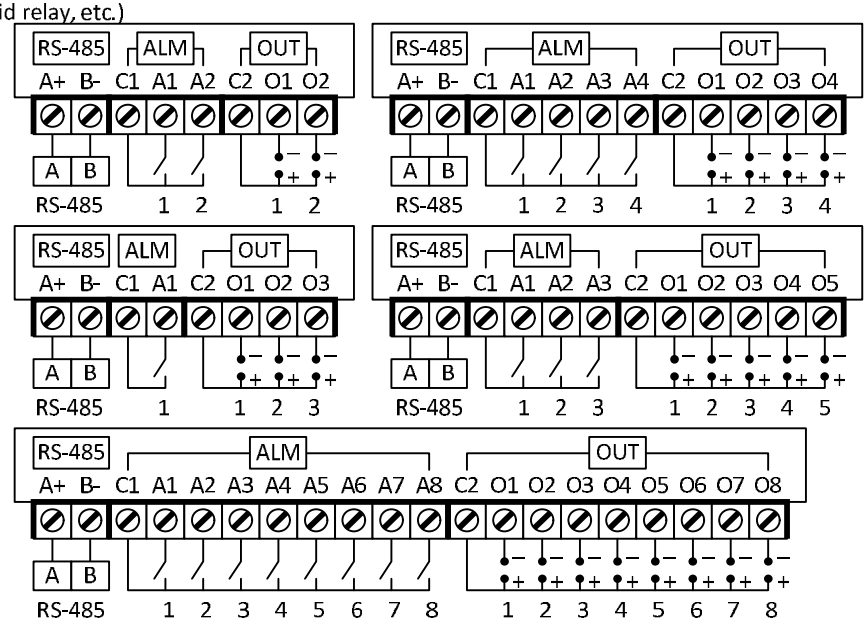


2) Power supply and thermistor signal input

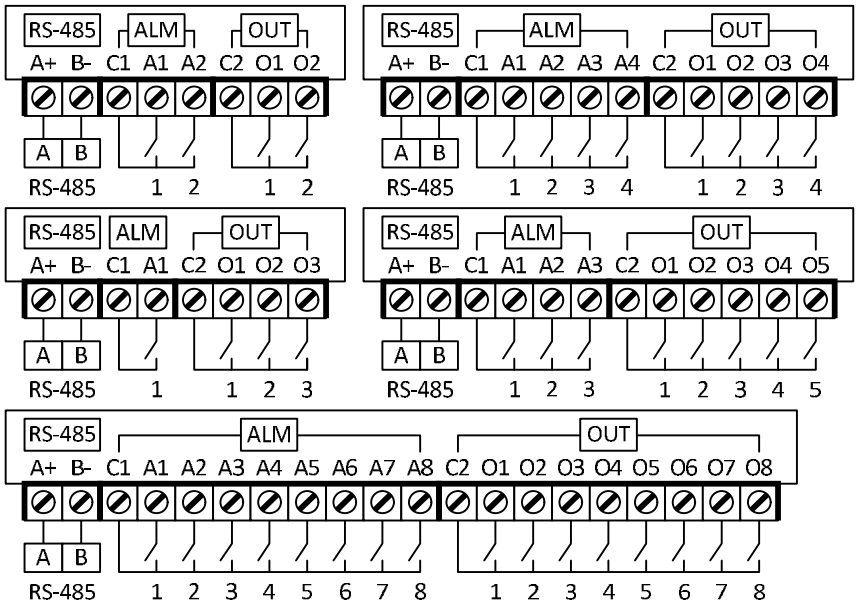


3.2. Wiring diagram of lower terminal

1) Rs-485 communication and transistor collector open control output (used to drive solid relay, etc.)



2) Rs-485 communication and relay control output (used to drive ac contactor, etc.)



4. Control parameter setting

4.1. Boot information

full screen >>> XMTN（N shows the quantity of zones）>>> V3.00（Software version number）>>> normal condition

4.2. CHANNEL SELECT

After long press ⊙ or ⊙ for one second, the current loop number starts flashing, and then short press ⊙ or ⊙ to switch the control loop. The N+1 channel is the temperature display of the environment (cold end of thermocouple).

