

CL04

Voltage and Current Signal Generator



JAKAR[®]
MEASUREMENT & CONTROL

Voltage and Current Signal Generator

1 Introduction

The voltage and current signal generator (calibrator) is a battery-powered, handheld portable instrument capable of outputting electrical and physical parameters. It can be used for analog output of DC voltage and DC current.

2 Contact Us

To order components or seek operational assistance, please call us or visit the website www.jakar.cz

3 Standard Configuration

The items listed below are included with your calibrator. If you find your calibrator damaged or something missing, please immediately contact the company where you purchased the product. To order replacement parts or spare parts, please contact us.

- Industrial test lead 1 pair
- Protective tube 1 pcs
- Latch key 1 pc
- AA alkaline battery 3 pcs

4 Safety Information

User should use the calibrator in accordance with the instructions of the manual, or the protective devices provided for the calibrator may be damaged. The Company is not responsible for any damage caused by failure to follow the safety warning information provided.




“ WARNING” indicates a situation or action that may pose a danger to the user. “Caution” indicates a situation or action that may cause damage to the calibrator or the equipment being tested. Please refer to Table 1 for an explanation of international electrical symbols used in the calibrator and the manual.


Table 1. International Electrical Symbols

	Grounding		Warning message
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WARNING

To avoid electric shock or personal injury:

- Do not apply voltage exceeding the rated voltage indicated on the calibrator between terminals or between any terminal and ground.
- Before use, measure a known voltage to verify that the calibrator is working properly.
- Please follow all safety steps of the instrument.
- Do not use a damaged calibrator. Check the housing of the calibrator for cracks or missing plastic parts before use. Pay special attention to the insulation around the connector.
- Select the proper function and range according to the measurement requirements.
- Make sure that the battery door is securely closed before using the calibrator.
- Remove the test lead from the calibrator before opening the battery door.

- Check the test lead for damage or exposed metal. Check whether the test lead is conductive. Damaged test lead should be replaced before using the instrument.
 - When using the probe, please keep your fingers away from its metal contact. Keep your fingers behind the finger protection device of the probe.
- During wiring, the common wire should be connected first and then the live test lead. During removal, the live test lead should be removed first.
- Do not use the instrument if it is faulty. Protective devices may have been damaged. If in doubt, please send the instrument for repair. Do not use the instrument near explosive gases, vapors, or dust.
 - The calibrator should be powered by 3 AA LR6 batteries, which should be properly installed in the instrument housing.
 - Remove the test lead before switching between different measurement or output functions.
 - Use the designated replacement parts when repairing the calibrator.
 - To avoid incorrect readings that could result in electric shock or personal injury, the battery should be replaced immediately when the symbol “  ” appears on the display screen indicating low battery

5 Get to Know the Calibrator

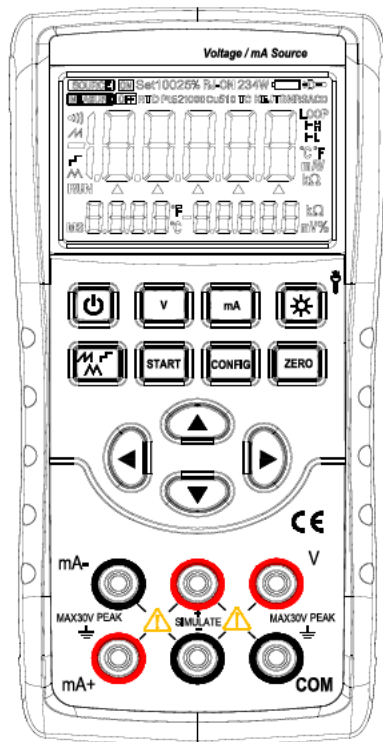


Figure 1. Overall Diagram

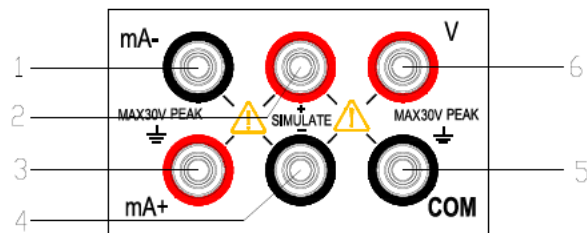


Figure 2. Output Terminals

5.1 Output terminals

Figure 2 shows the input and output terminals of the calibrator.

