WARRANTY

Our company warrants to the original purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service for a period of one year from date of purchase. Our company's warranty does not apply to fuses, test leads or any product which, in our company's opinion, has been misused, altered, or damaged by accident or abnormal conditions of operation or handling.

To obtain warranty service, contact the nearest Service Center or send the product, with a description of the difficulty, and postage prepaid, to the nearest Service Center. We assume no risk for the damage in transit. We will, at its option, repair or replace the defective product free of charge or refund your purchase price. However, if we determine that the failure was caused by misuse, alterations, accident or abnormal condition of operation or handing, you will be billed for the repair and the repaired product will be returned to you transportation prepaid.

SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipment of our company's instruments should be made via United Parcel Service or "Best Way" prepaid. The instrument should be shipped in the original carton; or if it is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL PURCHASER

The instrument should be thoroughly inspected immediately upon original delivery to purchaser. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument is damaged in any way, a claim should be filed with the carrier immediately.

To obtain a quotation to repair shipment damage, contact the nearest Service Center. Final claim and negotiations with the carrier must be completed by the customer.

Index

Multifunction Process Calibrator with HART Communication

Statement: this manual is applied to both HART type and Basic type multifunction process calibrators. Illustrations concerned with HART operations can be applied only to HART type. All explanations and examples are made on HART type.

1 Introduction

Multifunction process calibrator (as the Calibrator for short) is a hand-hold portable calibrator powered by batteries / Adapter, and can measure and source electrical paracalibrators and physical paracalibrators (See Table 1).

Table 1. List for Source and Measurement Functions

Measurement Functions / Source Functions		DCV	DCI		OHM	FREQ	TC	RTD	PULSE	PRESSURE	CONTACT
			LOOP OFF	LOOP ON							
DCV		●	●	●	●	●	●	●	●	●	●
DCI	------	●	●	●	●	●	●	●	●	●	●
	RAMP ON	×	×	×	×	×	×	×	×	×	×
	AUTO STEP ON	●	●	●	●	●	●	●	●	●	●
OHM		●	●	●	●	●	●	●	●	●	●

FREQ	●	●	●	●	×	●	●	×	×	●
PULSE	●	●	●	●	×	●	●	×	×	●
CONTACT	●	●	●	●	×	●	●	×	×	●
TC	●	●	●	●	●	×	×	●	●	●
RTD	●	●	●	●	●	×	×	●	●	●
PRESSURE	●	●	●	●	×	●	●	×	×	●

The Calibrator processes the following features expect the above-mentioned:

- Any function state can enter into HART function directly (only for HART type)
- Measurement and sourcing can work simultaneously. Measured information and soured information display separately
- Thermal couple (TC) input/output terminals and the internal process automatic temperature compensation reference node
- Manual step sourcing, auto step and ramp current sourcing
- Indoor temperature monitor in any operation
- Measurement/ output temperature monitor function
- Measurement/ sourcing mA% display
- Measurement filtering function
- Measurement manual hold function
- Auto-hold function of sourced pressure value display

2 Contact Us

To purchase parts, obtain operation help or address of the vendor or service center nearest to you, please call

us or visit our web (see the bottom page of the Manual).

3 Standard Accessories

Make sure that the package contains all the accessories listed below. And if you find they are damaged or any of them is missing, please contact the vendor from which you purchased the product as soon as possible. Refer to the replacing part list in 15.3 in the Manual if you want to order the replacing parts.

- One pair of Testing Probe（H000000-00）
- One pair of Industrial testing Lead（H000001-00）
- One pair of Industrial testing Lead （H000002-00）
- One pair of hook Testing Probe （H000004-00）
- One pair of Alligator clip（H010000-00）
- One pair of Alligator clip（H010007-00）
- One set of RTD Convertor（H200000-00）
- One copy of A User's Manual
- One copy of Certification of Warranty
- Two pieces of Fuse Tube（100mA/250V）
- Two pieces of Fuse Tube（50mA/250V）
- Four alkaline batteries
- One Bag

4 Safety Information

For the correct and safe use of the calibrator, be sure to follow the cautionary notes stated in this manual whenever handling the calibrator. The Company shall not be held liable for any damage resulting from use of the

calibrator in a manner other than prescribed in the cautionary notes.⚠**Warning** identifies conditions and actions that pose hazards to the user; a **Caution** identifies conditions and actions that may damage the calibrator or the equipment under test. Refer to Table 2 for the explanation of the international electric symbols adopted by the calibrator or the user's manual.

Table 2 Explanations of International Electrical Symbols

	EARTH GROUND		WARNING INFORMATION

⚠**Warning**

To avoid possible electric shock or personal injury:

- Do not apply more than the rated voltage, as marked on the calibrator, between terminals or between any terminal and earth ground;
- Before use, verify the calibrator's operation by measuring a known voltage;
- Follow all equipment safety procedures;
- Do not connect the probe of the testing lead with any live power when the other end has been inserted into the current jack;
- Do not use the calibrator if it is damaged. Before using the calibrator, inspect the case. Look for cracks or missing plastic .Pay particular attention to the insulation surrounding the connectors;
- Select the proper function and range for the measurement;
- Make sure the battery door is closed and latched before operating the calibrator;
- Remove test leads from the calibrator before opening the battery door;
- Inspect the test leads for damaged insulation or exposed metal. Check test lead continuity. Replace damaged test leads before using the calibrator;

- When using the probes, keep fingers behind the finger guards on the probes;
- Connect the common test lead before connecting the live test lead. When disconnecting test leads, disconnect the live test lead first;
- Do not use the calibrator if it operates abnormally. Protection may be impaired. When in doubt, have the calibrator inspect;
- Do not operate this calibrator in areas where inflammable or explosive gases or vapor exists. It is extremely hazardous to use the calibrator under such environments;
- Do not operate the calibrator around explosive gas, vapor, or dust;
- When use the pressure module, do make sure the process pressure line is shut off and depressurized before connecting or disconnecting the pressure module;
- Use only four of type AAA batteries, properly installed in the calibrator case, to power the calibrator;
- Do disconnect the testing lead before shifting to different source or measurement functions;
- When servicing the calibrator, use only specified replacement parts.
- To avoid false reading, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator (▭) appears.

Caution

To avoid possible damage to calibrator or to equipment under test:

- Disconnect the power and discharge all high-voltage capacitors before testing resistance or continuity.
- Use the proper jacks, functions, and ranges for the measurement or source operation.

5 Familiar With the Calibrator

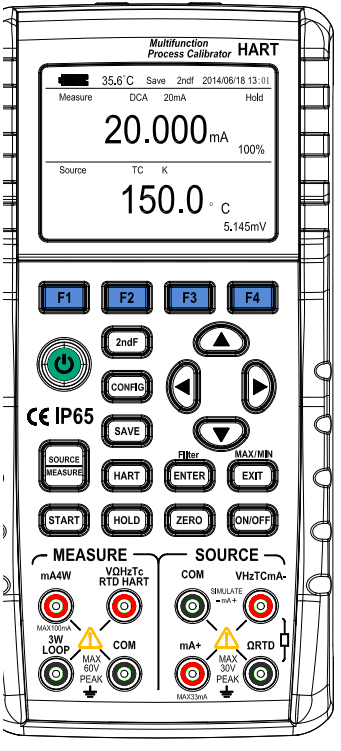


Figure 1 Entire Graph

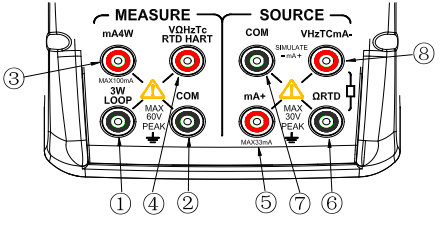


Figure 2 Measurement/ Source Terminals

5.1 Measurement/ Source Terminals

Figure 2 shows the measurement /source terminals of the calibrator. Table 3 explains their use.

Table 3 Measurement/ Source Terminals

Terminal	Function
①	3W terminals：3-wired OHM、RTD measurement input terminals； LOOP terminals：+24VDC loop power terminals
②	All the common (return) （-）terminals of measurement function
③	Input Signals（+）: DcmA; 4- wired OHM、RTD measurement input terminals
④	input signals（+）：DCV、OHM、FREQ、TC、RTD、SWITCH、HART
⑤	Source signals（+）：（+）DCmA
⑥	Source signals（+）： OHM、RTD
⑦	All the common (return) （-）terminals of measurement function
⑧	Source signals（+）（+）DCV、OHM、TC、RTD、FREQ、CYC、SWITCH Source signals（+）（-）DCmA

5.2 Keys

Figure 3 shows keys of the calibrator. Table 4 explains their use.

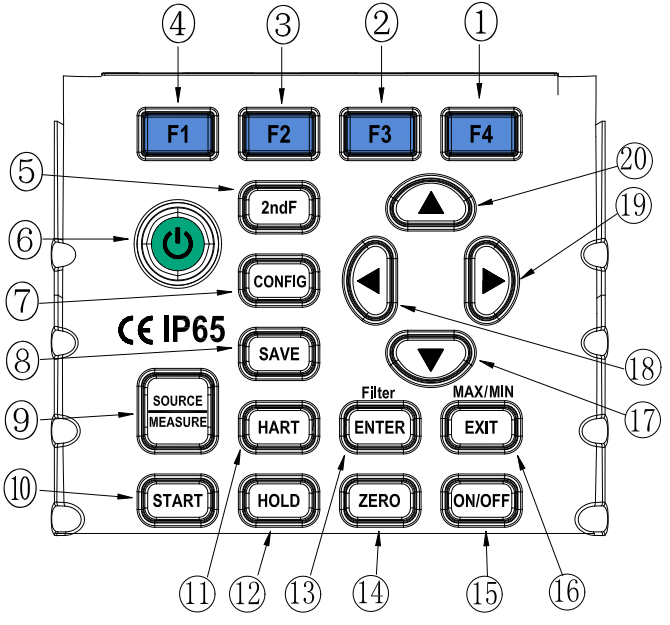


Figure 3 keys

Table 4 Functions of the keys

No.	Name	Function
1-4	Functional keys	operate the TFT display of the calibrator
5	**2ndF** key	select the second function of the press key
6	power key	connect or disconnect with the power
7	**CONFIG** key	enter into the setting interface
8	**SAVE** key	store the present data
9	**MERSURE/SOURCE** key	shift between measurement function and source function
10	**START** key	press the key to start or stop sourcing when the soured current sourcing is in auto-step or auto-ramp mode
11	**HART** key	in measurement state, press the key and enter into HART mode to start HART communication(only available to HART type, non-available to basic version)
12	**HOLD** key	measurement reading hold; release the locked pressure readings soured pressure measurement
13	**ENTER** key	Execution key, execution of the selected operation
14	**ZERO** key	source/ zero sourced value
15	**ON/OFF** key	start or shut source
16	**EXIT** key	exit key, exit from the selected operation
17	Source set key	decrement of the source set digit
18	Source set key	left shift of the source set digit

19	Source set key	right shift of the source set digit
20	Source set key	increment of the source set digit

6 Preparation for Operation

■ Operating Precautions

Precautions for Safe Use of the Calibrator

- Be sure to read the instructions given in Section Four “Precautions for Safe Use of the Calibrator.” when using the calibrator for the first time.
- Do not open the calibrator’s case.
  Contact the vendor from which you purchased the calibrator, for a service of inspecting or adjusting the internal assembly.
- In case of failure
  Should the calibrator begin to emit smoke, give off an unusual odor, or show any other anomaly, immediately turn off the POWER key. If you are using a Adapter, disconnect the plug from the wall outlet. Also cut off power to the object under test that is connected to the input terminals. Then, contact the vendor from which you purchased the calibrator.

■ **General Handling Precautions**

- Before carrying around the calibrator turn off power to the object under test, and then the POWER key of the calibrator. If you are using a Adapter, disconnect the power cord from the wall outlet. Finally, detach all lead cables from the calibrator. Use a dedicated carry case when transporting the calibrator.
- Do not bring any electrified object close to the input terminals, since the internal circuit may be destroyed.
- Do not apply any volatile chemical to the calibrator’s case or operation panel. Do not leave the calibrator in contact with any product made of rubber or vinyl for a prolonged period. Be careful not to let a soldering iron

or any other heat-emitting object come into contact with the operation panel, as the panel is made of thermoplastic resin.

- Before cleaning the calibrator's case or operation panel, disconnect the power cord plug from the wall outlet if you are using a Adapter. Use a soft, clean cloth soaked in water and tightly squeezed to gently wipe the outer surfaces of the calibrator. Ingress of water into the calibrator can result in malfunction.
- If you are using a Adapter with the calibrator and will not use the calibrator for a prolonged period, disconnect the power cord plug from the wall outlet.
- For handling precautions regarding the batteries, see "Installing or Replacing the Batteries".
- For handling precautions regarding the fuses, see "Installing or Replacing the Batteries".
- Never use the calibrator with the cover of the battery holder opened.