4.3. Control parameter setting

Long press ⊙ for 3 seconds to enter the setting state of control parameters. At this time, the upper row displays parameter prompt SV, and the lower row displays control parameters. At this point, the single digit flashes, short press ⊙ and move the flshing digits. After selecting the number of digits to be modified, short press ⊙ or ⊙ to modify the control parameter. Continue to press ⊙, and display each parameter prompt in the upper row. After finding the parameter that needs to be modified, continue to press ⊙ to move the flshing digits. After selecting the number that needs to be modified, press ⊙ or ⊙ again to modify the control parameter.

Long press ⊙ for more than 1 second, the controller automatically returns to the normal control state (no button operation within 60 seconds, the controller automatically returns to the normal control state).

4.4. A list of control parameter Settings

No.	Parameter Name	Symbol	Data Range	Unit	Introductions	Initial value
1	Set value	SV	SVL～SVH	℃	The set target value of the zone of the controller	100
2	The lower limit alarm 1	AL1	-500～4000	℃	See 4.5, alarm output instructions for details	50
3	The lower limit alarm 2	AL2	-500～4000	℃	Same as AL1, but can only be output through communication	50
4	Upper limit alarm 1	AH1	-500～4000	℃	See 4.5, alarm output instructions for details	50
5	Upper limit alarm 2	AH2	-500～4000	℃	Same as AH1, but can only be output through communication	50
6	Alarm type	SA	00～66	—	The single digit of XX is type 1 of alarm, while the ten digit is type 2 of alarm. X=0: no alarm; 1: upper limit deviation alarm; 2: lower limit deviation alarm; 3: alarm outside the deviation value of upper and lower limits; 4: alarm within the deviation value of upper and lower limits; 5: upper absolute value alarm;	01
7	Positive and negative action control and first power on alarm enable	EA	000～111	—	The hundred digits of XXX are positive and negative control options: X=0: reaction control (heating type); 1: positive action control (cooling type). The ten digit of XXX is first choice of alarm 2, the single digit of XXX is first choice of alarm 1: X=0: After the power on the alarm condition does not alarm, then all alarm if the alarm condition is met; 1: all alarm if the alarm condition is met.	011
8	Proportional band	P	0～9999	℃	Regulation of proportional action: the larger the P, the smaller the proportional action, the lower the system gain. 0: change to on-off control mode. At this point, the integral time I becomes 0.1 times of the upper limit of the insensitive region and the differential time D becomes 0.1 times of the lower limit of the insensitive region.	30
9	Integral time	I	0～9999	Sec.	Integral action time constant: the larger the I, the weaker the integral action, mainly used to eliminate the static difference. 0: become a PD control method, the integral inhibit Ar to set (RESET), and the Ar is set to zero, the unit for ℃, is used to eliminate static error. When P=0, see the description of P.	240
10	Differential Time	d	0～9999	Sec.	Differential action time constant: the larger the D, the stronger the differential action, which is mainly used to restrain the overshoot of measured values. When P=0, see the description of P.	60
11	Restrained Integration	Ar	0～100	%	Restrained Integration ratio: the larger the Ar, the larger the overthrust, and the smaller the Ar, the possible static difference. When the integral time I is equal to 0, see the description of the integral time I	100
12	Control cycle	t	1～100	Sec.	Output of thyristor or solid-state relay: 2~3 seconds; Relay output: 20~30 seconds	3
13	Sensor error correction	Pb	-500～4000	℃	Used to correct measurement error caused by sensor and thermocouple compensation wire	0.0
14	Auto tuning	At	nO or YES	—	YES: start self-tuning and restore nO after self-tuning. If the self-tuning rule is not completed within 4 hours, the original P, I and D values are still used for control.	nO
15	Auto tuning Limit	AtU	0～100	%	In order to overcome the overshoot phenomenon of the Auto tuning time, the Auto tuning control point can be lowered to SV x ATU.	100
16	Graduation	Sn	0～18	—	See 1.2 list of commonly used input types and range for details.	3-K
17	Decimal point	dP	0～1	—	0：the resolution of the measured values PV 1 ℃； 1：the resolution of the measured values PV 0.1 ℃	0
18	Filter coefficients	FILt	0～250	—	The smaller this value, the faster the measured value responds, but there may be fluctuations; The larger this value, the slower the measured value response and the more stable the display.	125
19	Screen blanking	dt	0～250	℃	Used to suppress the change sensitivity of the display value, and the range of inhibition is 0.1 times of the display inhibition dt.	15
20	Alarm1 differential gap	FH1	-500～4000	℃	The differential gap is 0.1 times of FH1	4
21	Upper limit	SVH	-500～4000	℃	The highest measured value is SVH	300