Table 2 explains their purposes.

2. Output terminals

Terminal	Function description
1	mA-: DCI output (-) terminal
2	SIMULATE output (+) terminal
3	mA+: DCI output (+) terminal
4	SIMULATE output (-) terminal
5	COM: DCV output (-) terminal
6	V: DCV output (+) terminal

5.2 Buttons

Figure 3 shows the calibrator buttons. Table 3 explains their functions

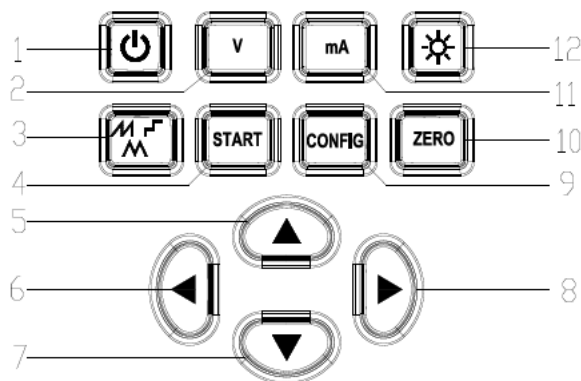


Table 3. Button Functions

Figure 3. Button Functions

S/N	Button name	Description
1	Power button	Power on/off
2	V button	Press this button to switch the function to voltage output
3	Output waveform switch button	Select output waveform of current output automatic waveform
4	Output START button	Start/stop button for automatic waveform output in the output current function
5, 7	Output setting button	Increase/decrease output setting position
6, 8	Output setting button	Output setting position left/right shift
9	CONFIG button	In the output current function, press this button to enter current-related parameter settings
10	ZERO button	In the output state, press this button to restore the output value to the default value. Press this button to save the settings in states of factory maintenance setting and parameter setting.
11	mA button	Press this button to switch the function to current output
12	Backlight/flashlight button	Short press to turn on/off the backlight; long press to turn on/off the flashlight

5.3 Display screen

- a: Output status mark
- b: Main display area for output data
- c: Automatic sawtooth wave mode output current mark
- d: Output data polarity indicator
- e: Auto-stepping mode output current mark
- f: Automatic triangular wave mode output current mark
- g: Output current automatic waveform operation mark
- h: Output setting position indicator
- i: Output current percentage data polarity indicator
- j: Display of output current percentage data
- k: Output current percentage data unit
- l: Output function and unit indicator
- m: Indicator for 24V power turned on inside the instrument
- n: Flashlight on indicator
- o: Low battery indicator
- p: Output current span mark
- q: Output on mark

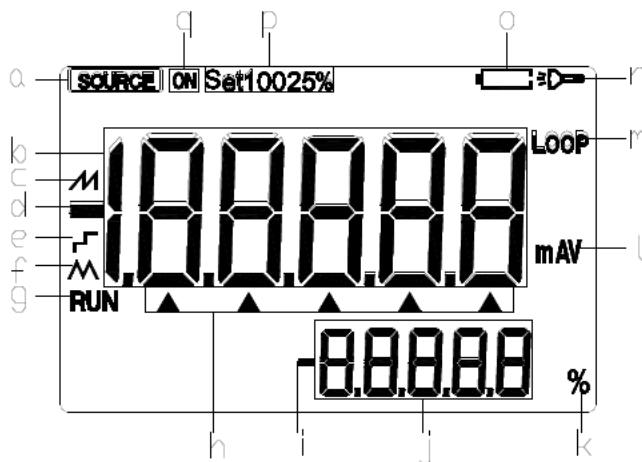


Figure 4. Typical Display Screen

6 Preparations

■ Operating precautions

Safe use for the calibrator

- When using the calibrator for the first time, be sure to read the safety information listed in Section IV.

