HT3561 Battery Internal Resistance Meter

Operation manual

Safety Tips

⚠Warning ⚠danger: When you find the following abnormal situations occur, do stop operating immediately and turn off the power cord. Please immediately contact your dealer or HOPE representative. Otherwise fire and electric shock would be caused.

- Abnormal instrument operation.
- Abnormal noise, odor, smoke or flash occur instrument operation.
- The instruments produce a high temperature or electric shocks during the operation.
- Power cord, power switch or power socket damage.
- Impurities or liquid flow in instrument

Safety Information

⚠Warning ⚠danger: Mishandling during use could result in injury or death, as well as damage to the product. Be certain that you understand the instructions and precautions in the manual before use.

Disclaimer	Before using the product, be sure to carefully read the following safety notes. If users do not observe the following instructions, Hope Electronic Science and Technology will not blame for any of users' loss.
instrument grounding	In order to avoid electric shock, please ground the equipment.
Avoid using instrument in the environment with explosive gas	Avoid using the instruments in the environment with explosive gas, vapor or dust environment. Using any electronic instrument in such environment is dangerous.
Do not open the instrument shell	Non-professional instrument maintenance personnel should not open the shell in an attempt to repair instrument. There is still residual charge, which may cause electric shock, after the instrument shutdown in a period of time.
Do not use damaged instrument	If the instrument has been damaged, the risk will be unpredictable. Please disconnect the power cord and no longer use the instrument. Do not attempt to maintenance yourself.
Do not use unusual instruments work	If the equipment is not working correctly, the risk will be unpredictable. Please disconnect the power cord and no longer use the instrument, do not attempt to maintenance yourself.
Do not exceed the designated use of equipment in manual	Beyond the scope, the protection of equipment provided will be ineffective.

HT3561 Battery Internal Resistance Meter

operation manual

k

English rev1.0.0
Dec, 2009

Index

Limited Security and Responsibility Scope

Hope Electronics Technology Co., Ltd ensures that each HT3561 you buy is fully qualified in terms of quality and measurement. This guarantee does not include fuses.

Hope commitment that the equipment have no defects in materials and processes such as product quality problems under warranty, if the products are proved to be defective, Hope will repair or replace the production free of charge.

Since the date of delivery, Hope commitment that the host of its products has two years guarantee, other accessories has one year. Under warranty, if the failure of hardware or software of the product happened which is due to the quality of the product itself, Users could produce the product warranty and maintenance card to get free maintenance which provides from the maintenance department or its authorized maintenance site of Hope. Customers should pay for the maintenance after the warranty period.

For free maintenance products (no special problems), Hope committed it would be repaired and returned to the customer within five working days as soon as receipt of the machine. Hope bear the cost of return transportation.

If one of the following circumstances occurs, Hope will not repair for free.

1) Accidental damage caused in transportation.
2) Error installation or equipment failure or damage is caused by in the non-use work environment.
3) Man-made Damage to the appearance of the products (such as surface scratches, deformation, etc.).
4) Unauthorized repair, alteration, replacement of devices and products has been tearing up the warranty seal.
5) The fault or damage is caused by irresistible factors (such as lightning strikes).
6) Directly or indirectly damage is caused by improper operation of the user.

If mismeasurement or unmeasurable is caused by the improper operation of the customer, but not the problem of the instrument, the cost of transit should be paid by the customer.

China
Jiangsu Province
Hope Electronics Technology Co., Ltd.
January 2009

1 Installation and Set Wizard

Thank you for purchasing our products! Please read this manual first, and keep it handy for future reference.
In this chapter you will learn the following:

- Primary function packing list
- Power Requirements
- Fuse replacement
- Operating Environment
- Cleaning

1.1 Packing List

Before using the product the first time, inspect it carefully to ensure that no damage occurred during shipping. If you find any damage, contact our dealer or representative.