■ **Environmental Requirements**

Use the calibrator in locations that meet the following environmental requirements:

- Ambient temperature and humidity

  Ambient temperature range: 0 to 50℃

  Ambient humidity range: 20 to 80% RH. Use the calibrator under non-condensing condition.

⚠
- Flat and level locations

■ **Do not use the calibrator in locations that are**

- Exposed to direct sunlight or close to any heat source.
- Exposed to frequent mechanical vibration.
- Close to any noise source, such as high-voltage equipment or motive power sources.
- Close to any source of intensive electric or electromagnetic fields.
- Exposed to large amounts of greasy fumes, hot steam, dust or corrosive gases.
- Exposed to unstable or a risk of explosion due to the presence of flammable gases.

Note:

- Use the calibrator under the following environmental conditions if precise source or measurement is your requirement:

  Ambient temperature range: 23±5°C; Ambient humidity range: 20 to 80% RH(non-condensing)

  When using the calibrator within a temperature range of 0 to 18°C or 28 to 50°C, add a value based on the temperature coefficient shown in Chapter 18“Specifications” to the given accuracy rating.
- When using the calibrator at an ambient humidity of 30% or lower, prevent electrostatic charges from being produced, by using an antistatic mat or any other alternative means.
- Condensation may occur if you relocate the calibrator from places with low temperature and humidity to places with high temperature and humidity, or if the calibrator experiences any sudden temperature change. In that case, leave the calibrator under the given ambient temperature for at least one hour to ensure that the calibrator is free from condensation, before using the calibrator.

■ Installing or Replacing the Batteries

Warning

- To avoid electrical shock, always remove the source or measurement lead cables from the object under test, as well as from the calibrator itself.

Caution

- To avoid the risk of fluid leakage or battery explosion, install batteries with their positive and negative electrodes correctly positioned.
- Do not short-circuit the batteries.
- Do not disassemble or heat the batteries or throw them into fire.
- When replacing batteries, replace all of the four batteries at the same time with new ones from the same manufacturer.

- If the calibrator will not be used for a prolonged period, remove the batteries from the calibrator.

Step 1: Remove the lead cables and Adapter and turn off the calibrator before beginning installing batteries.

Step 2: Remove the battery holder cover by sliding it in one-quarter counterclockwise direction and turn off the calibrator.

Step 3: Install four alkaline batteries of same type in the battery holder with their positive and negative electrodes positioned correctly as indicated on the holder.

Step 4: After replacement, reattach the battery holder cover.

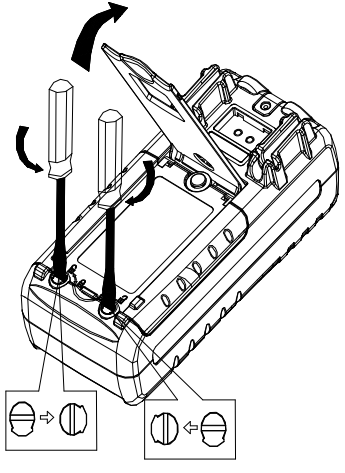


Figure 4-1

Indication of Battery Level

The battery replacement indicator shows the battery level in five types according to the measured voltage of the batteries.

Full battery:

The battery level is below 50% full: 

The battery level is below 25% full: 

Low battery:

Note that the battery replacement indicator is driven by directly measuring the battery voltage when the calibrator is in actual operation. Consequently, the indicator may read differently depending on the battery load condition (e.g., the load condition of the source output or on/ off state of the measurement function) if the batteries are too low.

If the calibrator will be used under a wide variety of conditions, it is advisable that the battery replacement indicator be verified under heavy loads (MEASURE mode is on and the SOURCE mode is set to the 20 mA/10 V output).

- **Replacing the Fuse**

⚠Warning

To avoid possible electric shock, remove the test leads from the calibrator before open the battery door.

The specification of fuse is 100mA/250V fast-belt fuse.

Replace the fuse as follows:

- Remove the test leads before replacing batteries or fuse, and turn off the calibrator;
- Remove the protector (the same as shown in “Replacing the Batteries”);
- Replace the blown fuses with same type;
- Reinstall and tighten the battery door (the same as shown in “Replacing the Batteries”).

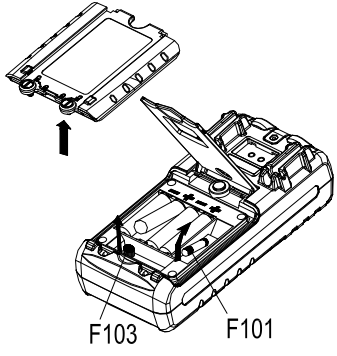


Figure 4-2

⚠ Warning

- Make sure the voltage of the AC power source matches the rated supply voltage of the Adapter, before connecting the Adapter to the AC power source.
- Do not use any Adapter other than the dedicated Adapter from the Company.

Step 1: Make sure the calibrator is turned off.

Step 2: Insert the plug of the optional Adapter into the Adapter connection jack.

Note:

Turn off the calibrator before connecting or disconnecting the Adapter from AC power, plugging in/out the Adapter connection jack.

- **Turning On/off**
  - Power On/off

    Pressing the Power key once and hold for 3 seconds to turn on the calibrator; repress the Power key

and hold for 3 seconds to turn off the calibrator.

⚠ **Note**

To make sure correct electronic operation, wait for 5 seconds before turn on the calibrator again.

- Automatic Power-off
  When the calibrator is running on batteries and no key is operated for approximately ten minutes, the calibrator turns off automatically. The automatic power-off time could be reset in the factory default parts.

7 Set the Menu

Press CONFIG key to enter into setting interface

There are two screens in setting menu, and ten items altogether

Specified operations for each setting are shown as follows:

- Press [▲]/[▼] key, select this option;
- Press ENTER key to enter into setting interface;
- Press [▲]/[▼] key to adjust to needed parameters;
- Press SAVE key to preserve setting;
- Press EXIT key to exit from setting.

Temperature compensation setting

The first option of the set menu is temperature compensation setting, which is used to make a reference for temperature compensation when the calibrator sources TC.

Auto-power off time

The second option in the calibrator setting menu is used to set auto-power off time, which is used to set the waiting time for no operation. The time can be set from 0 minutes to 30 minutes and 0 minutes denotes cancelling auto-power off function.

Beeper Enable

The third option in the calibrator setting menu is used to set beeper enable,

Backlight setting

The fourth option in the calibrator setting menu is used to set backlight of TFT screen, which is used to set high or low light of the backlight.

Systematic time setting

The fifth option in the calibrator setting menu is used to set systematic time, and the set time is displayed in the upper right part of the screen.

Systematic date setting

The sixth option in the calibrator setting menu is used to set systematic date.

Power frequency setting

The seventh option in the calibrator setting menu is used to set power frequency, which is used to set power frequency restrain.

HART write enable (only for HART type)

The eighth option in the calibrator setting menu is used to start or close the HART write; when in starting mode, LRV and URV operations are allowed while in closing mode, LRV and URV operations are prohibited.

HART main frame setting（only for HART type）

The ninth option in the calibrator setting menu is used to set HART main frame, which is used to select HART main frame; the HART main frame is divided into first HART main frame and second HART frame.

Restore to factory default

The tenth option in the calibrator setting menu is factory default setting, which is used to choose whether to restore to factory default or not.

8 Source Mode

After power on the calibrator, the measurement and source display in the same screen, the upper part of the TFT screen is for measurement and the lower part of the TFT screen is for source; press [SOURCE/MEASURE] key to shift between measurement and source.

From the calibrator, you can source a DC voltage, DC current, resistance, thermocouple, RTD, frequency, pulse number or switch signal.

⚠ Warning

To avoid electrical shock, do not apply more than the rated voltage, as marked on the calibrator, between terminals or between any terminal and earth ground. Always use the calibrator in locations with a voltage to ground below 30 V.

Caution

Do not apply any voltage to the output terminals for ranges other than 4-20mA simulating transmitter output; otherwise the internal circuitry may be damaged.

The calibrator has been calibrated without taking into account a voltage drop due to the resistance component of the lead cables for source. Care must be taken therefore when drawing a load current since the voltage drop due to the resistance component (approximately 0.1 Ω on a round-trip basis) of the lead cables serves as an error.

8.1 Connecting Cables to Terminals

For DC voltage, thermocouple, frequency, pulse or switch (Figure 5)

Step 1: Connect the black lead cable for source to the COM output terminal and the red lead cable to the "VhzTcmA-" output terminal.

Step 2: Connect the other ends of the cables to the input of equipment under test while making sure the polarities are correct.

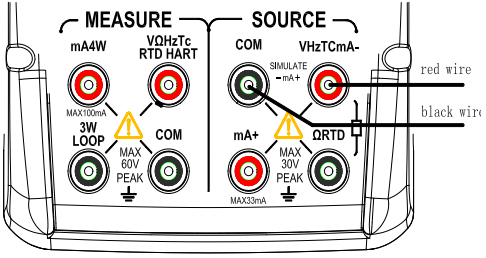


Figure 5 Sourcing DC voltage, TC, frequency, pulse and switch

For DC current (Figure 6)

Step 1: Connect the black lead cable for source to the “VhzTcmA-” output terminal and the red lead cable to the ‘’mA+’’ output terminal.

Step 2: Connect the other ends of the cables to the input of equipment under test while making sure the polarities are correct.

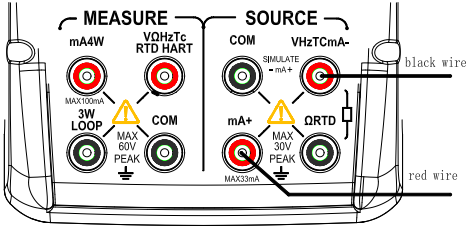


Figure 6 Sourcing DC Current

For resistance and RTD signal (Figure 7)

Step 1: Connect black lead cables for source to the ‘’Ω, RTD’’ terminal and the red lead cable to the “VhzTcmA-” terminal.

Step 2: Connect the other ends of the cables to the input of equipment under test while making sure the polarities are correct.

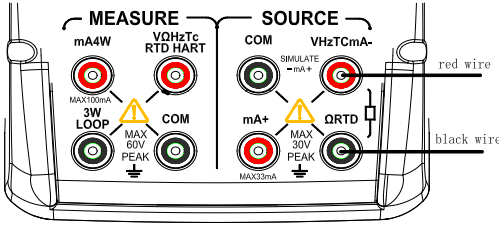


Figure 7 Sourcing Resistances and RTD

8.2 Sourcing DC Voltage

Step 1: Using the Function selector switch（**F1**）to select DC voltage source function, select the desired range from 100mV, 1V, and 10V by pressing the（**F2**）key.

Step 2: Set the output value digit by digit using Source keys.

The〔◀〕/〔▶〕key is to change the setting position, Each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the

value won't change if it is increased or decreased to the Maxim or Minimum value. Pressing the〔**ZERO**〕key initializes the output set point to the default value (0).

Step 3: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ''OFF'' to ''ON ''. The calibrator sources the preset DC voltage between the output terminals.

Step 4: To turn off the output, press the〔**ON**〕key once again. The'' OFF '' appears on the LCD and no signals sourced between the terminals.

8.3 Sourcing DC Current

Step 1: Using the Function selector switch〔**F1**〕to select DC current source function.

Step 2: Using〔F2〕key to select DC current sourcing span.

Current sourcing span: 0-20mA and 4-20mA.

Step 3: Set the output value digit by digit using Source keys.

The〔◀〕/〔▶〕key is to change the setting position, Each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value. Pressing the〔**ZERO**〕key initializes the output set point to the default value (0).

Step 4: Pressing the〔**ON**〕key causes the indicator on the SOURCE LCD to change from ''OFF'' to ''ON '' . The calibrator sources the preset DC current between the output terminals.

Step 5: To turn off the output, press the〔**ON**〕key once again. The'' OFF '' appears on the LCD and no signals sourced between the terminals.

8.3.1 25% step current sourcing

Step 1: In DC current function, press the〔**F3**〕key to display “25%” on the lower part of the screen. The default source value will be showed simultaneously.

Step 2: press the 〔▲〕key, the current sources from 0% and steps in 25% and increase to 100%.
Among which: 100% corresponds to 20mA; 0% corresponds to 0 mA or 4mA ; which are depends on the setting of current span; relevantly, 25% step corresponds to 5mA or 4mA.

Step 3: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ‘’OFF‘’ to ‘’ON ‘’. The calibrator sources the preset current signal between the output terminals.

Step 4: To turn off the output, press the〔**ON**〕key once again. The’’ OFF ‘’appears on the LCD and no signals sourced between the terminals.

8.3.2 100% step current sourcing

Step 1: In DC current function, press the〔**F3**〕key to display “100%” on the lower part of the screen. The default source value will be showed simultaneously.

