

Signal generator

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## Preface

Thank you for purchasing Signal calibrator. 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-S4.1-S4.2-MYEN1

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## **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

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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.

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If it is loose, please tighten it before use.

- It is not allowed to disassemble, process, modify or repair the product without authorization, otherwise it may cause abnormal operation, electric shock or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine or other organic solvents. Prevent all kinds of liquid from splashing on the product. If the product falls into the water, please cut off the power immediately, otherwise there will be leakage, electric shock or even a fire accident.
- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life and fire.
- Please strictly follow the instructions in this manual, otherwise the product's protective device may be damaged.



- Don't use the instrument if it is found damaged or deformed at opening of package.
- Prevent dust, wire end, iron fines or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, to modify configuration, signal output, startup, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment pollution.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

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## 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.

## Package contents

No.	Item Name	Quantity	Remarks
1	Signal calibrator	1	
2	Test lead	3	One for each color: red, black and yellow
3	Manual	1	
4	Certificate	1	

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



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## Chapter 1 Overview

### 1.1 Introduction

This signal calibrator can measure and output various signals, including voltage, current, thermocouple, resistance, and thermal resistance signals. An HD LCD and silicone button with distinct functions are used, providing clear display and easy operation. The calibrator has a long standby time, a high precision level and programmable output. It is widely used for commissioning for laboratories, industrial site PLC and process instruments and electric valves.

### 1.2 Functions

- Voltage signal: output and measurement of 0-30 V, 0-24 mV, and 0-100 mV
- (Maximum output is 15 V)
- Current signal: output and measurement of active and passive 0-24 mA and 4-20 mA
- Thermocouple: output and measurement of K, E, J, T, R, B, S and N
- Resistance/thermal resistance: output and measurement of 0-400  $\Omega$  and -199°C-650°C (the minimum resistance output is 15 $\Omega$ )

\* Note: Resistance/thermal resistance is only for SUP-C703S

## 1.3 Parameter

Table 1 Table for measurement and output functions

Item	Signal	Range	Accuracy	Resolution	Remarks
DC voltage	20 mV	0.00- 24.00mV	$\pm 0.2\%$	0.01 mV	
	100 mV	0.0-100.0mV	$\pm 0.2\%$	0.1 mV	
	V	Output 0.00- 15.00 V	$\pm 0.2\%$	0.01 V	Output: maximum current 30 mA
		Output 0.00- 30.00 V	$\pm 0.2\%$	0.01 V	Measurement: input impedance 1.2 M $\Omega$
DC current	mA	0.00- 24.00 mA	$\pm 0.2\%$	0.01 mA	Output: maximum load 750 $\Omega$
	4-20 mA	4/8/12/16/20 mA	$\pm 0.2\%$	0.01 mA	Measurement: Output impedance 100 $\Omega$
Passive current	mA	0.00- 24.00 mA	$\pm 0.2\%$	0.01 mA	Output: external power supply 16-30 V

Electric power distribution	24 V LOOP	24 V/16 V	10%	/	Drive current 24 mA
Thermo-couple	K	0-1372°C	±1%	1°C	The output or measurement temperature cannot be lower than cold conjunction compensation temperature. Note: The minimum excitation current is 0.5 mA and the maximum excitation current is 3 mA.
	E	0-1000°C	±1%	1°C	
	J	0-1200°C	±1%	1°C	
	T	0-400°C	±1%	1°C	
	R	0-1768°C	±1%	1°C	
	B	250-1820°C	±1%	1°C	
	S	0-1768°C	±1%	1°C	
	N	0-1300°C	±1%	1°C	
Resistance	Ω	Output 15.0-400.0Ω	±0.2%	0.1 Ω	
		Measurement 0.0-400.0 Ω	±0.2%	0.1 Ω	
Thermal resistance	PT100	-199.0°C- 650.0°C	±0.2%	0.1°C	

### 1.4 Specifications

Table 2 Specifications

Operating Temperature and Humidity	-10°C-55°C, 20%-80% RH (non-condensing)
Storage temperature	-20°C - 70°C
Dimension	115x71x30 (mm)
Weight	143g
Power supply	4*AAA batteries or external 5 V/1A adapter
Power consumption	About 200 mA; with power supplied by 4*AAA batteries ( each nominal capacity of 1100 mAh ), can be used for 4 hours with a full load and 17 hours standing by.
Reverse connection and Over current protection	30 V