Table1-1 apparatus accessories

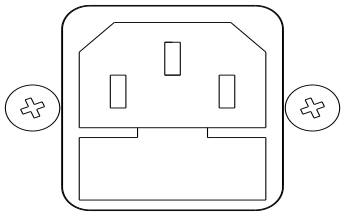
NAME	AMOUNT	REMARK
Instruction manual	1	
Three-core power cord	1	220V/50Hz
Fuse	2	0.2A fuse
Kelvin CLIP	1	HK9350
Measurement probe	1	HK9360
RS232Communication Cable	1	HK9800
Product certificate	1	
Quality certification	1	

1.2 Power Requirement

Can only be used in the following power conditions:
Voltage: 198-252 V AC
Frequency: 47.5-52.5 Hz
Power: 15 VA (max)

Danger: In order to avoid electric shock, please connect the power ground carefully.
If you have replaced the power cord, make sure that the power cord ground.

1.3 Fuse replacement



Pic1-1 The fuse box behind the plate

Warning：Please use 250V,0.2A fuse.

1.4 Operating Environment

Must be used under the following conditions:
Temperature：0℃～55℃，
Humidity：40℃ less than 95%RH

1.5 Clearing

In order to prevent risk of electric shock, please unplug the power cord before washing.
Please use a clean cloth dipped in a little water to wash shell and panel.
Do not clean the instrument internal.

Warning: Can not use solvents (alcohol or gasoline, etc.) to clean the instrument.

2 Overview

In this chapter, you will learn the following:

- Introduction
- Model Description
- Main Specifications
- Main function

2.1 Introduction

Thank you for purchasing HT3561.It is a contact-resistance meter capable of providing quick and accurate measurements for the contact resistance of elements such as relays, switches, and connectors and so on.

The HT3561 applies the principle of double-two-terminal to measure. It is capable of high-speed, high-precision, high-resolution resistance measurement. It is capable of measuring the resistance of 10μΩ~ 3.2kΩ, and showing the largest number of 3200. The basic accuracy of 3561 is capable of being up to 0.5%.The voltage measurement range of 3561 is 1mV ~ 60V, the basic accuracy is up to 0.1%. The maximum measurement speed of 3561 is capable of being up to 20 times / sec.

The instrument has professional comparator function. It has 30 groups of records for bin out. The 3561 is capable of a optional Handler interface, which is used in automatic comparator system to complete automatic assembly line measurement. Built-in RS232C interface and optional equipped IEEE-488 interface can be used for remote control and data acquisition and analysis.

Computer remote control commands are compatible with SCPI (Standard Command for Programmable Instrument), is capable of completing efficiently remote control and data acquisition functions.

2.2 Model Description

In order to give consideration to the needs of different users, HT3561 Series offers two models to choose from the flowing table:

Model	Measuring Range	Accuracy
Standard: HT3560	1 μ Ω-3.2kΩ	0.3%
	0V-60V	0.05%
Economy: HT3561	10 μ Ω-3.2kΩ	0.5%
	0V-60V	0.1%

2.3 Main Specifications

HT3561 technical specifications include the basic technical indicators and equipment allowable scope of measurement. These specifications have been achieved before leaving the factory.

Reference:  The whole technical specifications in Appendix A.

Resistance Measurement

- Basic resistance accuracy: 0.5%
- The greatest displayed number: 3200
- Six measurement range automatically or manually provide from 10μΩ to 3.2k measurement range.
- Four-terminal measurement

Voltage measurement

- Voltage basic accuracy: 0.1%
- The largest displayed number of 6000
- Auto-range: 6V/60V

Other

- High-speed and high-precision measurement
  Even the speed is up to 20 times every second, it can still maintain high accuracy measurement.
- Dual display
  Show the value of direct-reading measurement as well as show the absolute bias (ΔABS), the relative deviation (Δ%), and results of comparator (GD / NG).
- A variety of ways to trigger
  Internal trigger, external trigger and remote trigger.

2.4 Main function

- High-brightness, ultra-clear and four-color VFD display
  The display window is 98mm×58mm, and shows a wide range of parameters at the same time.
- Correction:
  The function of Zero adjust.
- Comparator features:
  There is 30 built-in compare data which can judge the measured on GD / NG, HI / IN / LOW.
- **Comparator function shows**: Using signs directly display on the VFD and (or) using the display window.
- **Comparators output**: Output more detailed results of the selection by RS232C or through matching Handler interface or IEEE-488

interface.