Step 2: press the 〔▲〕key, the current sources from 0% and steps in 100% and increase to 100%.
Among which: 100% corresponds to 20mA; 0% corresponds to 0 mA or 4mA ; which are depends on the setting of current span.

Step 3: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ‘’OFF‘’ to ‘’ON ‘’. The calibrator sources the preset current signal between the output terminals.

Step 4: To turn off the output, press the〔**ON**〕key once again. The’’ OFF ‘’appears on the LCD and no signals sourced between the terminals.

8.3.3 Auto-ramping Sourcing

Step 1: In DC current function, press〔**F3**〕key to display signal “” on the left part of the screen, and the default source value will be showed simultaneously.

Step 2: Pressing the〔▲〕/〔▼〕key to adjust the ramping time , and the range is within 5-60 seconds.
Step 3: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ‘’OFF‘’ to ‘’ON ‘’.
Step 3: Pressing the〔**START**〕key starts the auto-ramping mode. The “RUN” mark displays on the left part of the screen.
Step 4: Pressing the〔**START**〕key once more stops the auto-ramping mode. “STOP’ mark displays on the left part of the screen. The terminals source the value displayed on the screen.
Step 5: Repressing the〔**ON**〕key stops sourcing, ‘’OFF’’ mark displayed on the screen. No signals sourced between the terminals.

8.3.4 Auto-stepping Sourcing

Step 1: In DC current function, press 〔**F3**〕key to display signal “⌐¬” on the lower part of the screen, and the default source value will be showed simultaneously.
Step 2: Pressing the〔▲〕/〔▼〕key to adjust the stepping time , and the range is within 5-60 seconds.
Step 3: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ‘’OFF‘’ to ‘’ON ‘’.
Step 3: Pressing the〔**START**〕key starts the auto-stepping mode. “RUN “mark displays on the left part of the screen.
Step 4: Pressing the〔**START**〕key once more stops the auto-stepping mode. “STOP“mark disappears. The terminals source the value displayed on the screen.
Step 5: Repressing the〔**ON**〕key stops sourcing, ‘’OFF’’ mark displayed on the screen. No signals sourced between the terminals.

Tips:

- Press the 〔**START**〕key again to continue the auto-stepping and auto-ramping mode after stopping them, and “RUN” mark displays on the lower part of the screen.
- Using the〔**START**〕key to start mA auto-stepping and auto-sweeping mode is only available when the

source function is in ON state.

8.3.5 0-20 mA simulate transmitter source

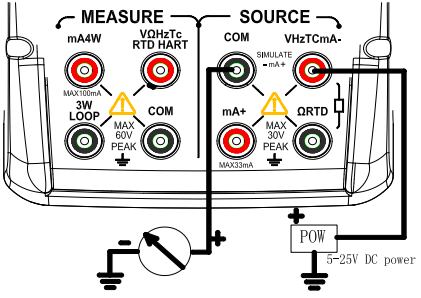


Figure 8. 0--20 mA simulate transmitter source

Operation is the same with the steps as shown in sourcing DC current.

8.4 Sourcing Resistance

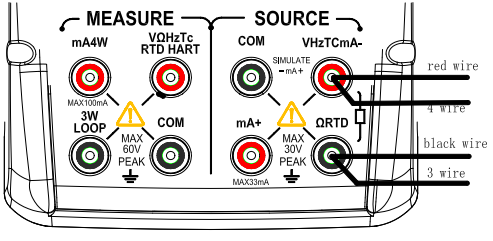


Figure 9. Connection method based on three-wire and four-wire

- Firstly, the calibrator sources a resistance signal by receiving the resistance-measuring current I supplied from the device being calibrated (such as a resistance calibrator) and then delivering the voltage V proportional to the preset resistance R between the output terminals, and thus producing the equivalent resistance R =V/I. Consequently, the calibrator sources the signal correctly only for such devices that employ this method of measurement.
- The allowable range of the resistance measuring current I that the calibrator receives from a resistance measuring device under calibration is rated as 0.1 mA to 3 mA. To ensure accuracy, the resistance measuring current I from the device under calibration shall be strictly confined within the range.
- Any resistance signal being sourced does not include the resistance component of the lead cables for source. The whole resistance, when measured at the ends of the lead cables for source, is given by adding the resistance of the lead cables (approximately 0.1Ω on a round-trip basis) to the sourced resistance signal. For source of precise resistance signals, use three-wire or four-wire connection.
- If capacitance between the terminals of a device under calibration is greater than 0.1μF, the calibrator may fail to source correct resistance signals.

Step 1: Using the function selector switch （**F1**）, select Ohm function. Using the （**F2**）key, select the desired range. Using the （**F3**）key select the proper simulate current range.

There are two ranges as 400Ω and 4KΩ for resistance source, the simulate currents of 400Ω range corresponds to 0.1mA and 1mA ranges; 4KΩ range corresponds to 0.1mA range.

The valid range of 0.1mA simulate current range is: 0.03~0.3mA; when the simulate current of the external input is higher than 0.3mA, li_LO symbols displays in the upper right part of the calibrator; when the simulate current of the external input is between 0.03mA and 0.3mA , li_ok symbols displays in the upper right part of the calibrator; The valid range of 1mA simulate current range is: 0.3~3mA; when the simulate current of the external input is higher than 0.3mA, li_Hi symbols displays in the upper right part of the

calibrator; when the simulate current of the external input is between 0.3mA and 3mA , li_ok symbols displays in the upper right part of the calibrator.

Step 2 : Set the output value digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, Each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value. Pressing the〔**ZERO**〕key initializes the output set point to the default value (0).

Step 3: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ''OFF'' to ''ON '', The terminals source the value displayed on the screen.

Step 4: Repressing the〔**ON**〕key stops sourcing, ''OFF'' mark displayed on the screen. No signals sourced between the terminals.

- Connection method based on three-wire and four-wire as shown in Figure 9

8.5 Simulate Sourcing TC

The calibrator is designed with an internal temperature sensor. To calibrate a device with built-in reference junction temperature compensation by sourcing a thermoelectromotive force with the calibrator without using non-external 0℃ reference junction compensation means, use the RJ sensor function. Select simulate TC source function, in which RJ senor goes on work automatically. The "RJ-ON" mark displays on the middle part of the screen.

Step 1: Using the function selector switch〔**F1**〕, select simulate TC source function. Using the〔**F2**〕key, select the desired range from K，E，J，T，N，B，L，U，R，S. The selected TC mark shall be shown in the right part of the LCD , the default range source value and unit shall be shown in the middle part.

Step 2 : Press the〔**F3**〕key to select temperature compensation type.

Temperature compensation type: non- compensation (RJ-OFF displays in the lower left part of the screen).

Take the temperature input by the User as a reference (the temperature set by the User in the lower left part of the screen).

See chapter seven for setting the referenced temperature by the User.

Take the measured temperature of the calibrator's temperature module (RJ-OFF displays in the lower left part of the screen).

Step 3 : Press the〔**F4**〕key to select TC unit.

Step 4 : Set the output value digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, Each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value. Pressing the〔**ZERO**〕key initializes the output set point to the default value (the default value of a typical B type is 600℃).

Step 5: Pressing the〔**ON**〕key causes the indicator on the LCD to change from "OFF" to "ON" . A thermoelectromotive force based on the temperature detected by the RJ sensor develops between the output terminals.

Step 6: To turn off the output, press the〔**ON**〕key once again. The "OFF" appears on the LCD and no signals sourced between the terminals.

Tips:

- The TC source function is unavailable if the TC /RTD measurement function is on, which is only usable

when the calibrator is in non-TC or RTD measurement function.

8.5.1 Temperature Monitor Function

The calibrator offers a temperature monitor function, which is convenient for the user to observe the voltage value sourced between the output terminals in TC source function.

In TC source function, LCD shows the voltage value sourced between the output terminals and the sourced voltage in the same screen.

8.6 Sourcing RTD

- The principle of RTD sourcing is the same as resistance sourcing.
- The allowable range of the resistance measuring current I in terms of type Pt100、Cu50、Cu10 that the calibrator receives from a resistance measuring device under calibration is rated as 0.1 to 3 mA . The allowable range of the resistance measuring current I in terms of Pt200、Pt500、Pt1000 that the calibrator receives from a resistance measuring device under calibration is rated as 0.05 to 0.3 mA . To ensure accuracy, the resistance measuring current I from the device under calibration shall be strictly confined within the range. For further details, see Chapter 18, “Specification”.
- Any resistance signal being sourced does not include the resistance component of the lead cables for source. The whole resistance, when measured at the ends of the lead cables for source, is given by adding the resistance of the lead cables (approximately 0.1Ω on a round-trip basis) to the sourced resistance signal. For source of precise resistance signals, use three-wire or four-wire connection.

Step 1: Using the function selector switch（**F1**）, select RTD function. Using the（**F2**）key to select a desired RTD range from PT100, PT200, PT500, PT1000, Cu10, Cu50. The selected function and the default range source value and unit shall be shown in the lower part of the LCD.

Step 2 : Press the（**F3**）key to select simulate current .

Simulate current：0.1mA（Pt100，Pt200，Pt500，Pt1000，Cu10，Cu50）

1mA（Pt100， Cu10，Cu50）

The valid range of 0.1mA simulate current range is: 0.03~0.3mA; when the simulate current of the external input is higher than 0.3mA, li_LO symbols displays in the upper right part of the calibrator; when the simulate current of the external input is between 0.03mA and 0.3mA , li_ok symbols displays in the upper right part of the calibrator; The valid range of 1mA simulate current range is: 0.3~3mA; when the simulate current of the external input is higher than 0.3mA, li_Hi symbols displays in the upper right part of the calibrator; when the simulate current of the external input is between 0.3mA and 3mA , li_ok symbols displays in the upper right part of the calibrator.

Step 3 : Press the〔**F4**〕key to select RTD unit.

Step 4 : Set the output value digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value. Pressing the〔**ZERO**〕key initializes the output set point to the default value (0).

Step 5: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ''OFF'' to ''ON '' . The calibrator sources the preset resistance value between the output terminals.

Step 6: To turn off the output, press the〔**ON**〕key once again. The ''OFF'' appears on the LCD and no signals sourced between the terminals.

- Connection method based on three-wire and four-wire as shown in Figure 9

Tips:

The RTD source function is unavailable if the TC /RTD measurement function is on, which is only usable when

the calibrator is in non-TC or RTD measurement function.

8.6.1 Temperature Monitor Function

The calibrator offers a temperature monitor function, which is convenient for the user to observe the resistance value sourced between the output terminals.

In TC source function, LCD shows the voltage value sourced between the output terminals and the sourced voltage in the same screen.

8.7 Sourcing Frequency

The calibrator can source a constant pulse signal responding to the preset frequency and amplitude.

Step 1: Press the〔**F1**〕key to select frequency sourcing function.

Step 2: Press the〔**F2**〕key to select proper frequency range among 100HZ，1KHz，10KHz，50KHz，CPM .

Step 3 : Set the output frequency value digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value.

Step 4 : Press the〔**F3**〕key to shift to the amplitude set; and set the frequency amplitude digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit

in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value.

Step 7: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ''OFF'' to ''ON'' . The calibrator sources constant pulse signals according to the preset frequency , amplitude value between the output terminals.

Step 8: To turn off the output, press the〔**ON**〕key once again. The ''OFF'' appears on the LCD and no signals sourced between the terminals.

Tips:

- The frequency source function is unavailable if the frequency and voltage measurement function is on, which is only usable when the calibrator is in non-frequency or voltage measurement function.
- The frequency value and range could be changed when the frequency source function is both in ''ON'' or ''OFF'' state.

8.8 Sourcing Number of Pulses

The calibrator can source a preset number of pulse signal responding to the preset frequency and amplitude.

Step 1: Press the〔**F1**〕key to select number of pulse.

Step 2: Press the〔**F2**〕key to select proper frequency range among 100HZ，1KHz，10KHz.

Step 3 : Set the output number of pulses digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum

value.

Step 4 : Press the〔F3〕key to shift to the amplitude set; and set the pulse amplitude digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value.

Step 5 : Press the〔F3〕key to shift to the number of pulse mode ; and set the number of pulse digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won't change if it is increased or decreased to the Maxim or Minimum value.

Step 6: Pressing the〔**ON**〕key causes the indicator on the LCD to change from ''OFF'' to ''ON '' and sources low electrical level.

Step 7: Pressing the〔**START**〕key starts the auto-stepping mode. The "RUN " mark displays on the left part of the screen. The calibrator sources the numbers of the pulse signals according to the preset frequency and amplitude between the output terminals.

Step 8: Pressing the〔**START**〕key once more stops the auto-stepping mode. The "STOP" mark appears.

Step 9: Repressing the〔**ON**〕key stops sourcing, ‘’OFF’’ mark displayed on the screen. No signals sourced between the terminals.