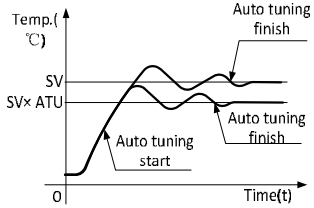
	of measured value					
22	Lower limit of measurement	SVL	-500～4000	℃	The lowest measured value is SVL. This parameter should be lowered if the ambient temperature is too low	0
23	Control the output switch	SSt	0～1	—	0: control output off (SV displays 0FF under normal state), and only the output is off, others such as alarm normal work;1: output open.	1
24	Alarm2 differential gap	FH2	-500～4000	℃	The differential gap is 0.1 times of FH2	4
25	Temperature of the unit switch	Ctr	0～1	—	0：℃； 1：℉。	0
26	Overshoot restrain	Ar2	0～250	—	Reserved, not used now	0

Note: if you did not press ⏎ for more than 1 second after modifying the parameter, the individual parameters may not be saved.

The change of each parameter in the list may change the control effect. Please be careful!

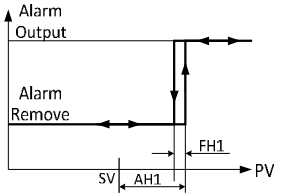
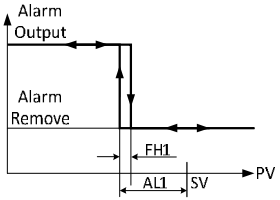
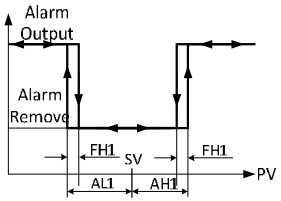
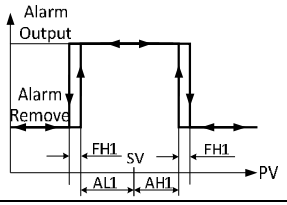
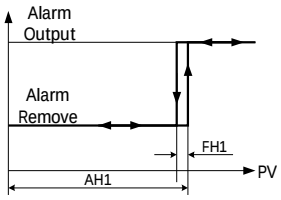
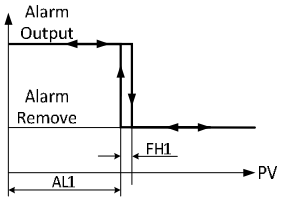
4.5. Auto tuning PID parameter function

Follow 4.4. Control parameter setting operation to find the auto tuning start parameter AT, and display the "AT" prompt on the upper row, and "nO" prompt on the lower row, indicating that currently No limit setting or auto tuning function has been opened, Click ⏫ to display the "YES" prompt below, indicating that the user is ready to start the loop auto tuning function; If the temperature in the loop system is not allowed to exceed the set value SV too much, the next parameter can be set as auto tuning limit ATU, which can be set as between 70 and 80% (Auto tuning is carried out on 70 ~ 80% of the set value), Then press ⏎ more than 1 second to exit parameters Settings, AT this point the AT indicator will flicker, indicate that the controller in the process of auto tuning, temperature fluctuations after two to three times to complete the whole process of auto tuning, then the AT indicator light off, it is concluded that a set of suitable for the loop control of P, I, D parameter values, and according to the new P, I, D parameters control, this P, I, D parameters will be forever in the controller.



If the auto tuning process needs to be interrupted during the setting process, the control parameter menu needs to be re-entered, Set the auto tuning start parameter AT to nO, and then exit the control parameter menu. AT this time, the AT indicator is off, and the controller will control according to the original P, I ,D parameters.