- Do not open the instrument housing.

To inspect or repair the instrument's internal components, please contact the seller from whom you purchased the product.

- Fault condition

If the instrument starts to release fume and emit a strange smell, or other abnormal phenomena occur, immediately turn off the instrument and remove the batteries. Then contact the seller from whom you purchased the instrument.

■ General operations

- Before moving the calibrator, turn off the power of the tested instrument and then the power of the calibrator. Finally, unplug all test leads from the calibrator. Use a professional transport packaging box when transporting the calibrator.

- Do not allow any live objects to approach the calibrator in case its internal circuitry gets damaged.

- Do not apply any volatile chemicals to the calibrator housing and operating panel, and do not leave the calibrator attached to any object made of rubber or vinyl for too long time. Take care to prevent the operating panel, which is made of thermoplastic resin, from contacting soldering iron, soldering tin or heating objects.

- For safe operations of battery, please refer to the "Install or replace batteries" section.

- Do not use the calibrator without the battery cover installed.

■ Environmental requirements

Use the instrument under the environmental requirements listed below:

- Ambient temperature and humidity

Ambient temperature: 0-50°C

Ambient humidity: 20%-80%; use the instrument under non-condensing conditions

- Use the instrument in a flat and horizontal area
- Do not use the instrument in the following environment
- Places directly exposed to sunlight or close to heat sources
- Places close to mechanical vibrations
- Approaching to any interference source, such as high-voltage equipment or engine power
- Approaching to any electromagnetic field or high-density electric power area
- Places filled with large amounts of oil fumes, heat flow, dust or corrosive gases
- Unstable places or places with flammable gases that can cause an explosion

Note:

- If precise measurements or output results are required, use the calibrator under the following environmental requirements:
 Ambient temperature range: $23\pm 5^{\circ}\text{C}$; ambient humidity range: 20-80% (without condensation)
 When using the calibrator in an environment of $0-18^{\circ}\text{C}$ or $28-50^{\circ}\text{C}$, refer to the Index section and add an additional error value at this temperature coefficient to achieve the given accuracy.
- When the humidity of the surrounding environment where the instrument is located is less than 30%, use an anti-static pad or take other effective measures to prevent the generation of static electricity.
- If the instrument needs to be moved from a place with lower ambient temperature or humidity to a place with higher ambient temperature, or if the instrument is to undergo a sudden temperature change, warm up the instrument for at least one hour under the ambient temperature before using to ensure its proper operation.
- Install or replace batteries

⚠ WARNING

- To avoid electric shock, the test lead must be removed from the calibrator before opening the battery door. The battery door must be closed tightly before using the calibrator.

Caution

- To prevent the risk of liquid leakage or battery explosion, install the positive and negative poles of the battery correctly.
- Do not short-circuit the battery.
- Do not disassemble or heat the battery, or throw the battery into a fire.
- When replacing batteries, use 3 identical batteries to replace them simultaneously.
- If the calibrator is not used for a long time, the battery should be removed from the calibrator.

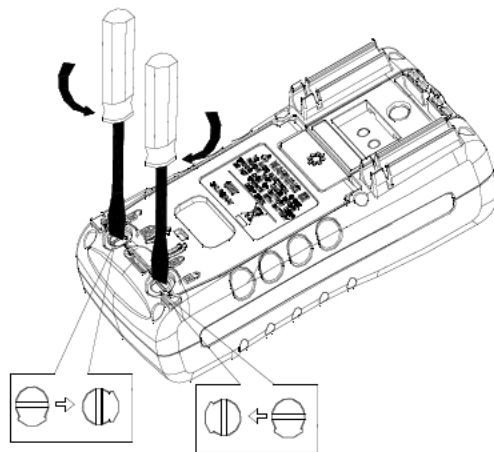


Figure 5

Step 1: Before replacing the battery, remove the test lead and turn off the calibrator.