Tips:

- The contact output source function is unavailable if the frequency measurement function is on, which is only usable when the calibrator is in non-frequency measurement function.
- When the “RUN” symbol vanishes from the LCD, you can change the frequency and amplitude both when the source function is in ‘’ON‘’ or ‘’OFF‘’.
- In the pulse sourcing process, pressing the〔**START**〕key causes to stop the output, and the “RUN” mark vanishes from the LCD. Press the〔**START**〕key once more to restart the sourcing function.
- Restarting the pulse output requires the source function is in ‘’ON‘’state.

8.9 Sourcing Switch

You can turn on or off the output terminals by using the contact output function. An FET is used as the contact-switching device.

Step 1: Using the function selector switch〔**F1**〕, select the output source function.

Step 2: Using the〔**F2**〕key, select the desired frequency from 100Hz, 1KHz, 10 KHz, and 50KHz.

Step 3 : set the frequency digit by digit using each pair of〔▲〕/〔▼〕keys.

The〔◀〕/〔▶〕key is to change the setting position, each press of the〔◀〕/〔▶〕key shifts the setting position one digit; Each press of the 〔▲〕/〔▼〕key increases or decreases the digit. Increasing the digit from 9 or decreasing it from 0 causes the digit to overflow or underflow, allowing you to set the output value without interruption. Holding down the 〔▲〕/〔▼〕key continuously changes the digit in question. And the value won’t change if it is increased or decreased to the Maxim or Minimum value.

Step 4: Pressing the（**ON**）key causes the indicator on the LCD to change from ‘’OFF‘’ to ‘’ON ‘’ and The calibrator sources the switch signals according to the preset frequency between the output terminals.

Step 5: Repressing the（**ON**）key stops sourcing, ‘’OFF’’ mark displayed on the screen. No signals sourced between the terminals.

Tips:

- The contact output source function is unavailable if the frequency and voltage measurement function is on, which is only usable when the calibrator is in non-frequency or non-voltage measurement function.
- You can change the frequency both when the source function is in ‘’ON ‘’ or ‘’OFF‘’.
- The contact output is polarity. Generally, connect the positive polarity with the H jack of the calibrator and the negative polarity with the L jack.
- Note the maxim allowable current of the contact output is 50mA.

8.10 Sourcing Pressure

The calibrator source pressure by measuring the pressure from a pump or any other device, and shows the value in the lower part of the LCD. Figure 10 demonstrates how to connect the pump with the pressure module so as to make it into a calibrated source. Ranges and types of the pressure module have various options. See “Accessories” for more information. Due to the difference in medium and accuracy of different pressure modules, user needs to read the Manual before operating it. Follow the steps listed below to source pressure with a proper pressure module (assisted by the tested technical pressure).

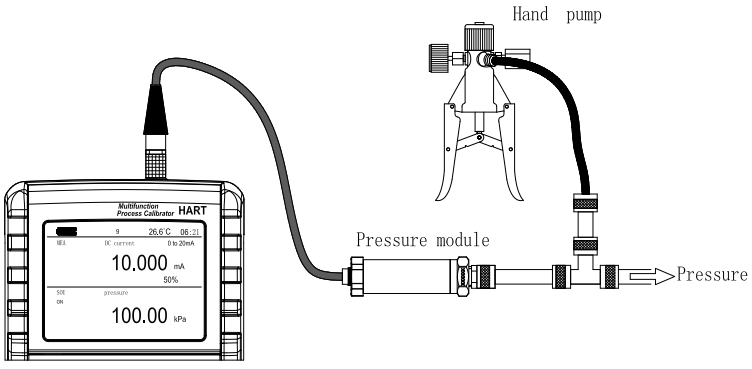


Figure 10 Sourcing Pressure

⚠Warning

To avoid a sudden release of the pressure system, do shut off the valve to release the pressure gradually before connecting the pressure module with the pipe.

Caution

To avoid any mechanical damage to the pressure module, do not apply any force higher than 13.5 Nm(10 ft.1bs) to the pressure pipe mouths(or the module and the pipe mouth).Do apply the specified force when connecting the pipe or the Adapter.To avoid any damage to the pressure module due to over pressed, do not apply any pressure higher than the maximum value marked or specified.To avoid any corrosive

damage, use the pressure module only with specified materials. Refer to the printing on the pressure module or the pressure module instruction sheet for the acceptable material compatibility.

Step 1: Connect the pressure module and calibrator. The screw of the pressure module pipe is compatible to the 1/4 inch NPT connector. If you have other requirement, contact the vendor.

Step 2: Using the function selector switch（**F1**）, select the pressure source function.

Step 3: Pressing the（**ON**） key turns on the function, the calibrator connects and senses the type of the pressure module and sets the range automatically. If it fails to connect, the LCD shows “n/a”in the lower part.

Step 4: Zero off the reading following the pressure module manual. When the reading overtops the 95 percentage of maxim value of the range, the LCD shows “ERR” in the lower part. Pressing the（**ZERO**）key initializes the calibrator to 0,and “△”symbol shows on the left lower part of the LCD.

Step 5: Apply pressure on the pipe with the pressure source until the desired pressure value displayed on the LCD.

Tips:

- For absolute pressure module, the calibrator stores the positive value and use the value automatically, thus the User won’t make zero calibration for each use of the module.
- In pressure source function, the User can not set the pressure value in the screen. When the soured pressure unit is MPa, press（**F4**）to shift between MPa and KPa.

For absolute pressure module, the calibrator saves the zero-off value and reuses the value automatically. Therefore, user does not need to zero off the calibration value for each use.

8.10.1 Auto-hold of pressure source **HOLD**

In pressure source function, when the switch measurement mode is selected, the calibrator preserves pressure value and the switch state on the LCD automatically. Pressing the〔**HOLD**〕key releases the HOLD mode automatically.

8.11 Zero-off function

- In any range of DC voltage, DC current, ohm, TC and RTD functions, pressing the〔**ZERO**〕key selects clearing off function, which initializes the preset source value for the convenience of user to reset source value.
- In pressure source function, pressing the〔**ZERO**〕key clears off the value. For absolute pressure module, the calibrator saves the zero-off value and reuses the value automatically.
- In frequency, pulse, contact output functions, the〔**ZERO**〕key is unavailable.

9 Measurement

After power on the calibrator, the measurement and source display in the same screen, the upper part of the TFT screen is for measurement and the lower part of the TFT screen is for source; press [SOURCE/MEASURE] key to shift between measurement and source.

From the calibrator, you can measure a DC voltage, DC current, resistance, thermocouple, RTD, frequency, continuity, switch and pressure.

⚠Warning

- In an application where the calibrator is used together with the supplied lead cables for measurement, the allowable voltage to ground of the input terminals is 60 V peak maximum. To avoid electrical shock, do NOT use the calibrator at any voltage exceeding the maximum voltage to ground.
- The allowable voltage to ground when the supplied thermocouple convertor is attached to the input terminals is 60V peak maximum. To avoid electrical shock, do not use the terminal adapter for measuring

any circuit voltage exceeding the maximum voltage to ground.

Tips:

- With the（**HOLD**）key, you can hold the measured value.
- The measurement value is updated differently responding to different measurement function. LCD shows “ - - - - - “on the upper part when shifting the range. If the input is over ranged, the measured value on the LCD reads as “oL”.

9.1 Connecting Cables to Terminals

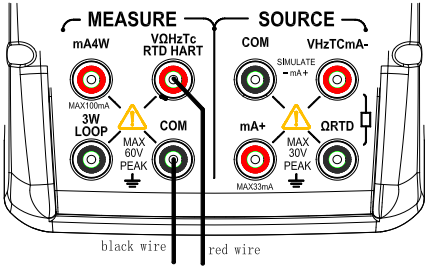


Figure 11. Measuring DC voltage, Ohms, frequency , continuity and switch

Step 1: Connect the black lead cable for measurement to the “COM” input terminal and the red lead cable to the ”VHzTc ΩRTD” input terminal.

Step 2: Connect the other end of the cable to the measuring terminals of equipment under test while making sure the polarities are correct.

For DC current signal (Figure 12)

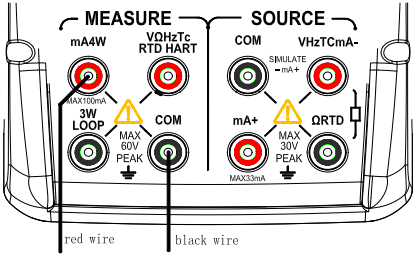


Figure 12 Measuring DC current

Step 1: Connect the black lead cable for measurement to the “COM” input terminal and the red lead cable to the ”mA” input terminal.

Step 2: Connect the other end of the cable to the measuring terminals of equipment under test while making sure the polarities are correct.

For thermocouple signal (Figure 13)

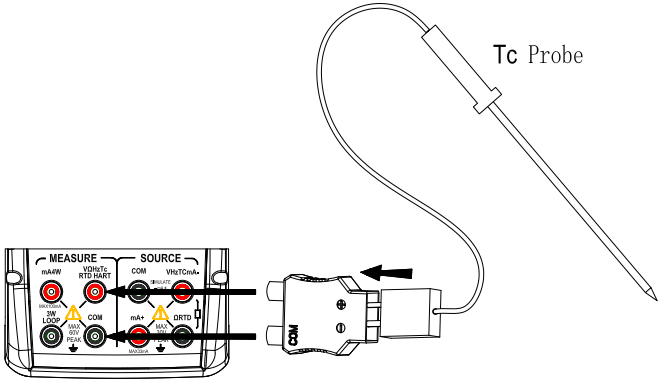


Figure 13 Measuring TC

Step 1: Connect the thermocouple convertor to the input terminals. This will help you connect the cables easily.

Step 2: Connect between TC terminals. Connect the positive output lead wire of the thermocouple to the '+' terminal of the thermocouple convertor and the negative output lead wire to the '-' terminal.

Three wire connection method for RTD signal (Figure 14)

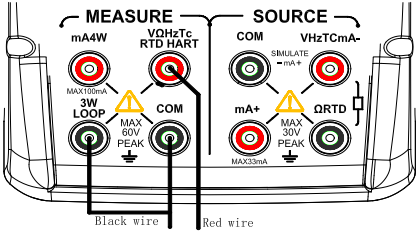


Figure 14 RTD signal with 3w method

Step 1: Connect one black lead cable for measurement to the “COM” input terminal and another black lead to the “3W” terminal. Connect the red lead cable to the ” VHzTcΩRTD” input terminal.

Step 2: Connect the three clips of the cables to the measuring terminals of equipment under test while making sure the polarities are correct.

⚠Warning

- Before connecting the calibrator to the device under test, cut off the power to the device.
- Do not apply any voltage or current exceeding the allowable voltage (55 V) or current (55 mA). Otherwise, there will be a danger of not only damage to the calibrator but also personal injury due to electrical shock.
- Mistaking the H voltage input terminal for the mA current input terminal, and vice versa, when wiring, is extremely dangerous. NEVER make this mistake.
- The current input terminals are equipped with a built-in current input protection fuse. Over-current input to

the terminals will cause the fuse to blow. If the fuse is blown, replace it with one with the specified ratings. For details on fuse replacement, see" replacing the battery and fuse".

⚠Warning

If you make a mistake in wiring or in the operating procedure in this measurement task, there will be a danger of not only damage to the calibrator but also personal injury due to electrical shock. Exercise the utmost care when carrying out the measurement task.

9.2 Measuring DC Voltage

Step 1: Make sure the lead cables for measurement are not connected to the measuring calibrator under test.

Step 2: Using the function selector switch（**F1**）, select DC Voltage measurement function.

Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring calibrator under test.

Step 4: Using the（**F2** ）key, select a desired range from 50mV, 500mV, 5V, 30V.

9.3 Measuring DC Current

Step 1: Make sure the lead cables for measurement are not connected to the measuring calibrator under test.

Step 2: Using the function selector switch（**F1**）, select DC Current measurement function.

Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring calibrator under test.

9.3.1 Current Span

In current measurement function, press（**F2**）to select current span, which is divided into 0-20mA and 4-20mA, the measured current percentage is different for different span.

9.3.2 Using As 24-V Loop Power Supply

This function helps to turn on a 24V loop power supply connected in line with the measured DC current circuit, in which you can use the calibrator as a loop power supply to calibrate a 2-wire converter by undertaking the following steps:

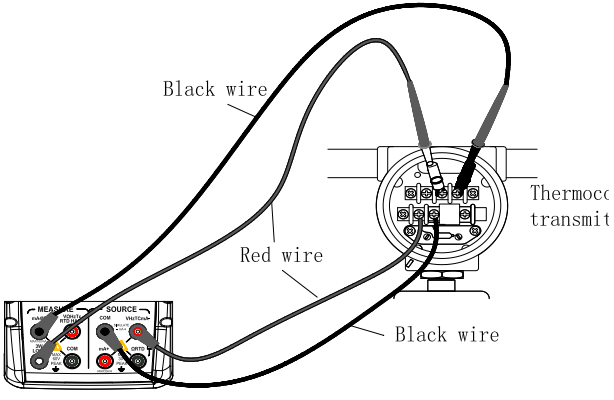


Figure 15 Using 24v loop power circuit supply

Step 1: When the calibrator is in current measurement function, pressing the（**F3**）key causes the LCD shows LOOP symbol. And the built-in 24V loop power of the calibrator will be turned on.