## Chapter 2 Component and functions

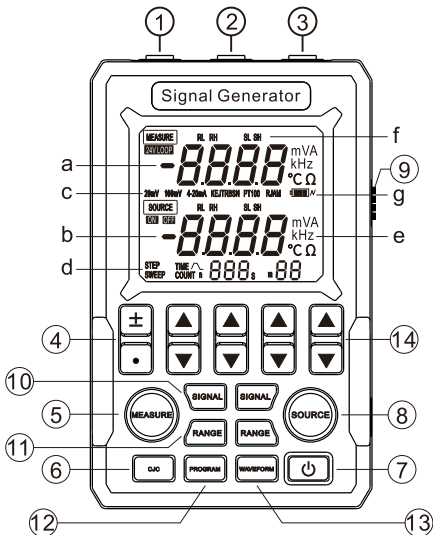


Figure 1 Front view of the signal calibrator



### 2.1 Terminal




- The port for the test pen is as shown in Figure 1. Please see Table 3 to its function .
- If the measurement end is used for signal measurement, insert the test pen into ports ① and ③ in Figure 1.
- If the output end is used for signal output, insert the test pen into ports ① and ② in Figure 1.








Table 3 Terminals function description

No.	Name	Description
①	Black terminal	Common
②	Yellow terminal	Output signal
③	Red terminal	Measurement signal

### 2.2 Navigation button

Table 4 Button and switch description

No.	Button	Description
④		Move the decimal point/switch between positive sign and negative sign
⑤		Turn on or off the measurement function.
⑥		Display/change cold conjunction compensation (only works for measuring the thermocouple).

⑦		Turn on or off the power.
⑧		Turn on or off the signal output.
⑨	Switch (OFF by default)	<ol style="list-style-type: none"> <li>1. Automatic power-off: the device will automatically be turned off if there is no operation for 10 minutes.</li> <li>2. Manual cold junction compensation: set cold junction compensation value manually for thermocouple measurement.</li> <li>3. Passive output: output passive current signals for analog transmitters.</li> <li>4. Low-load mode: during passive current input, output 16 V voltage to the transmitter to lower the power dissipation and prolong the service life.</li> </ol>
⑩		Switch the type of measurement/output signals.
⑪		Switch the measurement/output range.
⑫		Turn on the programming function.
⑬		Switch the programmable output wave form (linear output/stepping output)
⑭		Increase or decrease the value.

### 2.3 LCD display








- A Measurement value display: four digits with a unit
- B. Source signal value: four digits with a unit
- 20mV/100mV/4-20mA/K/E/J/T/R/B/S/N。
- C. Signal and cold junction compensation mode:
  - 20mV/100mV/4-20mA/K/E/J/T/R/B/S/N
  - RJA is the automatic cold end and M is manual.
- D. Programming function:
  - $n/m$  is split output. The output value = (main set value)  $\times (n/m)$
  - "SWEEP" is linear output that outputs signals in a linear manner based on the time you set.
  - "STEP" is stepping output that outputs signals in a stepping manner based on the time you set.
  - "TIME" is the output time for each step, configurable from 0 to 999 s.
  - "COUNT" is the number of output cycle, configurable from 0 to 999. 0 means an infinite loop.
- E. Unit: mA/mV/V/°C
- F. Range switch function: RL is the lower limit of the display range, while RH is the upper limit. SL is the lower limit of the signal, while SH is the upper limit.
- G. Battery level: the real-time battery level is displayed. Three bars are the full level.

## Chapter 3 Signal output

The signal calibrator can source voltage, active current, passive current, thermocouple signal, and PT100 signal.




\* Note: PT100 signal is available only for SUP-C703S


### 3.1 Voltage and Active Current


- Connect the black signal cable to the public end and the yellow signal cable to the output end.
- Press the yellow signal button  to switch the signal type.
- Press  or  to adjust the output value.
- Press the yellow source button , and the value of  on the LCD will turn from  to  and the output is started.

### 3.2 4-20 mA

The 4-20 mA signal increases/decreases by 4 mA each time.

- Select 4-20 mA to be the signal type.
- Use the corresponding   button of 4-20 mA to set the output value in a stepping manner, with an increase/decrease of 4 mA each time in the order of 4→8→12→16→20. You can also use the regular 

and  button to fine-tune the value by adjusting the decimals.

- 3. Press the yellow source button , and the value of **SOURCE** on the LCD will turn from **OFF** to **ON** and the output is started.

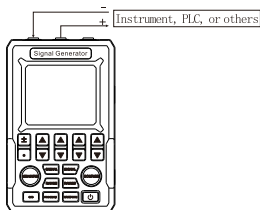






Figure 2 Outputting active current/voltage to the instrument or PLC

### 3.3 Thermocouple






Outputs a voltage equal to the thermocouple temperature minus cold conjunction compensation temperature.

- Press the yellow signal button  to switch the signal type to K/E/J/T/R/B/S/N.
- Press  or  to adjust the output temperature value.