- **Buzzer**: The voice output of the comparator result.
  Users can set up GD or NG beep-mode according to their own I nquiry.
- Keyboard-lock function.
- **Built-in RS232C**: Using three-wire simple serial interface. Compatible with SCPI instruction set, ASCII code transmission, completing all equipment functions.
- **Optional Handler Interface**: Output the compare results, input comparison gear, input the trigger signal and output EOC signal.
- Optional interface features:
  1. **IEEE-488 interface**: Compatible with SCPI instruction set. Transmit bus data and command by the ASCII code to complete all equipment functions. It is compatible with IEEE-488.1 and IEEE-488.2.

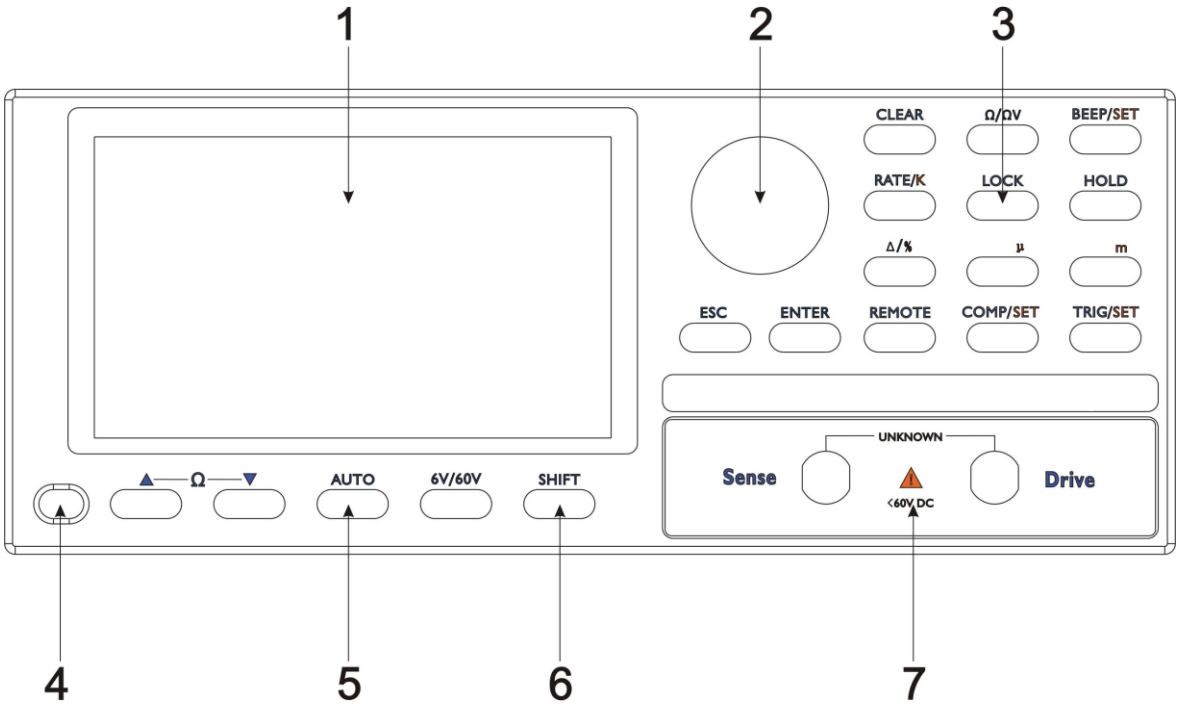
3 Starting

In this chapter, you will learn the following:

- Front panel: Buttons introduction, VFD introduction and measurement terminals.
- Back panel: Introduce the power and interface information.
- Instrument handle: Teach you to use the instrument handle.
- Power to start: Including the Power on and self-check process, equipment default and warm-up time.
- Display information: The message on starting and using equipment during the process which will be encountered.
- Prepare before measurement: How to connect to the measurement terminal, apparatus feature set.

3.1 Front panel

3.1.1 Front panel description



Pic3-1 The front panel

1: Display window

Reference：Details refer to the VFD section.

2: Knob

Used to select or enter values.