Step 2: Connect the calibrator with the loop current terminal of the converter as shown in Figure 15**.**

Note:

Since the function discussed above requires a significant amount of DC current (25 mA), operation on batteries

will reduce the battery life considerably.

9.3.3 250 Resistance

In current measurement function, press（**F4**）to start or close 250 resistance; this function is only available for 24V loop circuit, the resistance will be connected into the measured current loop when start the 250 resistance.

9.4 Measuring Resistance

Step 1: Make sure the lead cables for measurement are not connected to the measuring calibrator under test.
Step 2: Using the function selector switch（**F1**）, select resistance measurement function.
Step 3: Using the measurement（**F2**）key, select the desired range from 500Ω,5KΩ.
Step 4: Using the measurement（**F3**）key, select the desired measured method from 2W，3W，4W .
Step 5: Connect the lead cables for measurement to the measuring terminals of the measuring calibrator under test as shown in Figure 11.

9.5 Measuring Temperature with Thermocouple (TC)

Note:
Any voltage higher than 60V won't work on the measured circuit if applying the thermocouple convertor to the given input terminal.
Step 1: Make sure the lead cables for measurement are not connected to the measuring calibrator under test.
Step 2: Using the function selector switch （**F1**）, select TC measurement function. Using the measurement

（**F2**）key, select the desired range K，E，J，T，B，N，L，U，R，S.

Step 3: Connect the thermocouple convertor to the jack under test.

Temperature compensation type: non- compensation (RJ-OFF displays in the lower left part of the screen).

Take the temperature input by the User as a reference (the temperature set by the User in the lower left part of the screen).

See chapter four for setting the referenced temperature by the User.

Take the measured temperature of the calibrator's temperature module (RJ-OFF displays in the lower left part of the screen).

Step 4: Using the function selector switch（**F4**）, select TC unit.

Step 5: Connect the lead cables for measurement to the measuring terminals of the measuring calibrator under test as shown in Figure 13. The selected TC mark shall be shown in the right part of the LCD, the default range source value and unit shall be shown in the middle part.

Tips:

- The TC measurement function is unavailable if the TC/RTD source function is on, which is only usable when the calibrator is in non-TC/RTD source function.
- If there has been a sudden change in the operating ambient temperature of the calibrator, wait until the built-in reference junction compensation stabilizes. Avoid using the calibrator in locations exposed to wind from such apparatus as an airconditioner.

9.5.1 Temperature Monitor Function

The calibrator offers a temperature monitor function, which is convenient for the user to observe the voltage value measured from the input terminals.

In TC measurement function, the measured temperature value and voltage displays in the screen

simultaneously.

9.6 Measuring Temperature with RTD

Step 1: Make sure the lead cables for measurement are not connected to the measuring calibrator under test.

Step 2: Using the function selector switch（**F1**）, select RTD measurement function.

Step 3: Using the measurement （**F2**）key, select the desired type among Pt100，Pt200，Pt500，Pt1000，Cu10，C50.

Step 4: Using the measurement （**F3**）key, select the desired measurement method among 2W，3W，4W.

Step 4: Using the measurement （**F4**）key, select the RTD temperature unit.

Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring calibrator under test as shown in Figure 14.

Tips:

- The RTD measurement function is unavailable if the TC /RTD source function is on, which is only usable when the calibrator is in non-TC or RTD source function.

9.6.1 Temperature Monitor Function

The calibrator offers a temperature monitor function, which is convenient for the user to observe the resistance value measured from the input terminals.

In RTD measurement function, the display part shows the resistance value measured from the input terminals and the measured temperature value on the right part.

9.7 Measuring Frequency

Step 1: Make sure the lead cables for measurement are not connected to the measuring calibrator under test.

Step 2: Using the function selector switch（**F1**）, select frequency measurement function.
Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring calibrator under test as shown in Figure 11.
Step 4: Using the（**F2**）key to select the mode of frequency display.
Tips:
The frequency measurement function is unavailable if the frequency, pulse, contact or pressure source function is on, which is only usable when the calibrator is in non-frequency, pulse, contact or pressure source function.

9.8 Measuring Pulse

Step 1: Make sure the lead cables for measurement are not connected to the measuring calibrator under test.
Step 2: Using the function selector switch（**F1**）, select pulse measurement function.
Step 3: Connect the lead cables for measurement to the measuring terminals of the measuring calibrator under test as shown in Figure 11.
Step 4: Using the（**F3**）key to select the type of trigger cover.
Step 4: Using the（**START**）key to start measurement; The screen displays “RUN” in the left part.
Tips:
Repress the （**START**）key to stop measurement, and the screen displays ‘STOP’in the left part.
The pulse measurement function is unavailable if the frequency, pulse, contact or pressure source function is on, which is only usable when the calibrator is in non-frequency, pulse, contact or pressure source function.

9.9 Measuring switch

The calibrator could measure the connection or disconnection signal of the switch.

Using the function selector switch （**F1**）, select switch measurement function. LCD displays switch symbol "⏤◢⏤"on the upper part. The beeper sounds for one second if the state of the switch under measurement is changing.

9.9.1 Switch lock function

In switch measurement function, press the （**F3**）key to launch switch lock. This function is used to measure the change interval of switch.

For example: as illustrated in the figure, this calibrator source changeable signals from the terminals. When reaching parameters of the closed external switch, the external switch close and the measured terminal of the calibrator captures the changes of the external switch, and the internal calibrator reads and record the changeable signals(C in the screen means this value); this calibrator source changeable signals from the terminals. When reaching parameters of the open external switch, the external switch open and the measured terminal of the calibrator captures the changes of the external switch, and the internal calibrator reads and record the changeable signals(O in the screen means this value) ; and this is a cycle period of the switch, and the calibrator obtains the hysteretic band of the external switch (H in the screen means this value).

Press （**HOLD**）key to clear measurement result.

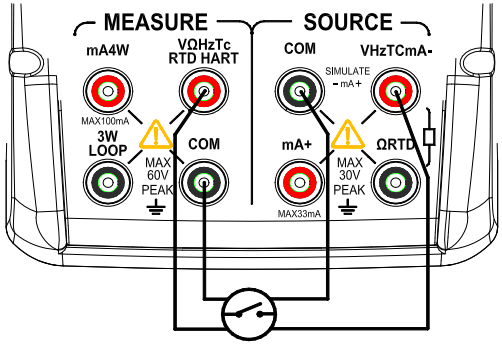


Figure 16. Connection of Switch lock

9.10 Pressure Measurement

Ranges and types of the pressure module have various options. See Chapter 15 for more information. Due to the difference in medium and accuracy of different pressure modules, user needs to read the Manual before operating it. Real pressure module can work as a surface pressure module by opening the L input terminal exhausting the air. Follow the steps listed below to connect the tested technical pressure pipe with a proper pressure module.

⚠Warning

To avoid a sudden release of the pressure system, do shut off the valve to release the pressure gradually before connecting the pressure module with the pipe.

Caution

To avoid any mechanical damage to the pressure module, do not apply any force higher than 13.5 Nm (10 ft.1bs) to the pressure pipe mouths (or the module and the pipe mouth).Do apply the specified force when

connecting the pipe or the Adapter. To avoid any damage to the pressure module due to over pressed, do not apply any pressure higher than the maximum value marked or specified. To avoid any corrosive damage, use the pressure module only with specified materials. Refer to the printing on the pressure module or the pressure module instruction sheet for the acceptable material compatibility.

Step 1: Connect the pressure module and calibrator as shown in Figure 10. The screw of the pressure module pipe is compatible to the 1/4 inch NPT connector. If you have other requirement, contact the vendor.

Step 2: Using the function selector switch（**F1**）, select the pressure measurement function.

Step 2: Using the function selector switch（**F1**）, select pulse measurement function.

Step 3: Using the（**ON**）key to start measurement; The calibrator connects and senses the type of the pressure module and sets the range automatically. If it fails to connect, the LCD shows “n/a”in the upper part.

Step 4: Zero off the reading following the pressure module manual. When the reading overtops the 95 percentage of maxim value of the range, the LCD shows “ERR” in the lower part. Pressing the（**ZERO**）key initializes the calibrator to 0,and “**ZERO**”symbol shows on the left upper part of the LCD.

Tips:

- For absolute pressure module, the calibrator saves the zero-off value and reuses the value automatically. Therefore, user does not need to zero off the calibration value for each use.
- Press（**F4**）to switch range between MPa and KPa, when measured value in MPa range.

9.11 Pressure Leakage Measurement

Pressure leakage measurement is used to measure the leakage volume and speed ratio within stipulated time (1-99999S band)

Before measuring the pressure leakage, the pressure module matched with the meter should be connected

well;

Step 1: Using the function selector switch（**F1**）, select pressure leakage input function.

Step 2: Using the（**ON**）key to start measurement; The calibrator connects and senses the type of the pressure module and sets the range automatically. If it fails to connect, the LCD shows “n/a”in the upper part.

Step 3: Press（**F4**）to switch to proper range(Kpa, Mpa, bar, psi, Kg/cm2).

Step 3: Zero off the reading following the pressure module manual. When the reading overtops the 95 percentage of maxim value of the range, the LCD shows “ERR” in the lower part. Pressing the（**ZERO**）key initializes the calibrator to 0, and “**ZERO**” symbol shows on the left upper part of the LCD.

Step 4: press（**F3**）key to shift to time set interface; ST indicates deffered time, which refers to the waiting time before measurement; TT indicates measured time, which refers to the desired measured time; the time of ST and TT can be set by the source adjustment key; the shift of ST and TT can be realized by（**F2**）.

Step 5: press（**F3**）to return back to measurement interface when the time is set.

Step 6: press（**START**）to measure.

9.12 Measurement-filtering function

In DCV, DCmA ,OHM, TC, RTD functions, press （**2ndF**）**+**（**EXIT**）key to make Max/Min dealt with the sampled value . when detecting the new Max/Min value, the former one will be refreshed; Maximum value (MAX) and minimum value(MIN) display in the lower part of the screen; press the （**EXIT**）key to exit from this function.

Using the （**2ndF**）**+**（**ENTER**）key , to select measurement-filtering function stabilizes the measured value displayed on LCD.

In DCV, DCmA, OHM, TC, RTD function, pressing the（**2ndF**）**+**（**EXIT**）key causes calculation of the

average of the samples. LCD shows the "AVG" symbol. Repressing the（**AVG**）key cancels the calibration and the "AVG" symbol disappears.

9.13 Measured Value holding function

Apart from the continuity and switch measurement functions, the reading-hold function can also be used to preserve the current measured value on the upper part of LCD, which consequently doesn't refresh the measured value.

Pressing the（**HOLD**）key selects reading-hold mode, and LCD displays "HOLD" symbol. To cancel the selection, press the（**HOLD**）key again and the "HOLD" symbol disappears.

10 HART device communication function (this function is only applicable to HART type, and the basic type does not have this function)

When using HART communication, the auto power off function will be canceled. When the HART communication is exited, the auto power off function will be restored

The transmitter device supports the loop current trimming function, but the actuator device does not support.

If the HART write setting menu is set to off, the following functions are disabled.

Write LRV

Write URV

Device diagnosis

4mA trimming

20A trimming

Fixed output

PV zeroing

If you want to use the above functions, you shall enable the HART write setting before entering the HART

communication.

10.1 HART connection

10.1.1 mA measurement mode

In the mA measurement mode, the instrument is in the loop and the loop power is supplied externally. If there is a 250Ω resistor in the loop, the instrument does not need to enable the HART resistor; if there is no 250Ω resistor in the loop, the instrument needs to enable the HART resistor.

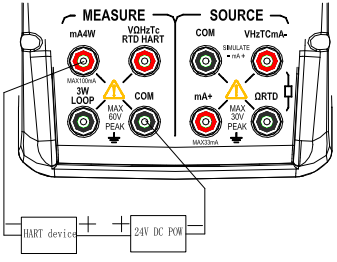


Figure 17. connection for mA measurement mode（with 250Ω resistance）

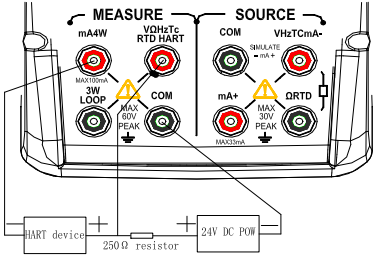


Figure 18. connection for mA measurement mode（without 250Ω resistance）

10.1.2 mA measurement mode at 24V voltage

In the mA measurement mode at 24V, the instrument is located in the circuit and the loop power supply is provided by the instrument. If there is a 250Ω resistor in the loop, the instrument does not need to enable the HART resistor; if there is no 250Ω resistor in the loop, the instrument needs to enable the HART resistor.

