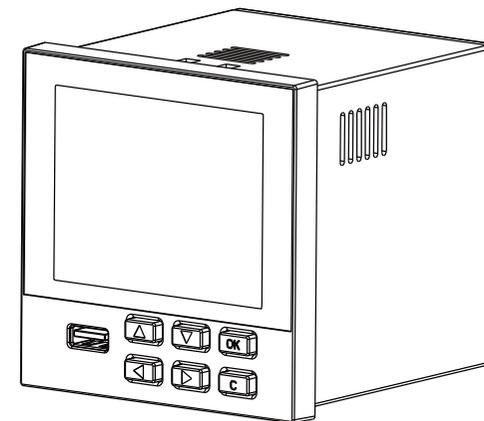


# Paperless Recorder



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Supmea Automation Co., Ltd.

## **Preface**

Thank you for purchasing paperless recorder. 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-RN3000-EN1

## **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 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, benzene 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	Paperless recorder	1	
2	Manual	1	
3	Certificate	1	
4	U disk	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.

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## Chapter 1 Introduction

### 1.1.Overview

This product is an industrial paperless recorder equipped with a 3.5-inch TFT true color full view LCD display screen. Multiple types of industrial standard signals such as current, voltage, thermocouples, and thermal resistors can be connected to achieve temperature, humidity, pressure, liquid level, flow display, recording, over limit monitoring, reporting, data communication, signal transmission, flow accumulation, flow temperature and pressure compensation, and other functions. It can be applied in various industries such as metallurgy, petroleum, chemical engineering, building materials, papermaking, electricity, food, pharmaceuticals, industrial water treatment, etc.

This product has a 18-channel analog signal input channel, 4-channel relay alarm output channel, 1-channel 150mA distribution output channel, 1-channel RS-485 communication interface, and a USB data dump interface. This product has online firmware upgrade function, which can be done through a USB flash drive or RS-485 interface. It supports customized writing of the startup interface and screenshot display function.

Table 1 Comparison of function

Function	Basic type	Updated type
Analog quantity input	18 channels	1~12 channels
Analog quantity output	N/A	4 channels
Relay output	2 channels	4 channels
RS-485 output	Yes	Yes
Power distribution	Yes	Yes
Flow (temperature and pressure compensation)	N/A	Yes
Accumulation	N/A	Yes

## 1.2.Main parameters

Table 2 The main parameters

Screen size	3.5-inch TFT true color LCD screen. Resolution is 320 * 240 High definition LED backlight.
Dimension	Dimension:96mm×96mm×100mm Cutout dimension:92mm×92mm
Panel thickness	1.5mm~6.0mm
Weight	0.37kg
Power supply	(85~264)VAC, (47~63)Hz (24VDC can be customized)
Internal storage	64M Bytes Flash (96M,128M can be customized)
External storage	U disk support (standard USB2.0 communication interface)
Maximum power consumption	10W
Relative humidity	(10~85)% (No condensation)
Operating temperature	(0~50)°C
Storage conditions	Temperature: (-20~60)°C Relative humidity: 5%~95% (No condensation)

## 1.3.Input signal

Table 3 DC voltage / current input

Type	The maximum allowed error(%FS)
(1~5)V	±0.1
(0~10)V	
(0~5)V	
(4~20)mA	
(0~20)mA	
(0~10)mA	
(0~100)mV	±0.2
(-20~20)mV	
(0~20)mV	

Table 4 Thermocouple input(not include cold junction error)

Type	Measure range(°C)	The maximum allowed error(°C)
B	600 ~ 1800	±2.4
E	-200 ~ 1000	±2.4
J	-200 ~ 1200	±2.4
K	-200 ~ -100	±3.3
	-100 ~ 1300	±2.0
S	-50 ~ 100	±3.7
	100 ~ 300	±2.0
	300 ~ 1600	±1.5
T	-200 ~ -100	±1.9
	-100 ~ 400	±1.6
R	-50 ~ 100	±3.7
	100 ~ 300	±2.0
	300 ~ 1600	±1.5
N	-200 ~ 1300	±3.0
WRe5-26	0~ 2310	±4.0
WRe3-25	0~ 2315	±4.0

Table 5 RTD input

Type	Measure range (°C)	The maximum permissible error(°C)
Cu50	-50 ~ 150	±1.0
Pt100	-200 ~ 650	±1.0
Pt1000	-200 ~ 200	±1.0

NOTE:Special RTD can be customized.

#### 1.4.Output signal

Table 6 The alarm output

Type	Scale range	Contact types	Contact capacity	Response cycle
The alarm output	0/1	Normally open contacts	2A, 250VAC	1 second

Table 7 Current output

Type	Range (mA)	Maximum permissible error (mA)
Current output	4 ~ 20	±0.025
	0 ~ 20	±0.025
	0 ~ 10	±0.025

### 1.5.Other parameters

Table 8 Other parameters

Power distribution specifications	150mA, 24 VDC.
Power failure protection	All data is stored in Flash storage to make sure that all historical data and configuration parameters are not lost due to power failure. The real-time clock powered by a lithium battery after power failure.
Alarm output	It has up to 4 channels. Relays are normally open contacts and the contact capacity is 2A,250VAC (resistive load).
Communication interface	1channel RS485 communication interface.one RS-485 input
Communication protocol	Using Modbus communication protocol
Sampling period	1s

## Chapter 2 Installation & Wiring

This chapter describes the installation and wiring methods of this instrument. It is necessary for technicians to learn when they use the instrument for the first time. This is a procedure which enables the instrument to normal operation, as the table

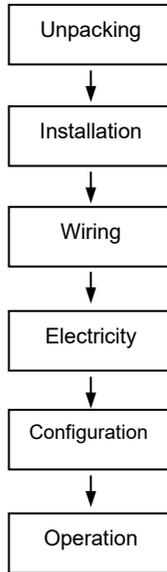


Figure 1 Flow diagram from unpacking to operation

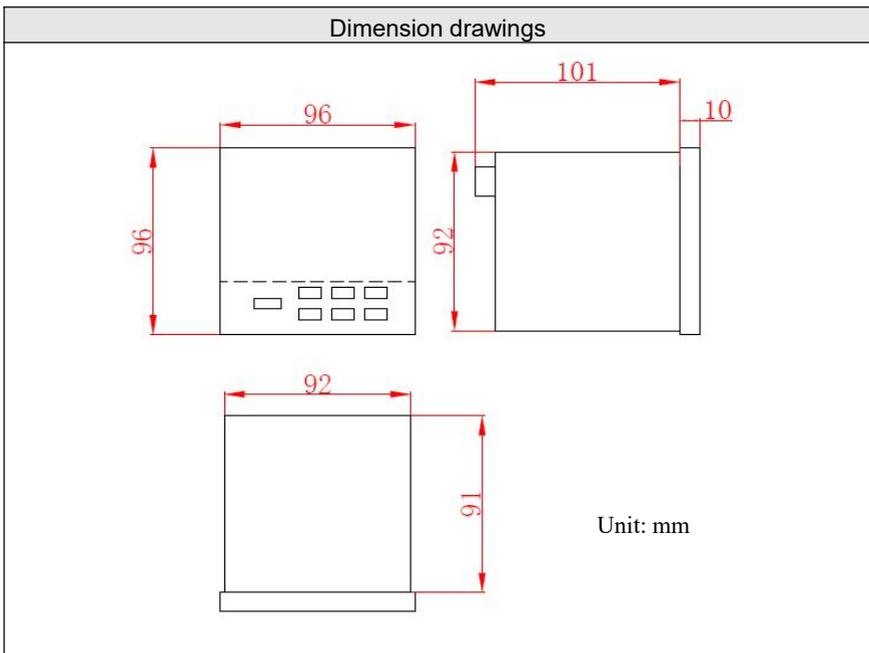
### 2.1 Unpacking

Upon receipt of the instrument, Please check the packaging whether intact or not. Do not put excessive force to the box when unpacking the box. The box should be facing up opened from the seal. Remove the instrument from the box carefully to make sure the housing is not deformed, broken or cracked. You can check the packing list of the machine equipment and other items.