3: Keypad two

A group of multi-function button including the main function keys, the second function keys and number keys

Reference：Details please refer to the "key areas" section.

4: Power switch

Press: Open; Pop: customs.

Warning: Do not fast and continuously switch power, the moment of impact may shorten equipment life or even damage equipment.

5: Keypad 1

A set of main function keys

Reference：Details please refer to "the key areas" section.

6: Input

Input used for connecting the four-terminal Kelvin clamp.

Warning：Do not add too high DC voltage or current to the measurement side, otherwise they will damage equipment.
Before measuring capacitance ensure that the charge of the capacitance has been fully set free.

Reference Details please refer to the "measure client connections" section.

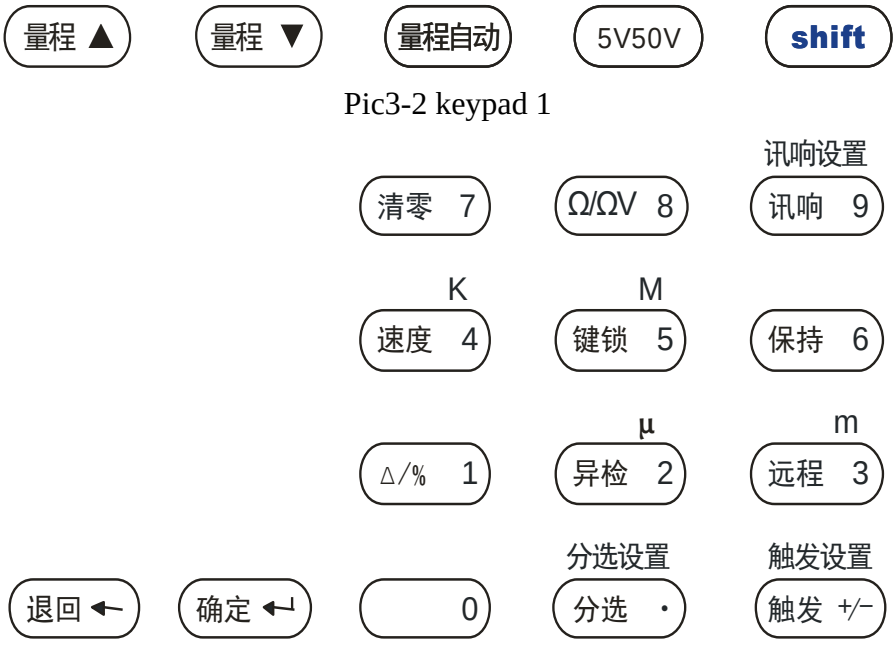
7: SHIFT key

From "the first function key" state switch to "the second function keys"

3.1.2 Key areas

Agreement:

In the instrument panel,
The place marked with " blue " font is the main function;
The place marked with "orange " font is the second function;
Button with "white" font is the number keys.



Pic3-2 keypad 1

Pic3-3 keypad 2

1. The main function keys

Agreement：

Button with "white" font is the main function key;
The following functions of the Shift in the logo screen out the selection.

量程 ▲: A range upward.

量程 ▼: A range downward.

量程自动: Range auto, manual selection switch.
AUTO displayed on the VFD means automatically range.

5V50V: choose 6V voltage range or 60V voltage range.

shift: The shift key implement second function.

清零 7: Zero clear

Ω/ΩV 8: Choose to display parameters (HK3560 version only).

讯响 9: Buzzer switch.

速度 4: Measurement speed.
Optional Speed: slow-speed, medium-speed, fast-speed.

键锁 5: Locks or unlock the keyboard.

保持 6: Maintain the result on the screen.

The current measurement results will be maintained at screen, do not refresh.

DH display current data has been instructed to be maintained.

Δ/% 1: Deviation display.

Options as follows: the absolute deviation (ABS), the relative deviation (%) and comparator output.

远程 3: Remote control settings.

Choose RS232 or GPIB remote control mode.

Provide them with a number of communication settings.

退回 ←: Back to the next level.

Effective only in the setting interface

确定 ↵: The interface used to confirm your selection set.

Effective only in the setting interface

分选 ·: Comparator switch.