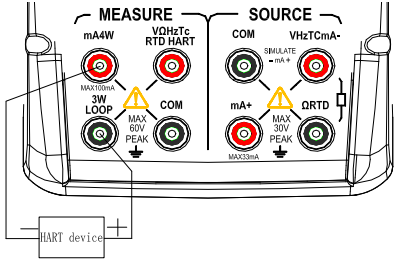


Figure 19. connection for 24V voltage mA measurement mode（with 250Ω resistance）

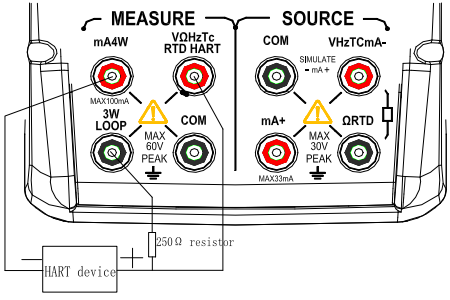


Figure 20. connection for 24V voltage mA measurement mode（without 250Ω resistance）

10.1.3 Communicator mode

In the only communicator mode, the instrument is located between the circuits and the loop power supply is provided externally. In the only communicator mode, the loop must have a 250Ω resistor.

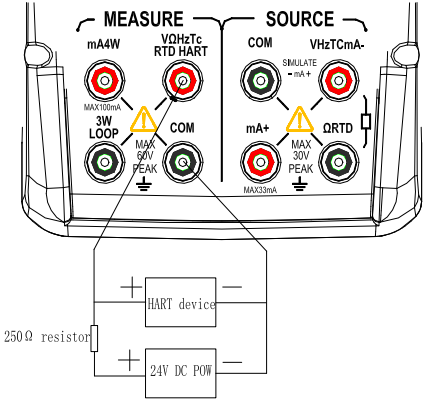
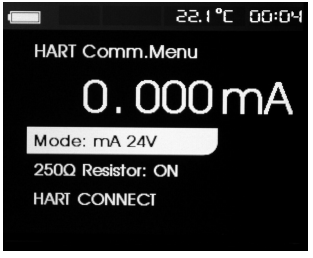


Figure 21. connction in communication mode

10.2 Communication Setting and Selection

When the instrument is in the measurement state, press the HART key to enter the HART communication menu interface; the operating mode is set to mA measurement at 24V voltage when entering the HART communication menu. The HART communication menu can not be entered while the instrument is in the output state.

Before connecting the test leads, the mode and 250ΩHART resistor must correspond to the connection method of the test leads; if the mode is only communicator mode, the 250ΩHART resistor is not used and the 250ΩHART resistor option displays n/a.



Press the Output Regulation key, select a function from the menu, and press ENTER to execute the function. If the measured input signal is out of range, an error OL or -OL is displayed and no action is taken.

10.2.1 Mode

The Mode function in the HART communication menu is used to select the operating mode.

10.2.2 250Ω HART resistance

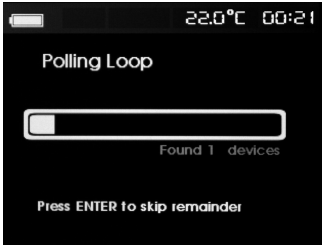
The 250ΩHART resistor function is used to turn the 250ΩHART resistor on or off.

10.2.3 HART connection

The HART connection function is used to locate the HART device in the loop. Before operating with the HART device, the device must be located in the loop by first polling all possible device addresses and then selecting a device from the addresses of the response search. If there are multiple devices in the loop, a tag list will be displayed. The correct device can be selected from the list. If there is only one device in the loop, the device will be selected by default. When a selected device is found, all relevant data will be read from the device.

- **Polling loop**

The polling loop function is used to search for the presence of HART device in the loop. This function is started immediately after the HART connection is performed. As the operation progresses, the screen changes once per second to show the extension of the progress bar.



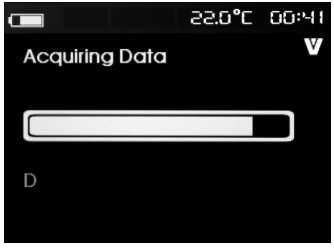
This screen shows the number of devices found during the polling period. If you know that all the devices in the loop have been discovered, you can press ENTER to end the polling ahead of time. Press EXIT to stop polling and exit HART mode. If no device is found, you will be prompted to find no device. If multiple devices are found, a tag list is displayed. You can use the tag list to select the required device. If only one device is found, the tag selection step will be skipped.

- **Tag selection**

The tag selection screen lists all long tag names found during polling. If necessary, the name of the tag can span two lines to display all the texts. If the long tag name can not be used or is blank, use the short tag name. If the short tag name is blank, the text polling address x <empty> is used. Press the Output Regulation key to select the necessary tag.

- **Data acquisition**

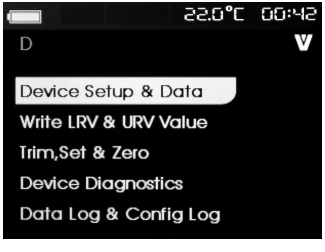
When the product acquires all the configuration data on the device, the data acquisition screen will be displayed. The progress bar is expanded once per second to show the operation process. The symbol flashes in the upper right corner to display the real-time HART connection.



This screen displays the name of the accessed tag. Press EXIT to stop data acquisition and exit HART mode.

- **Function selection**

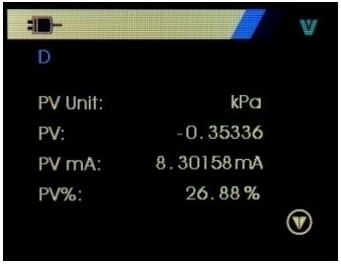
When the data acquisition is finished, the function selection menu will be displayed. This menu contains five functions.



The symbol flashes in the upper right corner to display the real-time HART connection. Press the Output Regulation key to select the desired operation and press ENTER to execute the selected operation. Press EXIT to exit HART mode.

- **Device settings and data**

The first item of the function selection menu is the display device setting and data function; device setting and data screen contains 11 sub-screens, press the Output Regulation key to view the content of each sub-screen, and the sub-screen format as shown in figure.



This screen shows all the data retrieved by the data acquisition program. The symbol flashes in the upper right corner to display the real-time HART connection. Each screen can hold up to 6 data points. If the data item is not supported by the HART device, it will be marked with n/a (not applicable). The dynamically changed data items in the HART device will be updated on the screen at the highest possible frequency. Press the Output Regulation key to switch the screen. Press EXIT to exit.

- **Write LRV and URV values**

The second item of the function selection menu is writing LRV and URV values function; the symbol flashes in the upper right corner to display the real-time HART connection.

If the HART write command is not turned on, these functions can not be used and will prompt the HART write function is not turned on. Press the Output Regulation key to select the necessary function. Press ENTER to execute the selected function. Press EXIT to exit.

Write LRV

Before you continue, the instrument will remind you that the loop will be changed to manual. Press ENTER to continue. At this point the screen shows the current LRV value and unit.

Press EXIT to exit.

Specific operation for change of the LRV value:

Step 1: Press the Output Regulation key to adjust the LRV value to the desired parameter.

Step 2: Press the [SAVE] key to send the new value to the HART device. If the HART device rejects the

value, an error will be displayed.
Step 3: After the value sending is successful, the screen prompts that the loop is back to the automatic mode.
Step 4: Press EXIT to exit.

Write URV

Before you continue, the instrument will remind you that the loop will be changed to manual. Press ENTER to continue. At this point the screen displays the current URV value and unit.

Press EXIT to exit.
Specific operation for change of the URV value:
Step 1: Press the Output Regulation key to adjust the URV value to the desired parameter.
Step 2: Press the [SAVE] key to send the new value to the HART device. If the HART device rejects the value, an error will be displayed.
Step 3: After the value sending is successful, the screen prompts that the loop is back to the automatic mode.
Step 4: Press EXIT to exit.

- **Trimming, setting and zeroing menu**

The third item of the function selection menu is the trimming, setting and zeroing menu; the symbol flashes in the upper right corner to display the real-time HART connection.

If the HART write command is not turned on, these functions can not be used and will prompt that the HART write function is not enabled. In the communicator mode, this function is disabled. Press the Output Regulation key to select the necessary function. Press ENTER to execute the selected function. Press EXIT to exit.

4mA trimming

If the operating mode is communicator only, the function is not available and an error message will be displayed. Before you continue, the instrument will remind you that the loop will be changed to manual. Press ENTER to continue. If the HART device rejects the mode change command when the HART device changes to the fixed output mode, an error will be displayed. When the mode change is successful, the screen will appear as shown in the figure.

When the output value is fixed at 4mA, the screen will display the measured value of this product. The measured value is updated once per second. The specific operation of 4mA trimming is as follows:

Step 1: Press [SAVE] to adjust the HART device. And then stay in the screen to evaluate the results. If the HART device rejects the trimming instruction, an error will be displayed.

Step 2: Press EXIT, the screen prompts the HART device changed to normal output mode, and then prompts the loop changed to automatic mode. If the device rejects the mode change instruction, an error will be displayed.

20mA trimming

If the operating mode is communicator only, the function is not available and an error message will be displayed. Before you continue, the instrument will remind you that the loop will be changed to manual. Press ENTER to continue. If the HART device rejects the mode change command when the HART device changes to the fixed output mode, an error will be displayed. When the mode change is successful, the screen will appear as shown in the figure.

When the output value is fixed at 20mA, the screen will display the measured value of this product. The measured value is updated once per second. The specific operation of 20mA trimming is as follows:

Step 1: Press [SAVE] to adjust the HART device. And then stay in the screen to evaluate the results. If the HART device rejects the trimming instruction, an error will be displayed.

Step 2: Press EXIT, the screen prompts the HART device to change to normal output mode, and then prompts the loop to be changed to automatic mode. If the device rejects the mode change instruction, an error will be displayed.

Setting of fixed mA output

If the operating mode is communicator only, the function is not available and an error message will be displayed. Before you continue, the instrument will remind you that the loop will be changed to manual. Press ENTER to continue. If the HART device rejects the mode change command when the HART device changes to the fixed output mode, an error will be displayed. When the mode change is successful, the screen will appear as shown in the figure.

This screen is used to set the fixed output and use the measured values of this product to monitor the results. The measured value is updated once per second. The value is set in the range of 3.0 mA to 21.0 mA. The specific operation of the fixed mA output is as follows:

Step 1: Press the Output Regulation key to adjust the value to the desired parameter.

Step 2: Press [SAVE] to send the new value to the HART device. And then stay in the screen. If the HART device rejects the value, an error will be displayed.

Step 3: Press EXIT, the screen prompts the HART device to change to normal output mode, and then prompts the loop to be changed to automatic mode. If the device rejects the mode change instruction, an error will be displayed.

PV zeroing

If the operating mode is communicator only, the function is not available and an error message will be displayed. Before you continue, the instrument will remind you that the loop will be changed to manual. Press ENTER to continue. The screen will appear as shown in the figure.

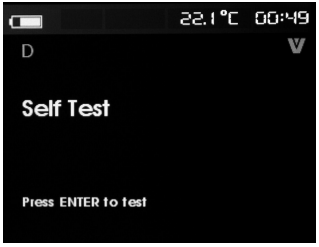
Specific operation of PV zeroing:

Step 1: Press the [SAVE] Key to reset the PV input to zero, and then sty in the screen to evaluate the results. If the HART device rejects the zeroing command, an error will be displayed.

Step 2: Press EXIT, the screen prompts to store the PV input value, and then the loop returns to the automatic mode.

- **Device diagnosis**

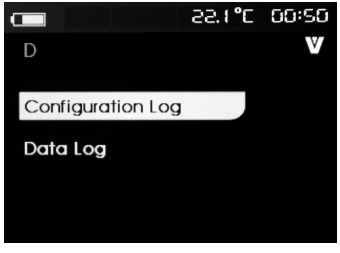
The fourth item of the function selection menu is the device diagnostic function; the symbol flashes in the upper right corner to display the real-time HART connection. If the HART write command is not turned on, these functions can not be used and the HART write function is not enabled as prompted. Before you continue, the instrument will remind you that the loop will be changed to manual. Press ENTER to continue. Screen display is as shown in the figure.



Press ENTER again to start the self-test. After the self-test, the screen will show no error, or report the error;the error report screen contains four sub-screens, and press the Output Regulation key to view the content of each sub-screen; press EXIT, the screen prompts loop back to automatic mode. Press EXIT again to exit this function.