### 2.2 Installation

Instrument operating environment will not only affect the normal use of the instrument, but also affect the maintenance and calibration work. Instrumentation environment should meet the following requirements:

- Indoor installation
- Operating temperature:(0~50)°C
- Relative humidity:10%~85% (No condensation)
- Ventilation requirements: ventilated to prevent the internal meter temperature is too high
- Vibration disturbance:Less mechanical vibration
- Air ingredients: NOT easy to produce condensate, non-corrosive gas or flammable gas
- Inductive interference: no strong inductive interference, not easy to produce static electricity, magnetic fields or noise
- Meter position: When installing the instrument, try to maintain the level and do not tilt left and right



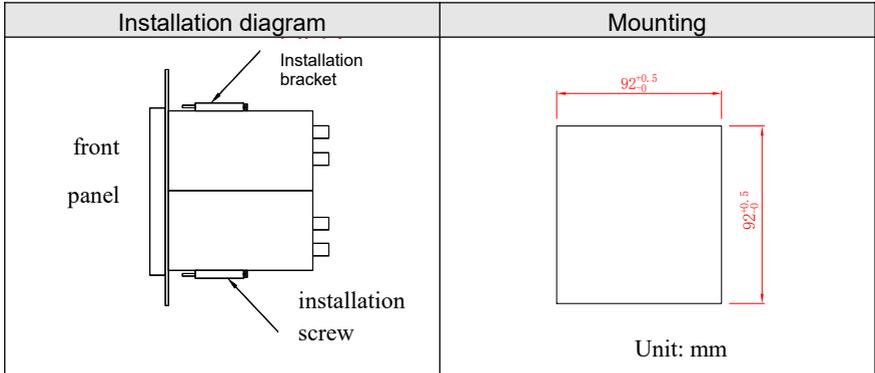


Figure 2 Product dimension and installation drawing

### 2.3 Wiring

In order to improve the stability and accuracy of the signals, it is recommended that you use the cold terminal signal cable to wire.

#### 2.3.1 Terminal introduction

Terminal arrangement is shown in figure 3 and figure 4. Specific definition of terminal symbols and explanation are described in table 9 and table 10.

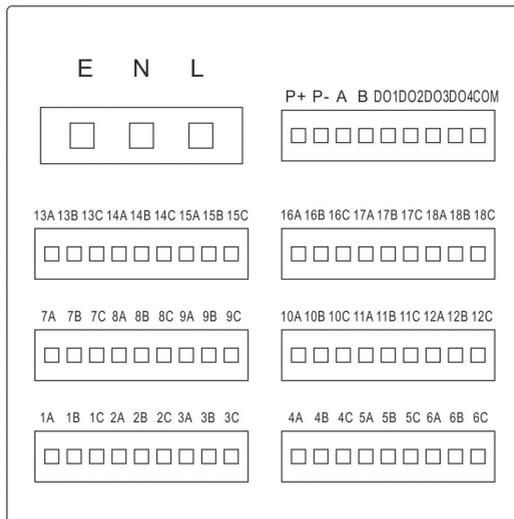


Figure 3 Terminal view of basic type

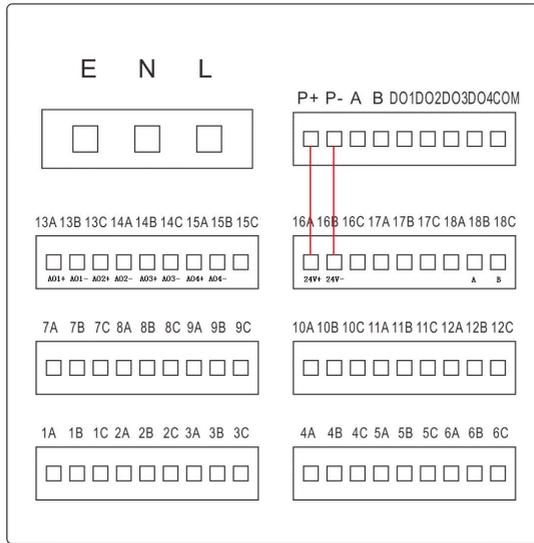


Figure 4 Terminal view of updated type

**NOTE:**

The analog quantity output board needs an external 24V power supply, which can be provided by the power adapter accompanied with the product. As the power is large, please do not power any other transmitter at this time.

Table 9 Specific instructions of each terminal

Terminal No.	Signal type	Description
E,N,L	E,N,L	<b>24VDC power supply:</b> L is 24V+; N is 24V-; E is undefined. <b>AC Power</b> ((single-phase three wire system) terminal block: L is Phase line terminals, N is Zero line terminals, E is Ground terminal.
Signal input Terminal Description		
1A, 1B, 1C	universal input	analog input channel 1
2A, 2B, 2C	universal input	analog input channel2
3A, 3B, 3C	universal input	analog input channel 3
4A, 4B, 4C	universal input	analog input channel 4
5A, 5B, 5C	universal input	analog input channel 5
6A, 6B, 6C	universal input	analog input channel 6
7A, 7B, 7C	universal input	analog input channel 7
8A, 8B, 8C	universal input	analog input channel 8
9A, 9B, 9C	universal input	analog input channel 9
10A, 10B, 10C	universal input	analog input channel 10
11A, 11B, 11C	universal input	analog input channel 11
12A, 12B, 12C	universal input	analog input channel 12
13A, 13B, 13C	universal input	analog input channel 13
14A, 14B, 14C	universal input	analog input channel 14
15A, 15B, 15C	universal input	analog input channel 15
16A, 16B, 16C	universal input	analog input channel 16
17A, 17B, 17C	universal input	analog input channel 17
18A, 18B, 18C	universal input	analog input channel 18
Signal output Terminal Description		
A	485+	communication port RS-485

Terminal No.	Signal type	Description
B	485-	communication port RS-485
Distribution output		
P+	/	24V+
P-	/	24V-
Alarm output Terminal Description		
DO1	Relays	Alarm output Channel 1
DO2	Relays	Alarm output Channel 2
DO3	Relays	Alarm output Channel 3
DO4	Relays	Alarm output Channel 4
COM	/	Alarm Commons

Table 10 Instructions for updated type terminal

Terminal No.	Signal type	Description
13A, 13B	Current output	Analog quantity output of the first channel
13C, 14A	Current output	Analog quantity output of the second channel
14B, 14C	Current output	Analog quantity output of the third channel
15A, 15B	Current output	Analog quantity output of the fourth channel
16A, 16B	Power distribution input of the board	16A:24V+, 16B:24V-