Step 2: Use a slotted screwdriver to rotate the battery door screw by a quarter turn counterclockwise and remove the battery door.

Step 3: Correctly install 3 pieces of AA LR6 alkaline batteries into the battery compartment in the direction as it indicates.

Step 4: After replacing the battery, close the battery door tightly again.

■ Power on/off

It is necessary to press the power button to turn on the calibrator when the power supply is turned off. Besides, it is needed to press the power button for 2 seconds to turn off the calibrator when the calibrator is turned on.

■ Automatic shutdown

In case of no button operations within the default 5 minutes set by the factory, the calibrator automatically shuts down. The automatic shutdown time can be set in the factory settings. Please refer to Chapter 9 “Factory Settings”.

■ Turn on/off of backlight

It is necessary to press the backlight button to turn on the backlight, and press it again to turn off the backlight. By doing so, it is easier to observe the content on the display screen in dark places or at the time of performing output or measurements. When the calibrator operates with batteries, turning on the backlight will reduce the battery life.

Note

The backlight will automatically turn off after about 60 seconds by default. In case of pressing the backlight button, the backlight will be on again.

The backlight illumination time can be set in the factory settings. Please refer to Chapter 8 “Factory Settings”.

7 Use of output mode

The calibrator should be used for outputting a DC signal.

⚠WARNING

To avoid electric shock, it is not allowed to apply voltage exceeding the rated voltage indicated on the calibrator between the terminals or between any terminal and ground of the calibrator. The calibrator should be used in situations where the voltage to ground at any terminal does not exceed a peak value of 30V.

7.1 Output of DC voltage

Step 1: Connect the lead to the target device

- Connect the black lead to the 'COM' end and the red lead to the 'V' end.
- Connect the other end of the two leads to the signal end of the controlled device and ensure that the terminal polarity is correct.

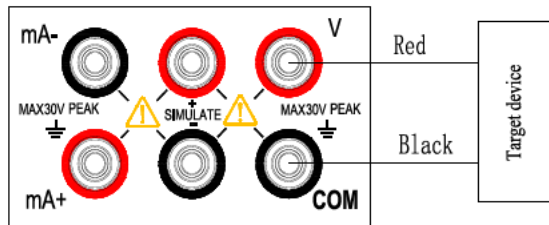


Figure 6. Output DC Voltage

Step 1: Press (V) button to switch to the voltage output function and the character 'V' on the display screen will light up. At this time, the DC voltage output function will take into force.

Step 2: Use output setting button to set the output value.

Change the output setting value: (▲) / (▼)

Change the output digit: (◀) / (▶)

7.2 Output DC current (active)

Step 1: Connect the lead to the target device

- Connect the black lead to the mA-end and the red lead to the 'mA+' end.
- Connect the other end of the two leads to the signal end of the controlled device and ensure that the terminal polarity is correct.

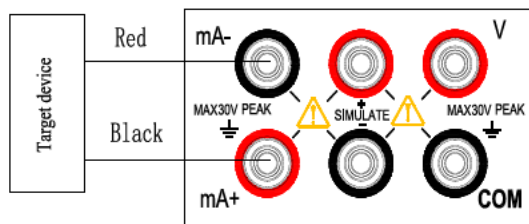


Figure 7. Output DC Current (Active)

Step 2: Press the [mA] key to switch to the current output function. The 'LOOP' and 'mA' characters on the screen light up, indicating the active DC current output function.

Step 3: Setting of manual stepping span and current output range:

- Press the [CONFIG] key to enter the DC current parameter setting interface. At this time, the character 'MAP.ER' is displayed in the lower right corner of the screen, indicating manual step span setting; the main display area of the

screen shows the parameters to be set;

- Set the required span by pressing the (▲) / (▼) key

Parameter '0' means: When pressing the (▲) / (▼) key, the corresponding value of the setting bit increases/decreases by 1;

Parameter '25' means: When pressing the (▲) / (▼) key, the output value increases/decreases by 25% of the measuring range;

Parameter '100' means: When pressing the (▲) / (▼) key, the output value increases/decreases by 100% of the measuring range;

Note: When the measuring range is 0-20mA, 25% span means 5mA; when the measuring range is 4-20mA, 25% span means 4mA.