Open or close the comparator function. VFD display COMP Bright means open.

触发 +/-: Trigger once measurement. Only effective in the manual trig-mode.

2. The second function keys (Shift with switch function)

Agreement:

Button with "orange" font is the second function key;
The following features in the press "shift" key, and logo on the screen lit.

BEEP/SET: set GD alarm or NG alarm.
COMP/SET: choose a group of records from 30 groups used for binout.
TRIG/SET: set trig-mode. an internal, external, manual and remote trig-mode can be choosed.
μ, M, k, M: unit magnification.
In the state of data input choose magnification for data.

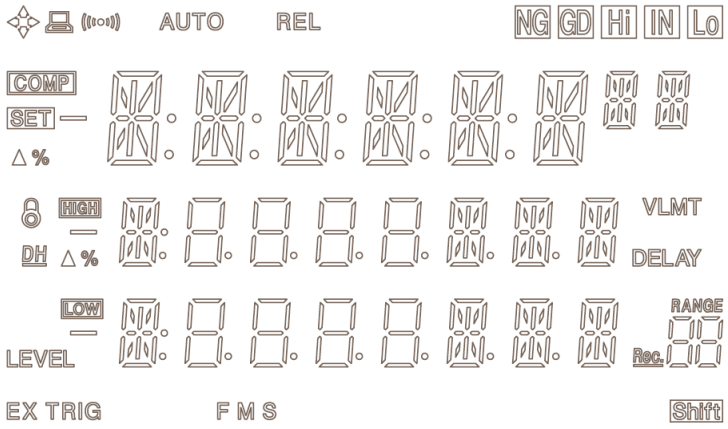
3. The number keys

Agreement:

Button with "white" word is the number keys.
Numeric keypad is effectively only in the input data state.

The whole number keys include keypad 2 with "white" font, the second function keys to select unit(μ, m, k, M).