2.3.2 Wiring diagram

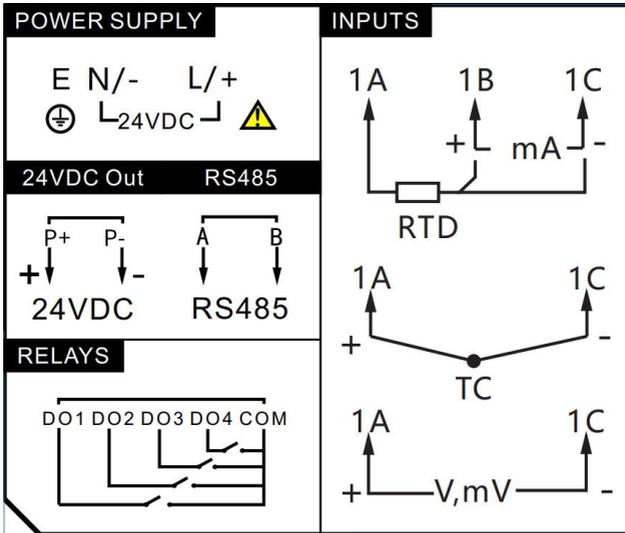


Figure 5 24V Wiring diagram

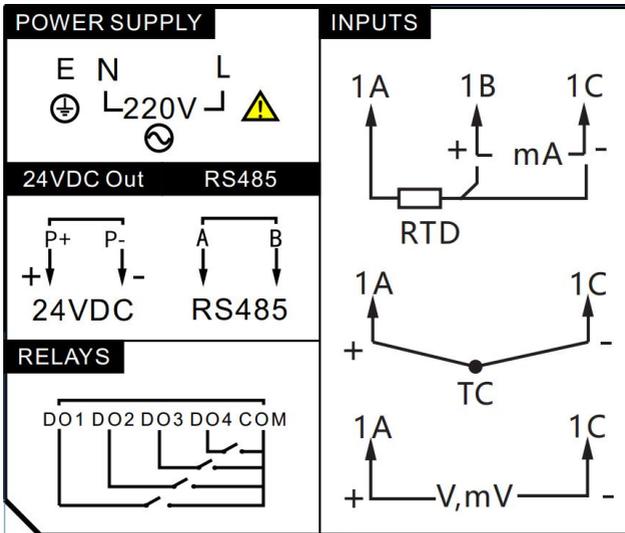


Figure 6 220V Wiring diagram

**2.3.3 Wiring of signal cable**

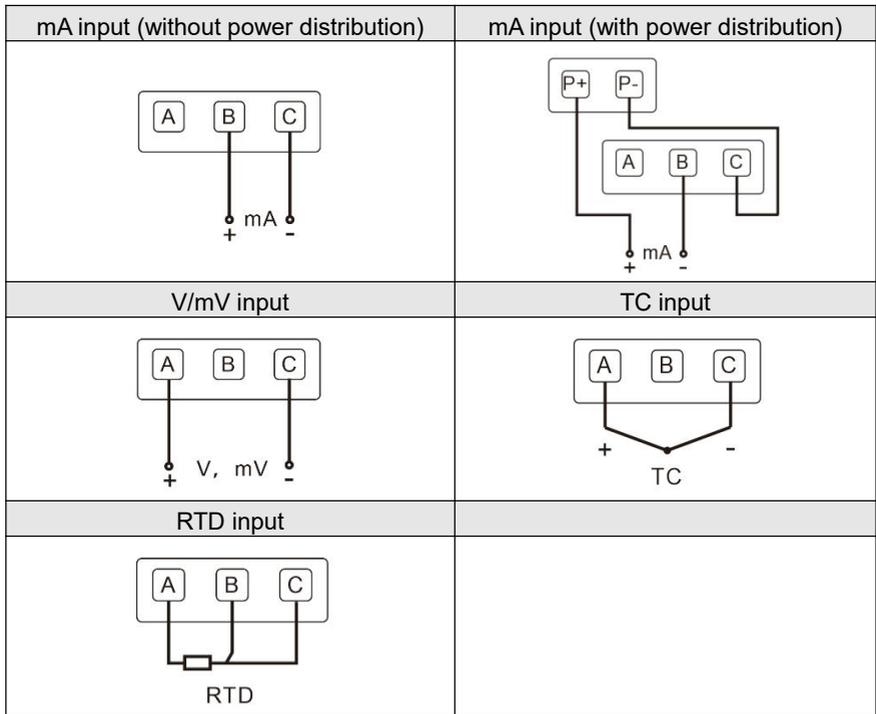


Figure 7 Schematic diagram of signal cable

## Chapter 3 Basic Operation

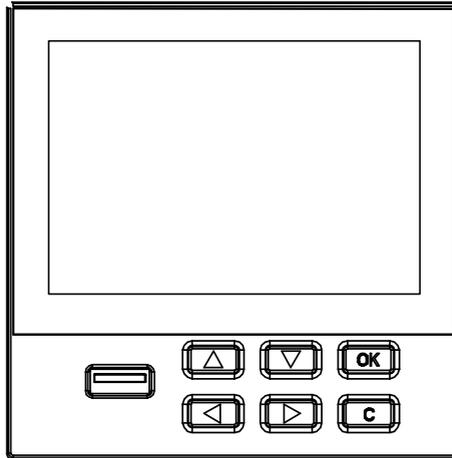


Figure 8 Panel component distribution

Panel component distribution of paperless recorder is shown in figure 8.

### 3.1 Panel component

- LCD Screen: Display monitor and configuration.
- key:

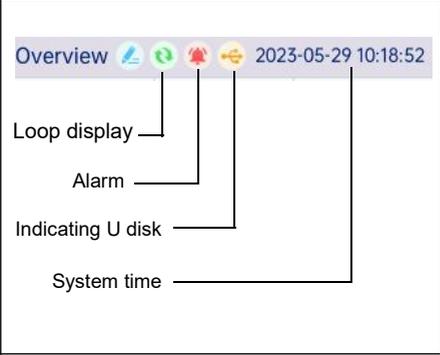
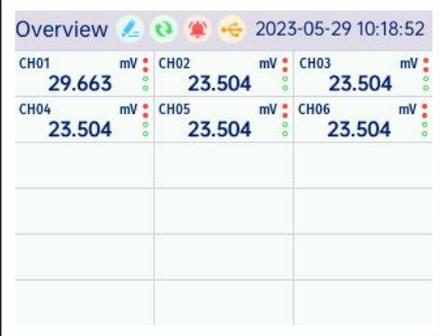
Table 11 Key definition

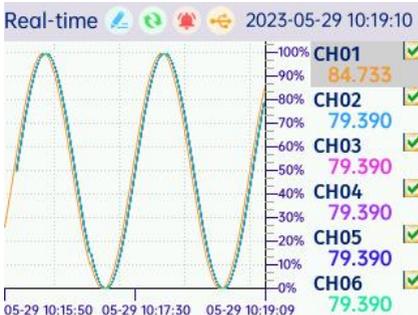
key	Name of key	key	Name of key	key	Name of key
	Up		Down		Enter
	Left		Right		Cancel