When the measuring range is 0-20mA, 100% span means 20mA; when the measuring range is 4-20mA, 100% span means 16mA.



- Press the [ZERO] key to save the settings and automatically switch to the current output range setting interface. At this time, the character 'SCALE' is displayed in the lower right corner of the screen, indicating the current output range setting; the main display area of the screen shows the parameters to be set;
- Set the required range by pressing the (▲) / (▼) key: 0-20mA/4-20mA;
- Press the [ZERO] key to save the settings and automatically switch back to span setting.
- Press the [CONFIG] key to exit the setting interface.





Note: After setting the current output range, the set range applies to all current output functions.

Step 4: Set the output value by pressing the output setting key.

- Change the set output value: (▲) / (▼) ;
- Change the set output bit: (◀) / (▶) , this step is only valid when the span is '0'
-

7.2.1 Automatic stepping output mode of output current



Step 1: Press () button in the output current function state to switch to the stepping mode function of DC current. At this time, the symbol  on the display screen will light up.













Step 2: Press (CONFIG) button to enter the DC current step mode parameter setting interface. At this time, the character 'STEP' is displayed in the lower right corner of the display screen, indicating the step size setting. The main display area of the display screen displays the parameters to be set; Use the () / () / () / () button to set the required step time (1-200S); Press the (ZERO) button to save the settings. Press (CONFIG) button again to exit the settings interface.

Step 3: Press (START) button to initiate the automatic stepping of output current and the logo (RUN) on the display screen will light up at this time.

Step 4: To end the automatic stepping of output current, press (START) button to stop the automatic stepping of output current. The logo (RUN) on the display screen will go out at this time.

7.2.2 Automatic sawtooth wave output mode of output current

Step 1: Press () button in the output current function state to switch to the function of the automatic sawtooth wave mode of DC current. At this time, the symbol  on the display screen will light up.

Step 2: Press (CONFIG) button to enter the parameter setting interface of the sawtooth wave mode of DC current. At this time, the character 'START' is displayed in the lower right corner of the display screen, indicating the start-point current setting. The main display area of the display screen displays the parameters to be set; Use the () / () / () / () button to set the required start-point current; Press the (ZERO) button to save the settings and switch to the next setting item. At this time, the character 'STOP' is displayed in the lower right corner of the display screen, indicating the endpoint current value setting. The main display area of the display screen displays the parameters to be set; Press the () / () / () / () button to set the required endpoint current; Press (ZERO) button to save the settings and switch to the next setting item. At this time, the character 'CYC' is displayed in the lower right corner of the display screen, indicating the period setting. The main display area of the display screen displays the parameters to be set; Press the () / () / () / () button to set the required

period (5-200S) and press (ZERO) button to save the settings. Press (CONFIG) button again to exit the settings interface.

Step 3: Press (START) button to initiate the automatic stepping of output current and the logo (RUN) on the display screen will light up at this time.

Step 4: To end the automatic stepping of output current, press (START) button to stop the automatic stepping of output current. The logo (RUN) on the display screen will go out at this time.

7.2.3 Automatic triangular wave output mode of output current

Step 1: Press (M) button in the output current function state to switch to the function of the automatic sawtooth wave mode of DC current. At this time, the symbol M on the display screen will light up.

Step 2: Press (CONFIG) button to enter the parameter setting interface of the sawtooth wave mode of DC current. At this time, the character 'START' is displayed in the lower right corner of the display screen, indicating the start-point current setting. The main display area of the display screen displays the parameters to be set; Use the (▲) / (▼) / (◀) / (▶) button to set the required start-point current; Press the (ZERO) button to save the settings and switch to the next setting item. At this time, the character 'STOP' is displayed in the lower right corner of the display screen, indicating the endpoint current value setting. The main display area of the display screen displays the parameters to be set; Press the (▲) / (▼) / (◀) / (▶) button to set the required endpoint current; Press (ZERO) button to save the settings and switch to the next setting item. At this time, the character 'CYC' is displayed in the lower right corner of the display screen, indicating the period setting. The main display area of the display screen displays the parameters to be set; Press the (▲) / (▼) / (◀) / (▶) button to set the required period (5-200S) and press (ZERO) button to save the settings. Press (CONFIG) button again to exit the settings interface.