- Press the yellow source button , and the value of **SOURCE** on the LCD will turn from **OFF** to **ON** and the output is started.


### 3.4 Resistance/Thermal Resistance




Source resistance/thermal resistance temperature

- Press the yellow signal button  to switch the signal type to  $\Omega$ /PT100.
- Press the blue measurement button , and the measurement part on the LCD will disappear.
- Press  or  to adjust the output temperature value.
- Press the yellow source button , and the value of **SOURCE** on the LCD will turn from **OFF** to **ON** and the source is started.

\* Note: Resistance/Thermal Resistance is only for SUP-703

### 3.5 Passive Current

- The passive current output can be used as a 2-wire transmitter simulator for loopback testing.
- Press the yellow signal button  to switch the signal type to mA.

- Flip the dial switch to the ON side of passive output to enable the passive current output function.
- Press  or  to adjust the output temperature value.
- Press the yellow source button , and the value of **SOURCE** on the LCD will turn from **OFF** to **ON** and the output is started.

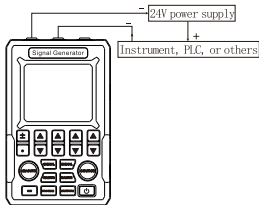















Figure 3 2-wire transmitter simulator

### 3.6 Output or Measurement of Voltage and Current Signals based on Display Range (Free from Range Conversion)



- Valid when the signal type is voltage and current.
- Press the yellow signal button  to switch the display and the switching order is: range lower limit (RL)→range upper limit (RH)→signal lower limit (SL)→signal upper limit (SH)→none.

- When the range display is RL, press  or  to set the corresponding value. Press  to move the RL decimal point. Press  to switch between the positive sign and negative sign for RL.
- Set the values of RL, RH, SL, and SH one by one.

#### During output:

- Press the range button  to exit the range settings. Press  to switch between range output and signal output. There is no unit display for range output.
- Press  or  to adjust the output value.
- Press the yellow source button , and the value of  on the screen will turn from  to , and the output is started.


#### During measurement:

- Press the blue range button  to exit the range settings. Press  to switch between display based on range measurement and display based on the signal value. There is no unit display for display based on the range.
- The actual measurement value or conversion value based on the range can be displayed in the measurement area.





## Chapter 4 Signal Measurement

The signal calibrator can measure the voltage, active current, passive current, thermocouple signal and resistance signal, with an updating cycle of 1s.

When you do not use the measurement function, press the blue measurement button  to close the measurement mode for battery power saving.

### 4.1 Voltage and Active Current

- Connect the black signal cable to the public end and the red signal cable to the measurement end.
- Press the blue measurement button  to enable the measurement function.
- Press the blue signal button  to switch the signal type.
- The actual measurement value is displayed in the measurement value display area on the LCD.

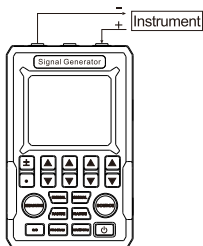



Figure 4 Measurement of voltage and active current signals

## 4.2 Passive Current

Used for testing 2-wire or 3-wire transmitters.

- Connect the signal cables based on the connection method for the 2-wire or 3-wire transmitter.
- Press the blue signal button  to switch the signal type to 24 V LOOP.
- Now the output end steadily outputs 24 V or 16 V voltage (16 V if the dial switch is on the ON side of low-load mode).
- The actual measurement value is displayed in the measurement value display area on the LCD, and the output display area steadily displays 25 mA.

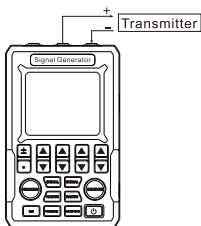


Figure 5 Measurement of 2-wire transmitter

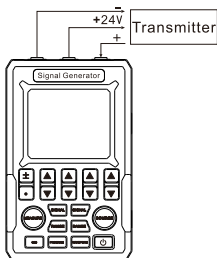



Figure 6 Measurement of 3-wire transmitter


### 4.3 Resistance/Thermal Resistance

- Connect the black signal cable to the common terminal and the red signal cable to the measurement terminal.
- Press the blue signal button  to switch the signal type to  $\Omega$ /PT100.
- The actual measurement value is shown in the measurement value display area on the LCD.





\* Note: Resistance/Thermal Resistance is only for SUP-703

### 4.4 Thermocouple

Used for measuring the thermocouple temperature. With an automatic or manual cold conjunction compensation function.

- Connect the black signal cable to the common terminal and the red signal cable to the measurement terminal.
- Press the blue signal button  to switch the signal type to K/E/J/T/R/B/S/N.
- The actual measurement value is shown in the measurement value display area on the LCD.