## 3.2 Navigation keys

### 3.2.1 Display interface

Table 12 Screen Operation

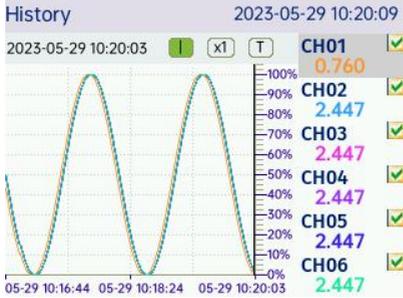
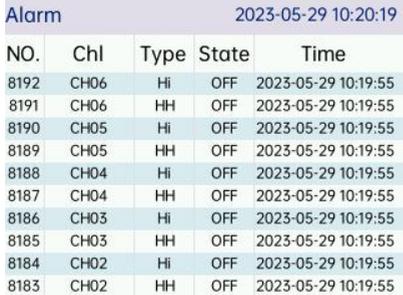
Information bar	Screen Description
 <p>Overview     2023-05-29 10:18:52</p> <p>Loop display</p> <p>Alarm</p> <p>Indicating U disk</p> <p>System time</p>	<ul style="list-style-type: none"> <li>● Loop display: Indicates the on state of the loop display mode on the patrol display interface.</li> <li>● Alarm: When there is an alarm message appears, please enter the alarm screen to check it and then it will disappear.</li> <li>● U disk Tip: When insert U disk ,this sign will appear.</li> <li>● System time: Time of present system.</li> </ul>
Over view screen	Screen Description
 <p>Overview     2023-05-29 10:18:52</p> <p>CH01 mV 29.663 CH02 mV 23.504 CH03 mV 23.504</p> <p>CH04 mV 23.504 CH05 mV 23.504 CH06 mV 23.504</p>	<ul style="list-style-type: none"> <li>● Show all bit of analog input resolution, instantaneous value, units and alarm status</li> <li>● “XXXXX” represents the channel disconnection</li> <li>● You can switch the former and later picture through left key and right key.</li> </ul>
Group cycle screen	Screen Description
 <p>Group     2023-05-29 10:21:03</p> <p>CH01 mV 82.139 CH02 mV 87.157</p> <p>CH03 mV 87.157 CH04 mV 87.157</p> <p>CH05 mV 87.157 CH06 mV 87.157</p>	<ul style="list-style-type: none"> <li>● Display channel bit number, the instantaneous value, units and alarm status.</li> <li>● Pressing up/down-key can switch channel.</li> <li>● You can switch the former and later picture through left key and right key.</li> </ul>

Loop display screen	Screen Description
	<ul style="list-style-type: none"> <li>● Display channel bit number, the instantaneous value, original signal bar graph and alarm status.</li> <li>● Pressing up/down-key can switch channel.</li> <li>● You can switch the former and later picture through left key and right key.</li> </ul>
Bar graph screen(vertical)	Screen Description
	<ul style="list-style-type: none"> <li>● Display channel bit number, the instantaneous value, units and alarm status.</li> <li>● Pressing up/down-key can switch channel.</li> <li>● You can switch the former and later picture through left key and right key.</li> </ul>
Real-time curve screen	Screen Description
	<ul style="list-style-type: none"> <li>● Real-time curve display: Channel number, instantaneous value</li> <li>● Pressing up/down-key can switch channels.</li> <li>● Press left/right key can switch the previous and the current interfaces.</li> <li>● Press the OK key to select or deselect the channel.</li> </ul>

Flow screen	Screen Description
	<ul style="list-style-type: none"> <li>● Display items of flow channel: instantaneous value, accumulation value, unit and alarm state.</li> <li>● Press left/right key can switch the previous and the current interfaces.</li> </ul>
Accumulation screen	Screen Description
	<ul style="list-style-type: none"> <li>● Display instantaneous value and total accumulation value at the same time.</li> <li>● Press left/right key can switch the previous and the current interfaces.</li> </ul>
Accumulated report screen	Screen Description
	<ul style="list-style-type: none"> <li>● Display Accumulated report.</li> <li>● Press up/down key to switch the location of the cursor.</li> <li>● After selecting a channel, press OK/left/right to switch channels. After selecting a report type, press OK/left/right to switch report types. After selecting the number of pages, press OK/left/right to turn pages.</li> <li>● Press left/right key can switch the previous and the current interfaces.</li> </ul>

## 3.2.2 Query interface

Table 13 Screen Operation

Enter the query	Screen Description																																																							
	<ul style="list-style-type: none"> <li>● Press and hold the OK key in the display interface to enter the configuration interface.</li> <li>● Press the up/down keys to select the cursor position, and press the confirm key to enter the corresponding function.</li> </ul>																																																							
Historical curve	Screen Description																																																							
	<ul style="list-style-type: none"> <li>● Press the up/down-key to move cursor to select the reading line/magnification/time/channel number selection function</li> <li>● When the cursor moves to the channel number, press the minus key to select the channel number</li> <li>● Press the OK-key to select the channel number, and continue pressing the down-key to cycle through pages.</li> </ul>																																																							
Alarm record	Screen Description																																																							
 <table border="1" data-bbox="143 1050 546 1345"> <thead> <tr> <th>NO.</th> <th>Chl</th> <th>Type</th> <th>State</th> <th>Time</th> </tr> </thead> <tbody> <tr><td>8192</td><td>CH06</td><td>Hi</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8191</td><td>CH06</td><td>HH</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8190</td><td>CH05</td><td>Hi</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8189</td><td>CH05</td><td>HH</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8188</td><td>CH04</td><td>Hi</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8187</td><td>CH04</td><td>HH</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8186</td><td>CH03</td><td>Hi</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8185</td><td>CH03</td><td>HH</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8184</td><td>CH02</td><td>Hi</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> <tr><td>8183</td><td>CH02</td><td>HH</td><td>OFF</td><td>2023-05-29 10:19:55</td></tr> </tbody> </table>	NO.	Chl	Type	State	Time	8192	CH06	Hi	OFF	2023-05-29 10:19:55	8191	CH06	HH	OFF	2023-05-29 10:19:55	8190	CH05	Hi	OFF	2023-05-29 10:19:55	8189	CH05	HH	OFF	2023-05-29 10:19:55	8188	CH04	Hi	OFF	2023-05-29 10:19:55	8187	CH04	HH	OFF	2023-05-29 10:19:55	8186	CH03	Hi	OFF	2023-05-29 10:19:55	8185	CH03	HH	OFF	2023-05-29 10:19:55	8184	CH02	Hi	OFF	2023-05-29 10:19:55	8183	CH02	HH	OFF	2023-05-29 10:19:55	<ul style="list-style-type: none"> <li>● Pressing up/down-key can switch previous and next item</li> <li>● Pressing left/right key can switch the former and later page</li> </ul>
NO.	Chl	Type	State	Time																																																				
8192	CH06	Hi	OFF	2023-05-29 10:19:55																																																				
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8185	CH03	HH	OFF	2023-05-29 10:19:55																																																				
8184	CH02	Hi	OFF	2023-05-29 10:19:55																																																				
8183	CH02	HH	OFF	2023-05-29 10:19:55																																																				