Step 3: Press (START) button to initiate the automatic stepping of output current and the logo (RUN) on the display screen will light up at this time.

Step 4: To end the automatic stepping of output current, press (START) button to stop the automatic stepping of output current. The logo (RUN) on the display screen will go out at this time.

7.3 Output DC current (passive)

Step 1: Connect the lead to the target device

- Connect the black lead to the SIMULATE - end and the red lead to the SIMULATE + end.
- Connect the other end of the two leads to the input end of the controlled device and ensure that the terminal polarity is correct.

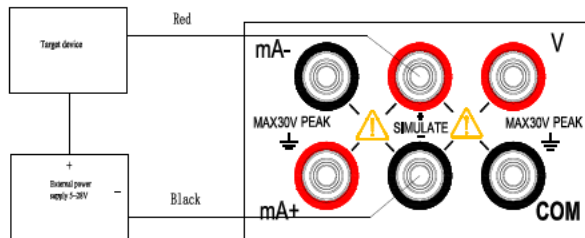


Figure 8. Output DC Current (Passive)

Step 2: Press (mA) button to switch to the current output function and the character 'mA' on the display screen will light up. At this time, the passive DC current output function will take into force.

Please refer to the active DC current function for other operations.

Tip: Passive DC current requires an external 5-28V DC power supply.

8. Factory settings

The calibrator can be used for changing the default factory settings.

To enter: Press and hold the Backlight button, and then press the Power button to turn on the instrument. After the instrument enters the settings interface, release the Backlight button.

8.1 Automatic shutdown time setting

Step 1: After entering the settings interface, you will find “APOF” shown on the display screen, which indicates the automatic shutdown setting.

Step 2: Use the setting buttons (▲) / (▼) / (◀) / (▶) to set the required parameters. The display unit of automatic shutdown time is minute.

Setting range: 0-60 minutes; 0 represents cancelling the automatic shutdown, while other values represent the corresponding time after which the instrument will shut down

Step 3: Press (ZERO) button. The display screen will show “SAVE”, indicating that the setting has been saved.

8.2 Backlight time setting

Step 1: Press (V) button to make the display screen show “BLOF”, which indicates the backlight time setting.

Step 2: Use (▲) / (▼) / (◀) / (▶) to set the required parameters. The display unit of backlight time is second.

Setting range: 0-3600 seconds; 0 represents cancelling the automatic backlight shutdown and other values represent the corresponding time after which the instrument backlight will shut down.

Step 3: Press (ZERO) button. The display screen will show “SAVE”, indicating that the setting has been saved.

8.3 Flashlight time setting

Step 1: Press (V) button to make the display screen show “LTOF”, which indicates the flashlight time setting.

Step 2: Use (▲) / (▼) / (◀) / (▶) to set the required parameters. The display unit of flashlight time is minute.

Setting range: 0-30 minutes; 0 represents cancelling the automatic backlight shutdown and other values represent the corresponding time after which the instrument backlight will shut down.

Step 3: Press (ZERO) button. The display screen will show “SAVE”, indicating that the setting has been saved.

8.4 Factory default setting

Step 1: Press (V) button to make the display screen show “FACT”, which indicates the factory default setting.

Step 2: Use (▲) / (▼) to set the required parameters;

NO indicates that all settings are not restored to factory parameters, while YES indicates that all settings are restored to factory parameters.

Step 2: Press (ZERO) button. The display screen will show “SAVE”, indicating that the setting has been saved.

All settings of the factory parameters are as follows:

APOF: 5 minutes.