If you need to check or adjust cold conjunction compensation temperature, do as follows:

- Press cold conjunction compensation button , and the LCD output value will be switched to cold conjunction compensation temperature.
- The LCD displays RJA. It means that cold conjunction compensation is cold conjunction compensation temperature collected by the signal calibrator sensor, which cannot be changed.
- If you flip the dial to the manual cold conjunction position, the LCD will display M. Now, you can manually set cold conjunction compensation value with  and .
- Press cold conjunction compensation button  to close cold conjunction compensation display.

## 4.5 Regulating Valve

Output active voltage/current to the valve and measure the feedback signal to regulate the valve.




- Connect the signal cables based on Figure 7
- Press the blue signal button  to switch the measurement signal type to voltage/current
- Press the yellow signal button  to switch the output signal type to voltage/current
- Press the yellow source button  and the value of **SOURCE** on the screen will turn from **OFF** to **ON**, and the output is started
- The feedback measurement value of the valve is shown on the LCD measurement value display area.
















Figure 7 Regulating valve

## Chapter 5 Programmable Output

### 5.1 Split Output Function (n/m)














Through split output, voltage, current and thermocouple signals can be split and output in n/m times.

Output value = (main set value) x (n/m)


- Press  or  to set the main set value for output.  

- If there is no wave form, press the programming button  to access the split output mode. The n/m menu is displayed.
- Press the programming button  to set the m value (value range: 1 to 20).
- Press  or  to set the n value (value range: 0 to m). The n/m output value can be obtained base on the n value.
- Press the yellow source button , and the value of  on the screen will turn from  to , and the output is started.
- Press the yellow source button  to stop the output.
- Press the programming button  to exit the split output mode.

## 5.2 Linear Output Function

Outputs a linear output signal value based on the time you set.

- Press  or  to set the main set value for output.
- Press the wave form button , and the LCD will display SWEEP. The linear output mode is enabled.
- Press the programming button  to set the linear output time parameter (TIME). There are four time to choose from: ascending time, upper limit holding time, descending time, and lower limit holding time. Press  or  to change the time value (configuration range: from 0 to 999s).
- Press the programming button  again to set the linear output times (COUNT), with a configuration range from 0 to 999. 0 means infinite times.
- Press the yellow source button , and the value of  on the screen will turn from  to , and the output is started.
- The LCD displays the current output step. 
- Press the yellow source button  to stop the output.



- Press the programming button  to exit the linear output function.

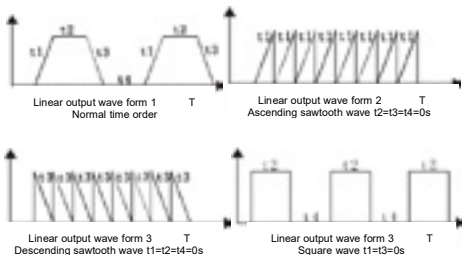









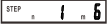




Figure 8 Linear output

### 5.3 Automatic Stepping Function

This function will output a signal value in the stepping manner based on the value you set.

- Press  or  to set the main set value for output.
- Press the wave form button , and the LCD will display STEP and the stepping output mode is enabled.

- Press the programming button  to set the time for linear output. Press  or  to change the time which is configurable from 0 to 999 s.
- Press the programming button  again to set the initial value of n/m for stepping output.
- During stepping output, n changes in the following order: 1→2→...→m-1→m→m-1→...→2→1.
- Press the yellow source button , and the value of  on the screen will turn from **OFF** to **ON**, and the output is started.
- The LCD displays the current output step.  

- Press the yellow source button  to stop the output.
- Press the programming button  to exit the stepping output function.

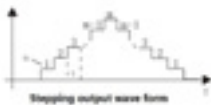


Figure 9 stepping output

## Chapter 6 Troubleshooting and maintenance

### 6.1 Troubleshooting

- Symptom: press the power button and the LCD has no display.
  - a. Check if the battery is fully charged.
  - b. Check if the power adapter current is 1000 mA.
- Symptom: there is no measurement value display.
- Check if the measurement function is enabled.
- Symptom: the output value or measurement value is abnormal.
  - a. Check if the signal line is correctly connected.
  - b. Check if the signal type is correct.

### 6.2 Maintenance

- This instrument is powered by four AAA batteries. For long period use, 5V/1A adapter is recommended to avoid low battery.
- If a mobile phone adapter is used for power supply, make sure that its output current is 1000 mA.
- This instrument is not waterproof, so do not use it in a high-moisture environment.
- Avoid placing this instrument in an unstable position or where it may be affected by violent shocks.
- Avoid placing this instrument outdoors or in a place with high moisture, dust, direct sunlight, or any heat sources.

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