Powerdown record				Screen Description
<b>Powerdown</b> 2023-05-29 10:20:31				<ul style="list-style-type: none"> <li>● Pressing up/down-key can switch previous and next item</li> <li>● Pressing left/right key can switch the former and later page</li> </ul>
NO.	Power-Down	Power-Up	Duration	
0115	2023-05-29 10:11:50	2023-05-29 10:12:56	0h1m6s	
0114	2023-05-29 10:07:00	2023-05-29 10:11:17	0h4m17s	
0113	2023-05-29 10:00:42	2023-05-29 10:06:22	0h5m40s	
0112	2023-05-19 09:22:16	2023-05-29 09:58:06	240h35m50s	
0111	2023-05-17 16:48:54	2023-05-19 09:21:50	40h32m56s	
0110	2023-01-11 17:00:56	2023-05-17 16:47:18	125d23h46m	
0109	2023-01-09 14:14:37	2023-01-09 14:14:43	0h0m6s	
0108	2023-01-03 08:35:52	2023-01-03 08:35:56	0h0m4s	
0107	2023-01-03 08:35:32	2023-01-03 08:35:38	0h0m6s	
0106	2023-01-03 08:31:29	2023-01-03 08:31:35	0h0m6s	
Operation log				Screen Description
<b>Operation</b> 2023-05-29 10:21:32				<ul style="list-style-type: none"> <li>● Pressing up/down-key can switch previous and next item.</li> <li>● Pressing left/right key can switch the former and later page</li> </ul>
NO.	Time	Event		
0039	2023-05-29 10:18:00	Modify Basic Config		
0038	2023-05-29 10:16:04	Modify Basic Config		
0037	2023-05-29 10:15:19	Modify Basic Config		
0036	2023-05-29 09:58:29	Modify Basic Config		
0035	2023-05-17 16:48:31	Modify Basic Config		
0034	2023-01-03 08:48:14	Export Files		
0033	2022-12-30 16:05:35	Export Files		
0032	2022-12-30 15:06:35	Export Files		
0031	2022-12-29 13:13:39	Export Files		
0030	2022-12-29 08:39:24	Export Files		
Data export				Screen Description
<b>Export</b> 2023-05-29 10:54:56				<ul style="list-style-type: none"> <li>● Pressing up/down-key to move the cursor, select it, and then press the OK key to export it</li> <li>● After successful export, the file name will be displayed in the prompt box on the right. Display the latest five file names, and then iterate over them</li> </ul>
<input type="button" value="All Data MDA"/>		State: Idle		
<input type="button" value="Part of Data MDA"/>		Exported files		
<input type="button" value="All Data CSV"/>		R230529105453.csv		
<input type="button" value="Alarm list"/>		P230529105452.csv		
<input type="button" value="Powerdown list"/>		A230529105445.csv		
<input type="button" value="Acc Reports"/>		H230529102343.csv		
		H230529102246.mda		

### U disk transferring data:

- (1) Please use a dedicated USB flash drive for reading and writing when transferring data, otherwise it may cause data export failure.
- (2) File save path: All files of this instrument are stored in the folder corresponding to the root directory of the USB drive **[RNX]**. The [Bmp] folder contains screenshots

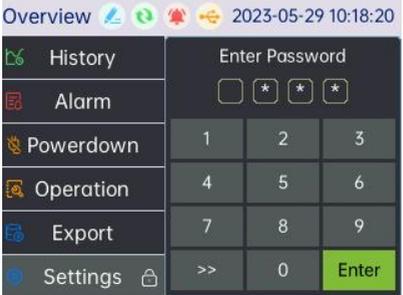
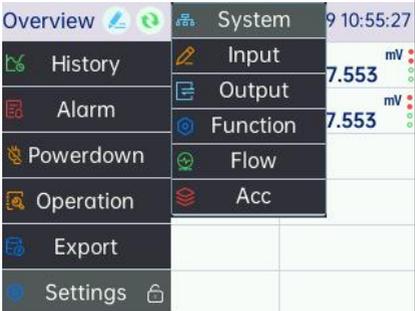
of records, the [Cfg] folder contains configuration files, the **[History]** folder contains historical records, and the **[Info]** folder contains various types of information (such as alarm information).

Table 14 File name

Document	Subdirectory	File name
Historic record	/History	H220905091650.csv/ H220905091650.mda
Accumulation record	/Info	R221027205014.csv
Alarm information	/Info	A220722113310.csv
Power off record	/Info	P220722113310.csv
Log record	/Info	O220722113310.csv

### 3.2.3 Configuration interface

Table 15 Screen Operation

Step	interface	Operation
1		<ul style="list-style-type: none"> <li>● Press and hold the OK key in the display interface to enter the configuration interface.</li> <li>● Press up/down-key to move the cursor, select <b>[Setting]</b></li> <li>● Press the OK key to enter the password, enter the configuration .</li> </ul>
2		<ul style="list-style-type: none"> <li>● Press the up/down keys to select the cursor position, and OK key to enter the corresponding function.</li> </ul>

## Chapter 4 Configuration

This chapter introduces the individual configuration parameters of instrument.

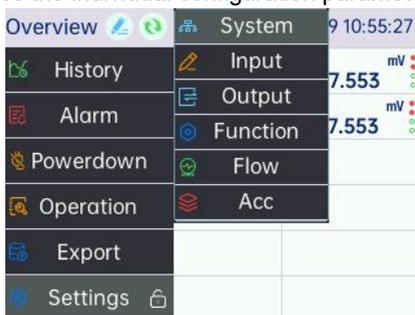


Figure 9 Configuration interface

### 4.1. System setting



Figure 10 System setting interface

Configuration Item Description:

Table 16 System setting configuration item description

Configuration Item	Function Description	Parameter range
Device Name	Set recorder name	10-bit character string (support the Chinese)
System Time	Set recorder time	2000~2099 <b>(Changing the time will clear historical data)</b>
Time Format	Set time display format.	YY-MM-DD, DD-MM-YY, MM-DD-YY
Password	Set password	0000~9999

Configuration Item	Function Description	Parameter range
Interval	Set record interval	1s,2s,5s...60min
Language	Select system language	Chinese/English
Cold Compensation	Set cold compensation mode	Auto / Manual
Temp Value	Compensation temperature (°C)	-50~110
Air Pressure	Set the atmospheric pressure coefficient	0~999999
Group Cycle	Display cycling time by group	0s,5s,10s,15s,30s

The recorder records sampling data in real-time according to the set time interval. The recording interval can be: 1 second, 2 seconds, 5 seconds, 10 seconds, 15 seconds, 30 seconds, 1 minute, 2 minutes, 5 minutes, 10 minutes, 30 minutes, or 1 hour; The default is 1 second.

The recording content of the recorder is cyclically covered. Based on the number of channels, recording intervals, and total number of records, the recording duration is calculated as follows: the base is based on a 1-second recording interval, with a maximum of 18 channels, which can be recorded for 18 days; The continuous storage duration for different channel numbers is as follows:

Table 17

Intervals	Number of channels						
	1	2	3-4	5-8	9-12	13-16	17-18
1s	339 days	169 days	84 days	42 days	28 days	21 days	18 days
2s	679 days	339 days	169 days	84 days	56 days	42 days	37 days
5s	1699 days	849 days	424 days	212 days	141 days	106 days	94 days
...	...	...	...	...	...	...	...

## 4.2.Input setting



Figure 11 Input setting interface

Configuration Item Description:

Table 18 Input setting configuration item description

Configuration Item	Function Description	Parameter range
Channel	Select analog channel	AI01~AI18 (The real display shall prevail.)
Type	Set signal types	Current, Vol-V, Vol-mV, TC, RTD
Signal	Select signal	(4~20)mA, (0~20)mA, (0~10)mA, Pt100, Pt1000, Cu50, (1~5)V, (0~10)V, (0~5)V, B, E, J, K, S, T, R, N, WRe5-26, WRe3-25, (0~20)mV, (-20~20)mV, (0~100)mV
Unit	Set the unit for analog channel	Custom string
Decimal	Set the decimal places	Setting range 0-3, switch between left and right buttons
Range L	Set low range limit	-999999~999999
Range H	Set high range limit	-999999~999999
Tap	Set bit of the analog channel	Custom string
Coef K	K in $Y=K*X+B$	-999.999~999.999
Coef B	B in $Y=K*X+B$	-9999.99~9999.99
Filter	First-order filter parameter	0~30s

Configuration Item	Function Description	Parameter range
Broke	Displays the value of channel broke	Multiple display modes are available, such as upper limit value, lower limit value, and hold
Alarm	Enter to alarm setting screen.	
Copy	Copy the configuration	
Paste	Paste the copied configuration information	

**Alarm setting:**

Figure 12 Alarm setting interface

## Configuration Item Description:

Table 19 Alarm setting configuration item description

Configuration Item	Function Description	Parameter range
Alarm HH	Higher alarm value	-999999~999999
Output HH	Higher alarm output terminal	Disable,Realy1,Realy2,Realy3,Realy4 (The real display shall prevail.)
Alarm Hi	High alarm value	-999999~999999
Output Hi	High alarm output terminal	Disable,Realy1,Realy2,Realy3,Realy4 (The real display shall prevail.)
Alarm Lo	Low alarm value	-999999~999999
Output Lo	Low alarm output terminal	Disable,Realy1,Realy2,Realy3,Realy4 (The real display shall prevail.)