BLOF: 60 seconds.

LTOF: 5 minutes.

Tip: Whenever you change the setting of any item, there is a need to press (ZERO) button to save the set value. Any press of the (ZERO) button will only save the latest set value.

9 Replace the battery or fuse

WARNING

To avoid electric shock, the test conductor must be removed from the calibrator before opening the battery door. The battery door must be closed tightly before using the calibrator.

Caution

- To prevent the risk of liquid leakage or battery explosion, install the battery correctly. Positive and negative polarity
- Do not short-circuit the battery.
- Do not disassemble or heat the battery, or throw the battery into a fire.
- When replacing batteries, use 3 identical batteries to replace them simultaneously.
- If the calibrator is not used for a long time, the battery should be removed from the calibrator.

Step 1: Before replacing the battery or fuse, remove the test leads and the charger and turn off the calibrator.

Step 2: Use a slotted screwdriver to rotate the battery door screw by a quarter turn counterclockwise and remove the battery door, as shown in Figure 9. Replacement of Battery and Fuse

Step 3: Correctly install 3 same AA LR6 batteries into the battery compartment in the direction as it indicates. Or replace the same model of fuse (100mA/250V).

Step 4: After replacing the batteries, close the battery door and fasten the screw fastener tightly again.

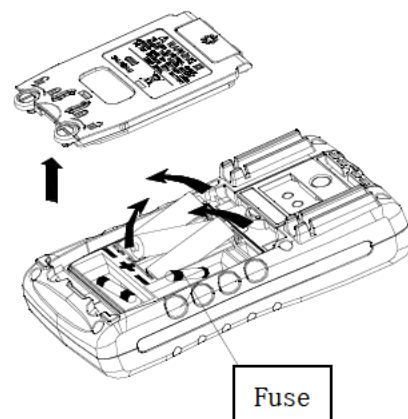


Figure 9.

10 Maintenance

10.1 Cleaning of calibrator

WARNING

Designated replacement parts should be used to avoid personal injury or damage to the calibrator. Do not allow water to enter the housing.

Caution

Do not use solvent or abrasive cleaner to avoid damage to the plastic lens and housing. Clean the calibrator with a soft cloth dampened with a little water or mild soapy water.

10.2 Service center for calibration or repair

Calibration, repair or maintenance of the instrument should only be carried out by experienced maintainer. Check the battery first if the calibrator is faulty, and replace it if necessary.

Make sure that the calibrator is operated in line with the instructions in this manual.

11 Index

Analog output function [Used within one year after calibration, 23°C±5°C, 20~70% RH, accuracy = ± (% set value + reading)]

Output function	Measurement range	Output range	Resolution	Accuracy	Remarks
DC voltage DCV	10V	-1.000V~11.000V	0.001V	0.05%+2mV	Maximum output current of 5mA
DC current DCI	30mA	0.000mA~30.000mA	0.001mA	0.05%+4uA	At 20 mA, a maximum load of 1000Ω resistance At the time of simulating the transmitter, the external circuit power supply is 5~28V

Other characteristics:

- Uncertainty includes standard uncertainty, hysteresis, nonlinearity, repeatability, and typical long-term stability over the period mentioned (K = 2).
- Maximum applied voltage at output terminal: approximately 30Vpk; Maximum applied current at output terminal: approximately 25mA
- Load characteristics: capacitive load $\geq 0.01\mu\text{F}$; Inductive load $\geq 0.01\mu\text{F}$ 100uH; Output load affects DCV (0.001% full scale + 1nV)/ mA
- Temperature coefficient: $0.1 \times \text{Basic accuracy}/^{\circ}\text{C}$ (temperature range <18°C or >28°C)

12 Notes for using the Manual

- This manual is subject to change without notice.
- The contents of this manual are considered to be correct. If users find any errors, omissions, etc., please contact the manufacturer.
- The Company is not responsible for accidents and hazards caused by user's misoperation.
- The functions described in this manual do not justify the use of the product for special purposes.