4.6. Alarm output instruction

No.	Type	Action condition		Schematic diagram (for example, alarm 1 only)
		Alarm1	Alarm2	
1	alarm free	Single-digit of SA =0。	tens digit of SA =0。	——
2	Upper limit deviation alarm	Single-digit of SA =1； PV>SV+AH1 Alarm； PV≤SV+AH1-FH1 remove alarm	tens digit of SA =1； PV>SV+AH2 Alarm； PV≤SV+AH2-FH2 remove alarm	
3	Minimum deviation alarm	Single-digit of SA =2； PV<SV-AL1 Alarm； PV≥SV-AL1+FH1 remove alarm	tens digit of SA =2； PV<SV-AL2 Alarm； PV≥SV-AL2+FH2 remove alarm	
4	Upper and lower limit deviation outside alarm	Single-digit of SA =3； PV>SV+AH1 Alarm； PV≤SV+AH1-FH1 remove alarm； PV<SV-AL1 Alarm； PV≥SV-AL1+FH1 remove alarm	tens digit of SA =3； PV>SV+AH2 Alarm； PV≤SV+AH2-FH2 remove alarm； PV<SV-AL2 Alarm； PV≥SV-AL2+FH2 remove alarm	
5	Upper and lower limit deviation within alarm	Single-digit of SA =4； SV-AL1<PV<SV+AH1 Alarm； PV≥SV+AH1+FH1 or PV≤SV-AL1-FH1 remove alarm	tens digit of SA =4； SV-AL2<PV<SV+AH2 Alarm； PV≥SV+AH2+FH2 or PV≤SV-AL2-FH2 remove alarm	
6	Upper absolute value alarm	Single-digit of SA =5； PV>AH1 Alarm； PV≤AH1-FH1 remove alarm	tens digit of SA =5； PV>AH2 Alarm； PV≤AH2-FH2 remove alarm	
7	Lower limit absolute value alarm	Single-digit of SA =6； PV<AL1 Alarm； PV≥AL1+FH1 remove alarm	tens digit of SA =6； PV<AL2 Alarm； PV≥AL2+FH2 remove alarm	

4.7. Error message

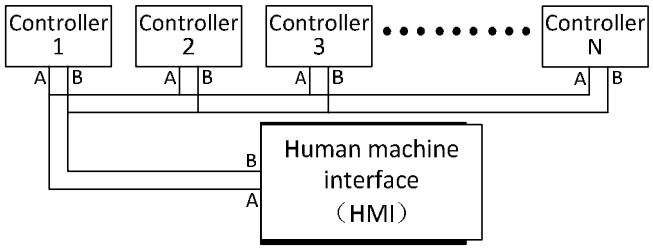
When the measured value PV is lower than SVL, it is shown as 0000 (communication output is -16666), indicating that the thermocouple is inversely connected, thermal resistance short-circuit or three-wire connection is wrong, and the ambient temperature (cold end temperature) is too low. Please check whether the sensor wiring is correct or the sensor is damaged. When the ambient temperature is too low, the lower limit SVL can be lowered to test.

When the measured value PV is higher than SVH, it is shown as 0000 (communication output is 18888), which indicates that the thermocouple is open circuit or the thermal resistance is open circuit, and the actual measurement temperature is higher than the upper limit of the range (the sensor and the heating unit do not form the same loop, resulting in long-term heating). Please check whether the sensor is damaged and the control loop is connected correctly

5. Communication connection and set-up

5.1. Multiple controller communication connection

When the sensor indexing code Sn is not set to a valid value, it is displayed as Erro (communication output is 15555).



5.2. Communication parameter setting（In normal state, long press ⟪ for more than 3 seconds to enter the communication parameter setting）

No	Parameter Name	Symbol	Data Range	Introductions	Initial value
1	Communication address	Addr	0～254	Common addresses are 0 ~ 9 and can be extended to 254; Including: 0 is broadcast address; 251 is the initial value address of all parameters restored at factory: When Addr=251, press ⟲ and all parameters of the controller are restored to the factory initial value. About 5 seconds later, the system will restart and enter the normal working state automatically.	1
2	Communication rate（bps）	bAUd	The value of 0～10	0：600； 1：1200； 2：2400； 3：4800； 4：9600；5：14400；6：19200；7：28800；8：38400； 9：57600； 10：115200。	9600
3	The number of Measurement and automatic inspection function	CHLS	01～88	0X：The single digit is used to limit the control loop number，The set range of X is 1～8（match with hardware）。 X0：10 digits for manual/automatic inspection function setting; X=0：Manually switch the loop to be displayed; X=1～8：Show stop time for each channel during automatic inspection, unit is second.	28

6. Maintenance and preservation

6.1. Maintenance: within 18 months following the purchase of the instrument, the factory shall be responsible for the overall warranty for the failure of manufacturing quality. If the instrument is damaged due to improper use, the factory will charge users repair cost, and the instrument has lifetime warranty.

6.2. Storage: the instrument should be kept in dry, ventilated and free of corrosive gas with complete package.

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