Configuration Item	Function Description	Parameter range
		shall prevail.)
Alarm LL	Lower alarm value	-999999~999999
Output LL	Lower alarm output terminal	Disable,Realy1,Realy2,Realy3,Realy4 (The real display shall prevail.)
Relay delay	Relay delay time	0~120s
Hysteresis	Alarm Hysteresis	0~999999

**Note: The relay delay and hysteresis of different alarm types are independently set.**

Note: Hysteresis prevents repeated alarm when the measures date fluctuates from the alarm point. The high- or low-level alarm and Hysteresis figure is showed in Figure 4-1 below. At high level alarm, when the actual engineering value is larger than or equal to the alarm value, the recorder enters into the alarm state. When the input is reduced, the actual engineering value is less than the alarm value, but the recorder will not exit the alarm state immediately. Until the actual engineering value is less than the alarm value and Hysteresis value, will the recorder exit the alarm state. The same is for low level alarm.

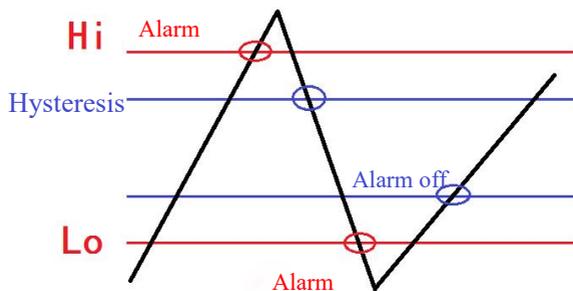


Figure 11 High- or low-level alarm and Hysteresis

### 4.3.Output setting

The current output module provides 4 independent ( 4~20 ) mA current output. It can transmit outputs to analog input channels and flow channels.



Figure 13 Output setting interface

Configuration Item Description:

Table 20 Output setting configuration item description

Configuration Item	Function Description	Parameter range
Channel	Select AO channel	01~04
State	Enable/Disable this channel	Enable/Disable
Source	Channel to be output	AI01~AI18, FLOW1~FLOW4,
Signal	Output analog quantity type	(4~20)mA, (0~20)mA, (0~10)mA
Decimal	Output decimal places	0~3
Range L	Low limit of channel	-999999~999999
Range H	High limit of channel	-999999~999999
Zero calibration	Can be slightly adjusted in mA.	-999.999~999.999

**Note :**

$$\text{Current output} = \frac{\text{Signal source} * (\text{Output high limit} - \text{Output low limit})}{\text{Signal source high limit} - \text{Low limit}} + \text{Output low limit} + \text{Zero calibration}$$

#### 4.4.Function setting

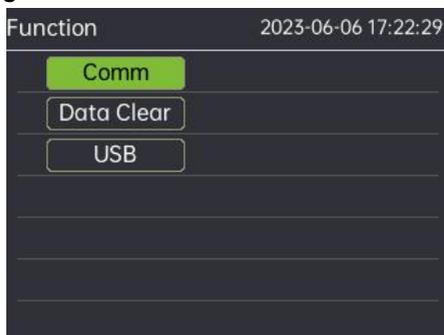


Figure 14 Function setting interface

##### 4.4.1 Communication setting

This product supports the communication operation with the upper computer (the supporting upper computer can be obtained from the company's official website) to achieve real-time monitoring of the instrument. This product only supports the Modbus RTU protocol.

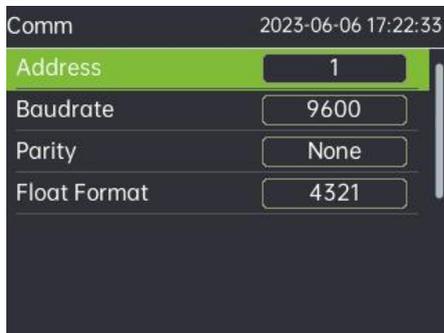


Figure 15 Communication setting interface

Configuration Item Description:

Table 21 Communication setting configuration item description

Configuration Item	Function Description	Parameter range
Address	Device address	1~247(Default 1)
Baud rate	Communication speed	1200,4800,9600(Default),19200,57600,115200
Parity	Communication verify	None(Default),Even,Odd
Float Format	Floating point format	4321(Default),3412,2143,1234

#### 4.4.2 Data Clear

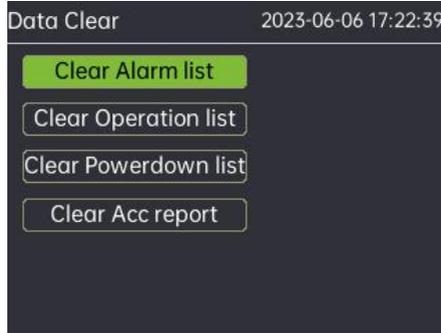


Figure 16 Data clear interface

Configuration Item Description:

Table 22 Data clear configuration item description

Configuration Item	Function Description
Clear Alarm list	Clear all alarm information
Clear Operation list	Clear all operation records
Clear Powerdown list	Clear all powerdown records
Clear Acc report	Clear all accumulated records

#### 4.4.3 U disk operation

The instrument supports saving the current configuration to a USB disk or reading the configuration file therein.

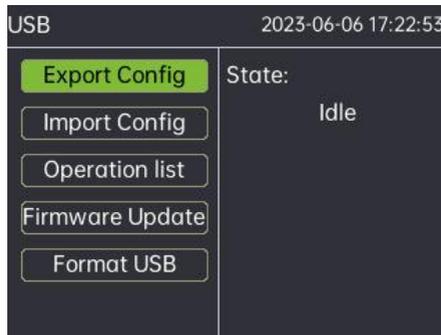


Figure 17 U disk operation interface

Configuration Item Description:

Table 23 U disk operation configuration item description

Configuration Item	Function Description	File format
Export Config	Export current recorder configuration	CFG(.cfg)
Import Config	Read recorder configuration in U disk	
Operation list	Export operation list	
Firmware Update	Firmware Update	
Format USB	Format the U dis	FAT16/32

#### 4.5.Flow setting

The flow function can be used to measure such medium as superheated steam, saturated steam, general gas, mixed gas, natural gas, coal gas, water, hot water, chemical liquidness. It's applicable to be used with the vortex flowmeter, turbine flowmeter, V-cone flowmeter, elbow flowmeter, electromagnetic flowmeter, mass flowmeter, orifice flowmeter, nozzle flowmeter, classic venturi and other flow products.