- **Data recording and configuration recording**

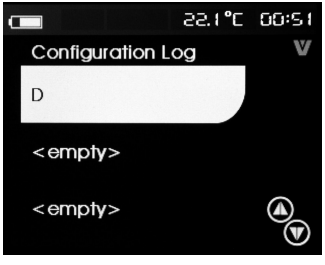
The fifth item of the function selection menu is data recording and configuration recording function. The configuration log and data log can only be used when connected to the HART device. Press the Output Regulation key to select the configuration log or data log.



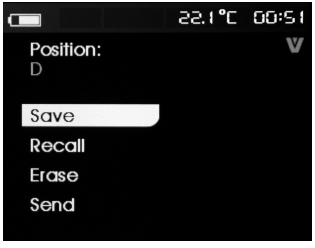
Configuration recording

Up to 20 tags can be stored for configuration data for subsequent calls. The stored configuration data is the same as the data displayed on the device data screen.

The initial configuration log screen spans multiple screens and will display the stored tag log. If the storage location is not used, the <empty> will be displayed in the tag name area, as shown in the figure.



After selecting a storage location, you can save the data or call the data from it. You can clear the data or send the data to the USB port. You can also use software to upload data to your PC. Press the Output Adjustment Key to select the correct storage location, and press ENTER to enter this storage location sub-menu, as shown in the figure:



The number and contents of the storage location are displayed at the top. If the storage location is null, the tag number is <empty>. Press the Output Regulation key to select the desired function, and then press ENTER to execute.

Save operation:

If the storage location is null, the current device configuration data is stored in the storage location.

If the storage location is in use, it will confirm if the existing data is replaced with the current tag data before you save the data to the storage location.

Reading operation:

If the location is null, an error message will be displayed.

If the storage location is in use, the data will be displayed in the same screen order as the 'Device Data' screen.

Erase operation:

If the location is null, an error message will be displayed.

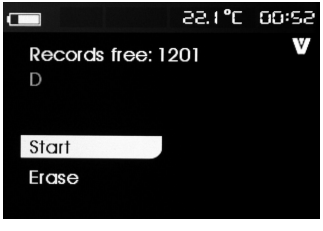
If the storage location is in use, it will confirm whether the existing data is permanently deleted before clearing the data.

Send operation:

If the location is null, an error message will be displayed.

Data recording

The process data can be stored for a single tag, so that it can be uploaded to the personal computer with the software. The data can be recorded in multiple sessions, but all sessions must be from the same HART device identified by the long tag name. You can select a different log interval for each session. Each data sample contains the product measurements, device mA current and all four process variables. You can use 1200 records. Each data sample uses a record. Each session uses two records for the top data, where the top data is shared by all data samples for that session. There can be 1 to 99 sessions. The total number of data samples that can be recorded is twice that of 1200 minus the number of starts and stops. Press the ENTER key to enter the data record menu item, and the screen displays as shown in the figure:

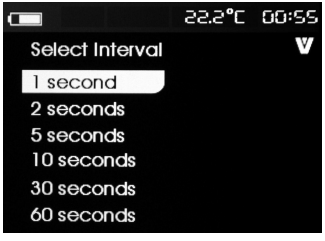


The number of idle records is displayed in the first line. If the data has been recorded, the tag number will be displayed below it. Press the Output Regulation key to select the desired function, and then press ENTER to execute.

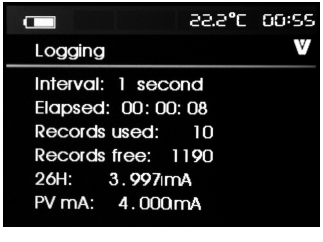
Start operation:

If there is no idle or idle session, or if the current HART device does not match the recorded HART device, an error message will be displayed.

Otherwise it will proceed to the illustrated interval selection.



Press the Output Regulation key to select the necessary recording interval. Press ENTER to start recording at this interval. When recording is performed, the screen in the figure is displayed for monitoring the progress.



The data items shown are:

The top line indicates that the log is being recorded or stopped. When the memory is full, or when the battery reaches the low voltage automatic shutdown limit and the product is turned off, it will automatically stop recording.

Interval time is the previously selected data item. Used time is the time spent after the start of the log and will be updated each time you save the new sample. Used record means the total number of records used by all sessions so far. Idle record means the total number of unused records and will be updated each time a new sample is saved. 709H refers to the current measured value and will be updated at the highest possible rate. PV mA is the last HART device measured value and will be updated at the highest possible rate.

Erase operation:

If there is no recorded data, an error message will be displayed. Otherwise it will confirm whether the current data is permanently cleared before clearing the data.

11 Environmental Temperature Test

The calibrator can measure the surrounding environmental temperature, and displays it on the top right corner. After turning on the calibrator, LCD displays the temperature value and the unit in the top right corner.

12 Data Storage

The calibrator can store data at any time, the maximum volume for stored data can reach 1200 items; Press the（**SAVE**）key to store the data; The storage item displays on the upper part of the screen.

13 Maintenance

13.1 cleaning the calibrator

⚠Warning

To avoid electrical shock or damaging the calibrator, serve the calibrator only by the replacement parts specified and never get water inside the case.

Caution

To avoid damaging the plastic lens and case, do not use solvents or abrasive cleansers. Clean the Calibrator with a soft cloth dampened with water or water and mild soap.

13.2 Calibration or Sending to the Service Center

Calibration, maintenance or repair work unmentioned in this manual should be undertaken by the experienced worker. If the calibrator operates abnormally, inspect the batteries first and replace them if necessary.

If you suspect that the calibrator has failed, review this manual to make sure you are operating it correctly. If the calibrator still fails to operate properly, pack it securely (in its original container if available) and forward it, postage paid, to the nearest Service Center. The company assumes NO responsibility for damage in transit. The Company guarantees a rapid repair and maintenance and delivers the calibrator back as soon as possible. Please refer to the Warranty. If the warranty is due, you will be billed for the maintenance and repair work. If the calibrator or the pressure module is not within the Warranty range, you can contact the warranted service center for enquiring about the expenditure. Please refer to the Chapter “Contact Us” to find a warranted service center.

13.3 Replacement of Parts

All the types of parts are listed in Table 7, see Figure 22 as reference.

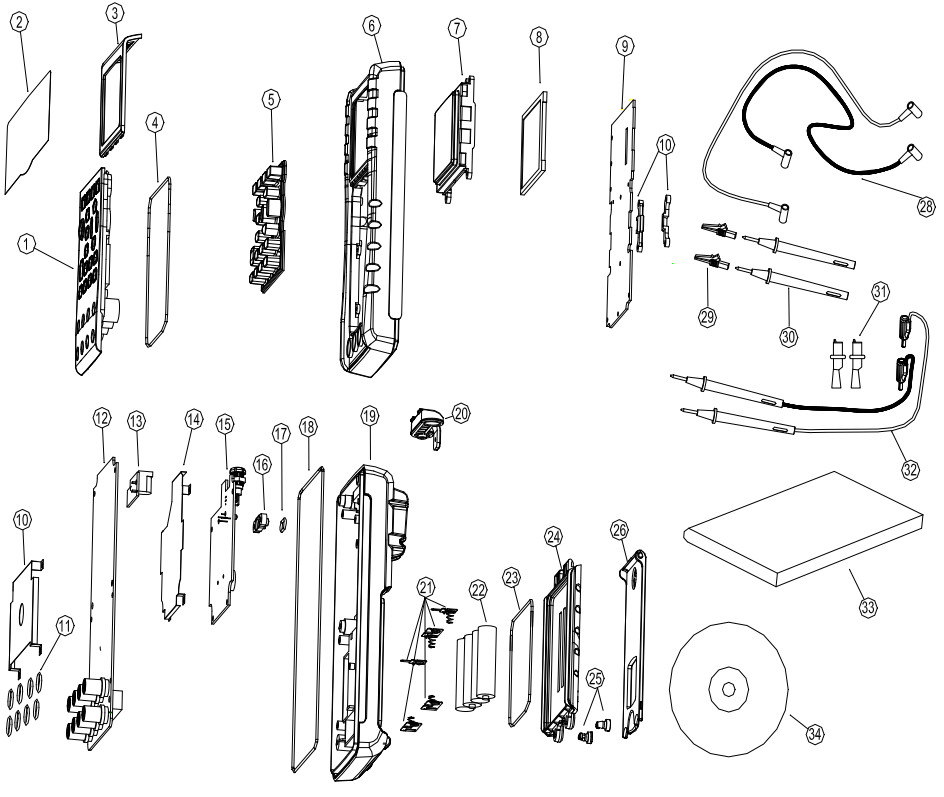


Figure 22 replacements of parts

Table 7. Replacement of parts

Item	Instruction	Quantity		Item	Instruction	Quantity
1	Top panel	1		18	O-shape circle	1
2	Window protective film	1		19	O-shape circle	1
3	Trade Mark Frame	1		20	Bottom shell	1
4	O-shape circle	1		21	soft robber cover	1
5	Rubber Key	1		22	power reed	4
6	Panel Shield	1		23	battery	1
7	transparency window	1		24	O-shape circle	1
8	TFT screen	1		25	battery door	1
9	LCD Circuit Panel	2		Basic type	plastic screw	2
10	keyboard card	1		27	supporting panel	1
11	shielding case	1		28	industrial testing lead	1
12	O-shape circle	1		29	alligator clip	2
13	main-circuit board	1		30	testing probes	1
14	adaptive-circuit board	1		31	alligator clip	1
15	power circuit board	1		32	industrial testing lead	1
16	power circuit board	1		33	quick guide	1
17	communication window			34	Product DVD disk	1

14 Options

For more information about the options and its price, please contact the representative of the company. For information about relevant pressure module and its type (see Table 9 and Table 10). For information about the new pressure module, which isn't listed in Table 9 and Table 10, please contact the representative of the company.

Table 8. Options

No.	Name of the Options	Mode
1	PC communication convert module	Z070107-00
2	Wired Adapter (DC5V)	P070003-00

15 Technical index of Pressure Module Convertor and Compatibility

The source of pressure module may cause an overflow of 5-digits display or any improper selection of unit may cause failure reading due to low displayed value.

According to the range listed in the following table, the calibrator will display OL when exceeding the range (overload).

Table 9. Technical Index of Pressure Model

Type, range and accuracy of pressure module						
Type of	**Range（kPa）**	**bar（bar）**	**psi（psi）**	**type of sensor**	**pressure**	**Overall**

module					datum	accuracy（%）0～50℃
VPM100KGS	0～100kPa	0～1bar	0～15psi	Isolated, 316 stainless steel	gauge pressure	0.05
VPM200KGS	0～200kPa	0～2bar	0～30psi	Isolated, 316 stainless steel	gauge pressure	0.05
VPM500KGS	0～500kPa	0～5bar	0～72psi	Isolated, 316 stainless steel	gauge pressure	0.05
VPM001MGS	0～1MPa	0～10bar	0～150psi	Isolated, 316 stainless steel	gauge pressure	0.05
VPM002MGS	0～2MPa	0～20bar	0～300psi	Isolated, 316 stainless steel	gauge pressure	0.05
VPM005MGS	0～5MPa	0～50bar	0～725psi	Isolated, 316 stainless steel	gauge pressure	0.05
VPM010MGS	0～10MPa	0～100bar	0～1500psi	Isolated, 316 stainless steel	sealed gage	0.05

					pressure	
VPM020MGS	0～20MPa	0～200bar	0～3000psi	Isolated, 316 stainless steel	sealed gage pressure	0.05
VPM040MGS	0～40MPa	0～400bar	0～5800psi	Isolated, 316 stainless steel	sealed gage pressure	0.05
VPM060MGS	0～60MPa	0～600bar	0～8700psi	Isolated, 316 stainless steel	sealed gage pressure	0.05
VPM100KAS	0～100kPa	0～1bar	0～15psi	Isolated, 316 stainless steel	Absolute pressure	0.05
VPM200KAS	0～200kPa	0～2bar	0～30psi	Isolated, 316 stainless steel	Absolute pressure	0.05
VPM500KAS	0～500kPa	0～5bar	0～72psi	Isolated, 316 stainless steel	Absolute pressure	0.05

VPM001MAS	0～1MPa	0～10bar	0～150psi	Isolated, 316 stainless steel	Absolute pressure	0.05
VPM002MAS	0～2MPa	0～20bar	0～300psi	Isolated, 316 stainless steel	Absolute pressure	0.05
VPM005MAS	0～5MPa	0～50bar	0～725psi	Isolated, 316 stainless steel	Absolute pressure	0.05
VPM010MAS	0～10MPa	0～100bar	0～1500psi	Isolated, 316 stainless steel	Absolute pressure	0.05
VPM020MAS	0～20MPa	0～200bar	0～3000psi	Isolated, 316 stainless steel	Absolute pressure	0.05
VPM100KCS	-100～100KPa	-1～1bar	-15～15psi	Isolated, 316 stainless steel	compound pressure	0.05
VPM200KCS	-100～200KPa	-1～2bar	-15～30psi	Isolated, 316 stainless steel	compound pressure	0.05
VPM500KCS	-100～500KPa	-1～5bar	-15～72psi	Isolated, 316 stainless steel	compound pressure	0.05

VPM001MCS	-0.1～1MPa	-1～10bar	-15～150psi	Isolated, 316 stainless steel	compound pressure	0.05
VPM002MCS	-0.1～2MPa	-1～20bar	-15～300psi	Isolated, 316 stainless steel	compound pressure	0.05

note:

1. pressure datum: gauge pressure, absolute pressure and compound pressure
2. pressure unit: supporting varieties of pressure unit(take calibrator main frame as reference)
3. resolution: 5 digits
4. measurement media: varieties of liquid and gas of 316 stainless steel are compatible
5. working temperature: 0 to 50℃
6. storage temperature: -10 to 60℃
7. sealed grade：IP54
8. pressure connector: M20×1.5mm external thread
9. module electronic connector：Binder 5-pole male
10. communication cable(option)：Binder 5-pole female to LEMO 5-pole male。
11. comply with electromagnetic standards（EMC）：EN61326-1：2006

12. comply with electromagnetic standards：IEC 61010-1：2000

13. measurement：about Ø30×130mm

14. weight：about 350g

16 Index

measured technique index [specified for a period of one year after calibration, at 23℃±5℃, 35～70%RH, accuracy =±（%reading +% range）].