Figure 18 Flow setting interface

Configuration Item Description:

Table 24 Flow setting configuration item description

Configuration Item	Function Description	Parameter range
Channel	Select flow channel	01~04
State	Enable/Disable this channel	Enable/Disable
Unit	The display unit in flow interface	User-defined character string

Configuration Item	Function Description	Parameter range
Source	Channel of flow signal	AI01~AI18
Decimal	Select the number of decimal places for flow	0~3
Range L	Low limit of range after flow compensation	-999999~999999
Range H	High limit of range after flow compensation	-999999~999999
Flow Model	Select formula suitable for restriction choke	No SQRT, HAVE UNSQRT, HAVE SQRT <b>【Note 1】</b>
Flow Cut	Removal of small flow	-999999~999999
Flow K	K in the formula <b>【Note 1】</b>	-999999~999999
Compensation	Select algorithm of density compensation	Manual Density, superheated steam, saturated steam P, saturated steam T, general gases, not compensation, temperature compensation, pressure compensation <b>【Note 2】</b>
Pressure Source	P in density compensation in kPa	None, AI1~AI18
Emergency Pressure (kPa)	Emergency value in case of abnormal pressure	-999999~999999
Temp source	T in density compensation in °C	None, AI01~AI18
Emergency Temp (°C)	Emergency value in case of abnormal temperature	-999999~999999
Standard Density	Density of substances under standard conditions	-999999~999999
Manual Density	Set the density value of the substance	-999999~999999
Compensation coef A	Flow linear compensationcoef A	-999999~999999
Compensation coef B	Flow linear compensationcoef B	-999999~999999
Alarm	Enter alarm setting interface	

**【Note 1】 :**

Methods for calculating flow are various, such as throttling model, speed model, pulse frequency model, volumetric model, mass model, and so on.

In this recorder, three types of methods are concluded:

Table 25 Flow model and formula

Flow model	Formula
No extraction of a root	$Q = \frac{I_f \rho}{K}$
No extraction of a root for differential pressure	$Q = K * \sqrt{\Delta P * \rho}$
Extraction of a root for differential pressure	$Q = K * \Delta P * \sqrt{\rho}$

**Where:**

Q: Mass flow rate

K: Flow coefficient

$\rho$  : Fluid density

$\Delta P$ : Differential pressure signal

If : Flow value of restriction choke. It may be a current signal or a frequency signal.

**【Note 2】 :**

It can be seen from the flow model that the calculation of mass flow is directly related with the fluid density. As the gas density varies greatly with the operating conditions, the calculation of the working density is required.

Table 26 Calculation method for setting different gas densities.

Compensation mode	Calculation method	Applicable fluid
Given density	$\rho$ Calculate as per given density	Liquid
Superheated steam	$\rho$ Calculate as per IAPWS-IF97	Superheated steam
Saturated steam P	$\rho$ Calculate through pressure as per IAPWS-IF97	Saturated steam
Saturated steam T	$\rho$ Calculate through temperature as per IAPWS-IF97	Saturated steam
General gas	$\rho$ Calculate as per ideal equation, a standard density is required.	Oxygen, nitrogen, hydrogen, etc
Without compensation	$\rho$ Calculate as per constant 1	Measure volume flow rate
Temperature linear compensation	$\rho = A + B/t$ , A, B are linear compensation coefficients	
Pressure linear compensation	$\rho = A + B * P$ , A, B are linear compensation coefficients	

【Note 3】 :

$$Q_{\text{heat}} = K_{\text{heat}} * Q * H$$

**Where:**

Q<sub>heat</sub>: Heat flow rate

K<sub>heat</sub>: Heat flow rate coefficient (The coefficient of enthalpy of this recorder is 1)

Q: Mass flow rate

H: Enthalpy

**4.6.Accumulation setting**

The accumulation function accumulates selected signal sources in terms of hour, day, and month, which forms a time report, a daily report, and a monthly report.



Figure 19 Accumulation setting interface

Configuration Item Description:

Table 27 Accumulation setting configuration item description

Configuration Item	Function Description	Parameter range
Channel	Select the accumulated channel	01~04
State	Enable/Disenable this channel	Enable/Disenable
Unit	Unit displayed in accumulation interface	User-defined 8-bit character string
Source	Channel to be accumulated	AI01~AI18, FLOW1~FLOW4
Accumulative K	Multiply by multiplying power	-999999~999999

Configuration Item	Function Description	Parameter range
Accumulative InitVal	Initial value at restoration	-999999~999999
Reset Acc InitVal	Reset this channel according to accumulated initial value	<b>【Note 1】</b>

**【Note 1】** :After modifying the accumulated initial value, it requires to enable the configuration again to make it effective.

## Chapter 5 Fault Handling and Maintenance

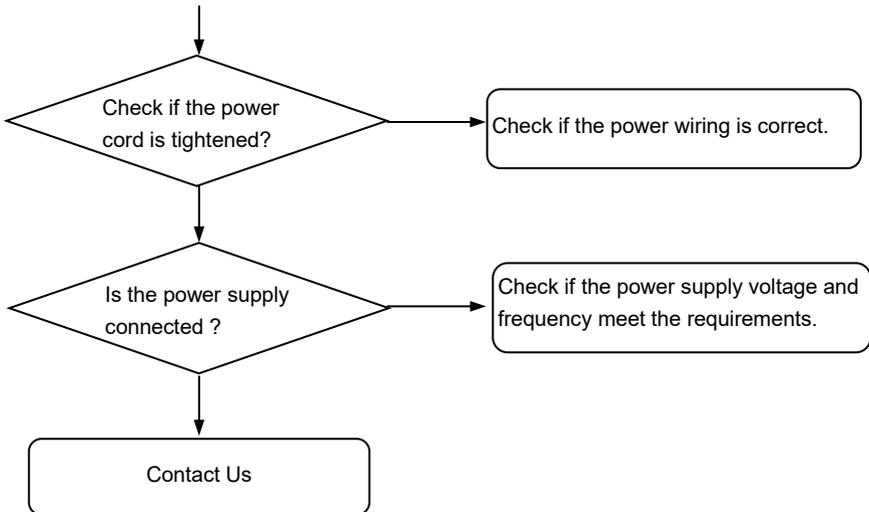
In order to maintain the reliability of the instrument and maintain its good working condition for a longer period of time, please regularly inspect and maintain it to ensure that the installation and usage environment of the instrument meet the requirements, and conduct wiring and other operations according to normal procedures. When the instrument malfunctions, it should be resolved according to the methods described in this manual.

### 5.1. Regular inspection and maintenance

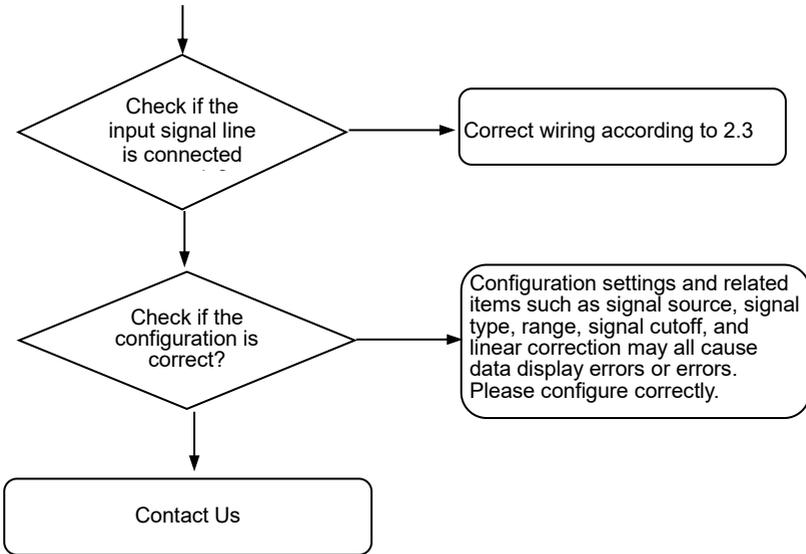
- Inspect all components of the instrument for damage, corrosion, and remove surface attachments;
- Check if all components are loose;
- Check the grounding protection to ensure that the protection measures are complete;
- Ensure that the ventilation holes of the instrument casing are unobstructed to prevent high-temperature faults, abnormal actions, reduced lifespan, and fires.

### 5.2. Fault handling

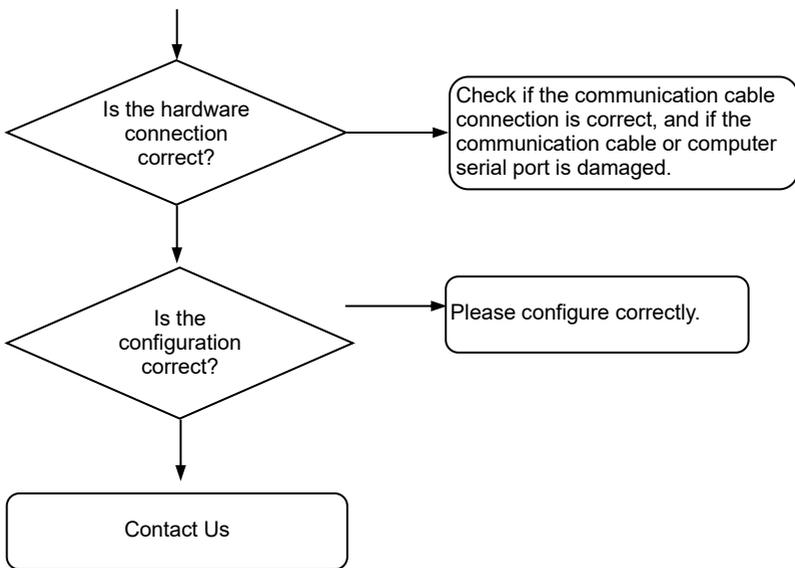
#### 5.2.1 LCD screen without display



### 5.2.2 Signal data display error



### 5.2.3 Unable to communicate correctly



## **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

## Appendix A: Communication

Table 28 Modbus Address

Name	Register address	Function code	Access Type	Description
Channel 1 Quantities	0x2000	0x03	float	Note the byte order. The default is 4321
Channel 2 Quantities	0x2002	0x03	float	
.....				
Channel N Quantities	$0x2000+(N-1)*2$	0x03	float	Hexadecimal:0x2000 Decimalism:(N-1)*2 Example:N=18, Register address=0x2022
Channel 1 Quality code	0x2080	0x03	short	BIT0: 0:normal 1:Alarm HH BIT1: 0:normal 1:Alarm H BIT2: 0:normal 1:Alarm L BIT3: 0:normal 1:Alarm LL BIT4: 0:normal 1:disconnection BIT5: 0:normal 1:Over the Upper Limit BIT6: 0:normal 1:over the lower limit
Channel 2 Quality code	0x2081	0x03	short	
.....				
Channel N Quality code	$0x2080+(N-1)$	0x03	short	Hexadecimal:0x2080 Decimalism:N-1 Example:N=18, Register address=0x2091
Flow value of channel 1	0x2100	0x03	float	
Flow value of channel 2	0x2102	0x03	float	
Flow value of channel 3	0x2104	0x03	float	
Flow value of channel 4	0x2106	0x03	float	
State of flow channel 1	0x2150	0x03	short	Same as register 2080
State of flow channel 1	0x2151	0x03	short	
State of flow channel 1	0x2152	0x03	short	

Name	Register address	Function code	Access Type	Description
State of flow channel 1	0x2153	0x03	short	
Total accumulation value of accumulated channel 1	0x22C0	0x03	long	Accumulated value integer part
Total accumulation value of accumulated channel 2	0x22C2	0x03	long	Accumulated value integer part
Total accumulation value of accumulated channel 3	0x22C4	0x03	long	Accumulated value integer part
Total accumulation value of accumulated channel 4	0x22C6	0x03	long	Accumulated value integer part
Hourly accumulation value of accumulated channel 1	0x2310	0x03	float	
Hourly accumulation value of accumulated channel 2	0x2312	0x03	float	
Hourly accumulation value of accumulated channel 3	0x2314	0x03	float	
Hourly accumulation value of accumulated channel 4	0x2316	0x03	float	
Daily accumulation value of accumulated channel 1	0x2360	0x03	float	
Daily accumulation value of accumulated channel 2	0x2362	0x03	float	
Daily accumulation value of accumulated channel 3	0x2364	0x03	float	
Daily accumulation value of accumulated channel 4	0x2366	0x03	float	

Name	Register address	Function code	Access Type	Description
Monthly accumulation value of accumulated channel 1	0x23B0	0x03	float	
Monthly accumulation value of accumulated channel 2	0x23B2	0x03	float	
Monthly accumulation value of accumulated channel 3	0x23B4	0x03	float	
Monthly accumulation value of accumulated channel 4	0x23B6	0x03	float	

**Communication Example:**

Example 1:Real-time value of analog input 1:1.00

State :

01 03 20 00 00 02 CF CB

Explanations:

01:Instruments address (Configuration can be changed)

03:03 order to Modbus

20 00:Address register is 0x2000

00 02:The number of registers is 2

CF CB:CRC Verify

Returned data:

01 03 04 3F 80 00 00 F7 CF

Explanations:

01:instruments address

03:03 order to Modbus

04:Four bytes of returned date

3F 80 00 00:Floating point ( F4321 , configuration can be modified), It represents 100.0

F7 CF:CRC Verify

## Appendix B: Calculation of flow coefficient K

Case 1: Orifice (no extraction of a root for differential pressure), measure the flow of oxygen in Nm<sup>3</sup>/h.

### Calculation sheet

<u>process data:</u>	design	max	norm	min	Einheit
absolute pressure	950.000				kPa
temperature	20.0				°C
Flow	40000.00 000	36000.000 00	21500.000 00	10800.00 000	Nm <sup>3</sup> /h
expansion coefficient	0.9994	1.0000	0.9998	0.9995	-
reynolds	278E+04	25,009E+0 2	14,936E+0 2	75,026E+ 01	-
fluid velocity	12.3963	11.1567	6.6630	3.3470	m/s
pressure loss	0.1066	0.0863	0.0308	0.0078	kPa
differential pressure	1.8400	1.4901	0.5312	0.1340	kPa

### Obtain the following information based on the calculation sheet:

parameter	Value
Design pressure	0.95MPa
Design temperature	20°C
Design flow	40000Nm <sup>3</sup> /h
Design differential pressure	1.84kPa

**Calculation method:**

The oxygen density under standard conditions and design temperature pressure are calculated.

According to the ideal state equation:

$$PV = (mRT / M) = nRT$$

$$PV = mRT / M$$

$$PM / RT = m / V = \rho$$

$$\rho = PM / RT$$

The density under standard conditions is 1.429Kg/m<sup>3</sup>.

The density under design temperature pressure is 12.485Kg/m<sup>3</sup>.

Calculate according to the formula  $Q = K * \sqrt{\Delta P * \rho}$ , which is substituted by design parameters.

$$40000 * 1.429 = K * \sqrt{1.84 * 12.485}$$

$$K=11926.1$$

**Note:**

Since the designed flow unit is Nm<sup>3</sup>/h, first, convert the designed flow unit into standard unit. The flow unit obtained at this time is kg/h. If you want to acquire t/h, you need to reduce K by 1000 times to 11.9261. If you want to acquire Nm<sup>3</sup>/h, you need to use K to divide by the density under standard conditions 1.429 to obtain 8345.7.