Function	Range	Range	Resolution	Accuracy	Remark
DCV	50mV	-5.000mV～55.000mV	1μV	0.01+0.01	Input Resistance: About 100MΩ
	500mV	-50.00mV～550.00mV	10μV	0.01+0.01	
	5V	-0.5000V～5.5000V	0.1mV	0.01+0.01	Input Resistance: 1MΩ
	30V	-5.000V～35.000V	1mV	0.01+0.01	
DCI	50mA	-5.000mA～55.000mA	1μA	0.01+0.01	Shunt Resistance: 10Ω

OHM（4W）	500Ω	0.00Ω～550.00Ω	0.01Ω	0.01+0.01	500Ω about 1mA simulation 5KΩ about 0.1mA simulation Open Circuit Voltage ： about 2.5V; Does not include lead resistance;
	5KΩ	0.0000 KΩ～5.5000KΩ	0.1Ω	0.01+0.01	
FREQ	50KHz	3Hz ～ 50.00000KHz	0.01Hz	0.01+0.00004	Input Impedance：100 kΩ at least; Sensitivity：3Vp-p minimum; Duty Cycle: 50%.
	CPM	180 ～ 3000000 CPM	1CPM	±2 bytes	
TC	R*	0°C～1767°C	1°C	0 ～ 500 ℃ : 1.8℃ 500 ～ 1767 ℃ : 1.5℃	By using ITS-90 temperature scale; The accuracy does not include the error of internal temperature
	S*	0°C～1767°C			
	K	-100.0°～1372.0°C	0.1°C	-100.0～0.0℃ : 1.2℃ 0.0～1372.0℃ : 0.8	

	E	-50.0°C～1000.0°C		-50.0℃～0.0℃ : 0.9℃ 0.0 ～ 1000.0 ℃ : 1.5℃	compensation caused by a sensor;
	J	-60.0°C～1200.0°C		-60.0～0.0℃ : 1.0℃ 0.0 ～ 1200.0 ℃ : 0.7℃	
	T	-100.0°C～400.0°C		-100.0～0.0℃ : 1.0℃ 0.0 ～ 400.0 ℃ : 0.7℃	
	N	-200.0°～1300.0°C		-200.0～0.0℃ : 1.5℃ 0.0 ～ 1300.0 ℃ : 0.9℃	
	B*	600°C～1820°C	1°C	600 ～ 800 ℃ : 2.2℃ 800 ～ 1000 ℃ : 1.8℃ 1000～1820℃ : 1.4℃	
	L	-60.0°C～900.0°C	0.1°C	-60.0～0.0℃ 0.7℃ 0.0～900.0℃ 0.5℃	

	U	-100.0°C～600.0°C	0.1°C	-100.0～0.0℃ 0.7℃ 0.0～600.0℃ 0.5℃	
RTD	Pt100 385	-200.0°C～800.0°C	0.1°C	-200.0～0.0℃ : 0.5℃ 0.0～400.0℃ : 0.7℃ 400.0～800.0℃ : 0.8℃	By using ITS-90 temperature scale; The accuracy does not include the error of internal temperature compensation caused by lead resistance, three-wired and four wired.
	Pt1000 385	-200.0°C～630.0°C		-200.0～100.0℃: 0.3℃ 100.0～300.0℃ : 0.5℃ 300.0～630.0℃ : 0.7℃	
	Pt200 385	-200.0°C～630.0°C		-200.0～100.0℃: 0.8℃ 100.0～300.0℃ : 0.9℃ 300.0～630.0℃ : 1.0℃	

	Pt500 385	-200.0°C～ 630.0°C		-200.0～100.0℃: 0.4℃ 100.0～300.0℃ : 0.5℃ 300.0～630.0℃ : 0.7℃	
	Cu10	-100.0°C～ 260.0°C		1.8℃	
	Cu50	-50.0°C～ 150.0°C		0.7℃	
PULSE	100000 cycles	1 ～ 100000cycles	1cycle	±2 bytes	Take relevant index in frequency as reference

SWITCH		CLOSE / OPEN			About 1mA simulation short circuit display CLOSE，short circuit display OPEN；Threshold value is about 200~300Ω
CONNECT	500Ω	≤ 50Ω sounds	0.01Ω		500Ω About 1mA simulation
LOOP	24 V			10%	short circuit protection Maximum current：22 mA Maximum input voltage：30 V DC source resistance：250Ω Nominal value

Note：

- The valid range of the temperature in manual compensation is R、S、B graduation of the TC is 0～50°C.

- Measurement speed：twice / second
- Common mode rejection：50Hz /60Hz>120 dB, string mode rejection：50Hz/60Hz>60 dB
- Temperature co-efficiency：0.1 ×basic accuracy/℃ （temperature range <18℃ or >28℃）
- Inferior temperature compensation senor RJC， range of measured temperature -10～50°C. the accuracy of measured temperature ±0.5℃ in 18 to 28°C, accuracy of other measured temperature is ±1℃。Cold compensation time: 10S/ each。
- V、Ω、Hz input terminals and the maximum voltage applied between COM terminals is: 30Vpk
- Maximum current of mA terminals is：100m. input protection of mA terminals：100mA/250Vfas-melt
- Built-in optional 250 Ω HART loop circuit, not necessary to carry load resistance separately（only available for HART type）。

Source technical index [specified for a period of one year after calibration, at 23℃±5℃, 35～70%RH, accuracy =±（%reading +% range）].

Function	range	input set range	resolution	accuracy	remark
DCV	100mV	-10.000 ～ 110.000mV	1μV	0.01+0.01	maximum source current 0.5mA
	1V	-0.10000 ～ 1.10000V	10μV	0.01+0.01	maximum source current 2mA
	10V	-1.0000～11.0000V	0.1mV	0.01+0.01	maximum source current 5mA
DCmA	30mA	0.000～33.000mA	1μA	0.01+0.01	In 33 mA, Max load 1KΩ resistance

					simulate convertor, External power: 5 ～ 28V
	400Ω	0.00～400.00Ω	0.01Ω	0.01+0.01	Simulate current: ±0.5~3mA Simulate current: ±0.1~0.5mA, add 0.1Ω additional error. The accuracy does not include the lead resistance.
	4KΩ	0.0000～4.0000 KΩ	0.1Ω	0.01+0.01	±0.05~0.3mA simulate current, The accuracy does not include the lead resistance.

TC	R*	0°C～1767°C	1°C	0～100℃ : 1.5℃ 100～1767℃: 1.2℃	By using ITS-90 temperature scale;
	S*	0°C～1767°C		0～100℃ : 1.5℃ 100～1767℃: 1.2℃	The accuracy does

	K	-200.0°C～1372.0°C	0.1°C	-200.0～-100.0 : 0.6℃ -100.0～400.0℃:0.5℃ 400.0～1200.0℃:0.7℃ 1200.0～1372.0 : 0.9℃	not include the error of cold end compensation.
	E	-200.0°C～1000.0°C		-200.0～-100.0 : 0.6℃ -100.0～600.0℃:0.5℃ 600.0～1000.0℃:0.4℃	
	J	-200.0°C～1200.0°C		-200.0～-100.0 : 0.6℃ -100.0～800.0℃: 0.5℃ 800.0～1200.0℃:0.7℃	
	T	-250.0°C～400.0°C		-250.0～400.0℃: 0.6℃	
	N	-200.0°C～1300.0°C		-200.0～-100.0℃:1.0℃ -100.0～900.0℃: 0.7℃ 900.0～1300.0℃:0.8℃	
	B*	600°C～1820°C	1°C	600～800℃ : 1.5℃ 800～1820℃: 1.1℃	
	L	-200.0°C～900.0°C	0.1°C	-200.0 ～ 0.0 ℃ 0.7℃ 0.0 ～ 900.0 ℃ 0.5℃	

	U	-200.0°C～600.0°C	0.1°C	-200.0 ～ 0.0 ℃ 0.7℃ 0.0 ～ 600.0 ℃ 0.5℃	

RTD	Pt100 385	-200.0°C～800.0°C	0.1°C	-200.0～0.0℃ : 0.3℃ 0.0 ～ 400.0 ℃ : 0.5℃ 400.0 ～ 800.0 ℃ : 0.8℃	By using ITS-90 temperature scale; Pt100、Cu50、Cu10 simulate current is ：±0.5~3mA simulate current is ：±0.1~0.5mA，add 0.5 ℃ additional error Pt200 、 Pt500 、 Pt1000 simulate current ±0.05~0.3mA The accuracy does
	Pt1000 385	-200.0°C～630.0°C		-200.0～100.0℃: 0.2℃ 100.0 ～ 300.0 ℃ : 0.5℃ 300.0 ～ 630.0 ℃ : 0.7℃	
	Pt200 385	-200.0°C～630.0°C		-200.0～100.0℃: 0.8℃ 100.0～300.0℃ : 0.9℃ 300.0～630.0℃ : 1.0℃	
	Pt500 385	-200.0°C～630.0°C		-200.0～100.0℃: 0.4℃ 100.0～300.0℃ : 0.5℃ 300.0～630.0℃ : 0.7℃	
	Cu10	-100.0°C～260.0°C		1.8℃	

	Cu50	-50.0°C～150.0°C		0.6℃	not include lead resistance
FREQ	100Hz	1.00Hz～110.00Hz	0.01Hz	±2 bytes	Sensitivity: 1 ～ 11 Vp-p±5％ reading +0.5V Duty Cycle: 50% Load>100KΩ ：3Vp-p minimum; Duty Cycle: 50%.
	1KHz	0.100KH ～ 1.100KHz	1Hz		
	10KHz	1.0KHz～11.0KHz	0.1KHz		
	50KHz	10KHz~50KHz	2KHz	±5 byes	
	CPM	60～1200CPM	1CPM	±2CPM	

PULSE	100Hz	1～100000cycles	1cyc	±2 bytes	Sensitivity: 1 ～ 11 Vp-p±5％ reading +0.5V Duty Cycle: 50% Load>100KΩ
	1KHz				
	10KHz				
SWITCH	100Hz	1.00Hz～110.00Hz	0.01Hz	±2 bytes	field effect switch maximum current/voltage ：
	1KHz	0.100KHz ～ 1.100KHz	1Hz		

	10KHz	1.0KHz～11.0KHz	0.1KHz		+28 V/50mA
	50KHz	10KHz~50KHz	2KHz	±2 byts	

Notes ：

- Temperature co-efficiency: 0.1 ×basic accuracy/ ℃ （temperature range <18℃ or >28℃）
- Inferior temperature compensation sensor RJC, measured temperature range -10 ～ 50 ° C, compensation error ≤±0. 5℃
- Maximum voltage applied between the input terminals and the earth is: 30Vpk
- Maximum soured current: about 25mA
- The valid range of the temperature in manual compensation is R、S、B graduation of the TC is 0～50°C.

Measured and sourced Press

pressure	range and accuracy	resolution	Applicable to pressure module in

PRESS	see pressure module	display in five digits	VPM series, provides modules used for gauge pressure, vacuum pressure, absolute pressure and high pressure; see Pressure Module for detailed technical index.

17 NOTES FOR THE MANUAL

- The present operation instruction is subject to change without notice.
- The content of the operation instruction is regarded as correct. Whenever any user finds its mistakes, omission, etc., he or she is requested to contact the manufacturer.
- The Company is not liable for any accident and hazard arising from the customer misuse or inadvertent operation.
- The functions described in this operation instruction should not be used as grounds to apply this product to a particular purpose.