3.1.3 VFD



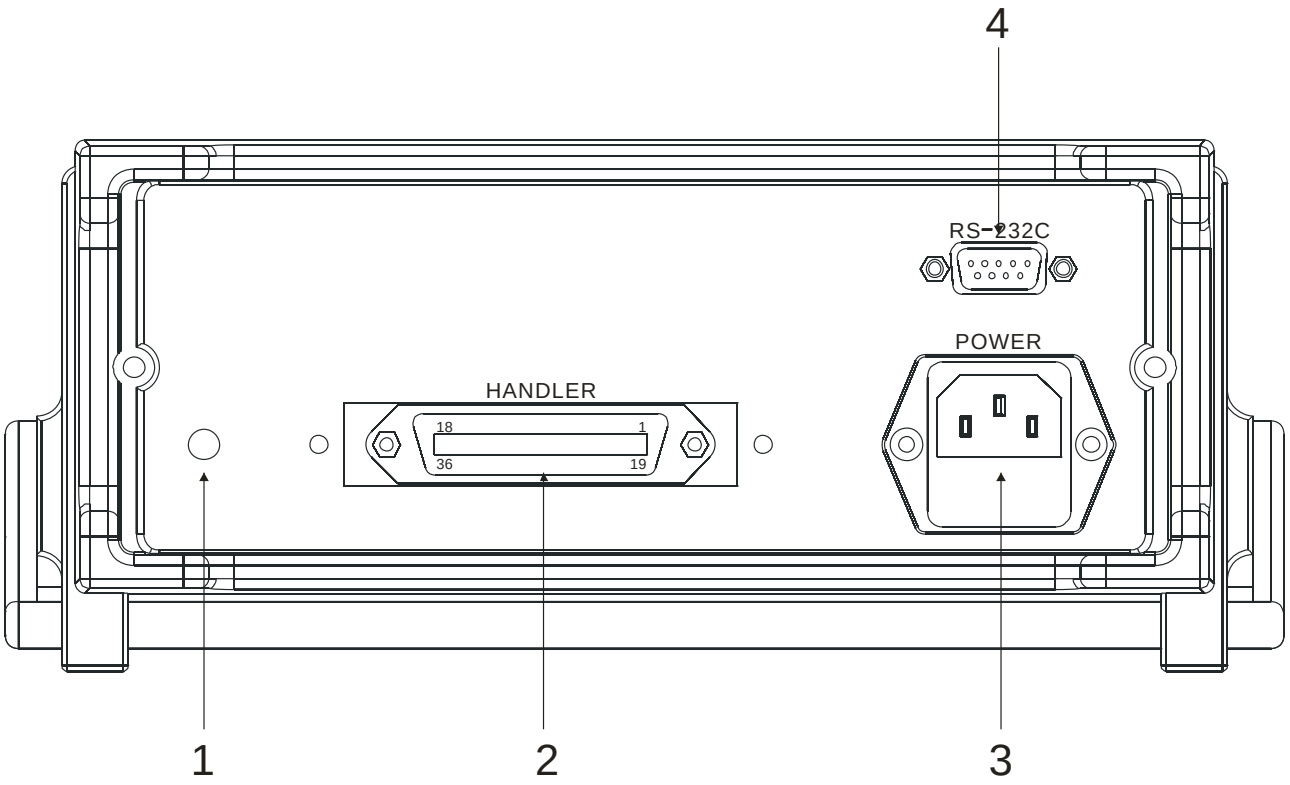
Pic3-4 VFD

	This indicator lights to indicate RS-232C or GP-IB interfaces is on work.
	This symbol indicates that the buzzer is enabled.
AUTO	This symbol appears to indicate that the resistance or voltage range is set to auto-range.
NG	Failure
GD	Qualified
Hi	Higher
IN	In
Lo	Lower
COMP	This symbol lights to indicate use of either the comparator function or set.
SET	Comparator settings
HIGH	Comparator Upper limit
LOW	Comparator Lower limit
	Keyboard lock
DH	Data hold
EX	External (trigger)
TRIG	Manual trigger signs.
F M S	Speed: fast, medium and slow.
VLMT	20mVclamp level sign

Show the current range numbers in measurement state or in a comparator set display the numbers of comparison record.

Shift Shift function

3.2 Back panel



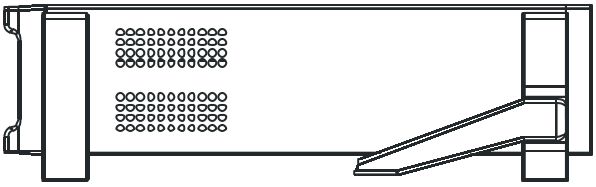
Pic3-5 back panel

1. Instrument shell ground terminal
2. Handler interface. (Optional)
   Used to the output signal of comparator and external trigger signal input.
3. Power outlet and the fuse box.
4. RS232C interface.
   Use straight-hole DB-9 cable.

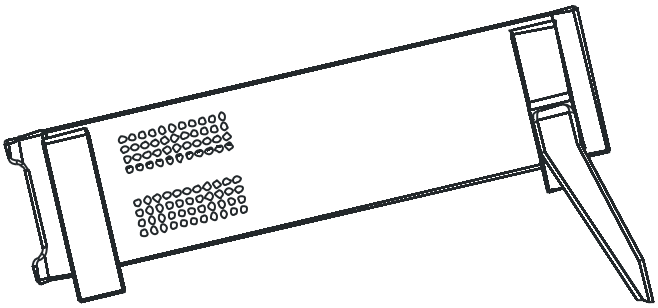
3.3 Instrument Handle

Instrument handle is capable of being adjusted. Hold the handle on both sides at the same time pull to both sides lightly, and then rotate the

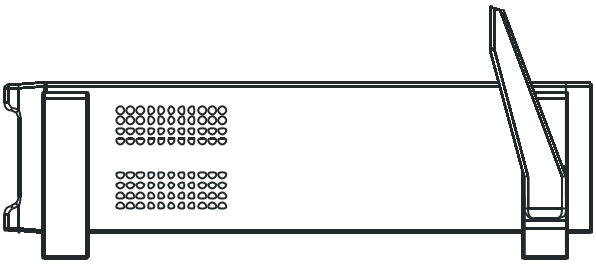
handle. Handle can be adjusted to four positions as follows:



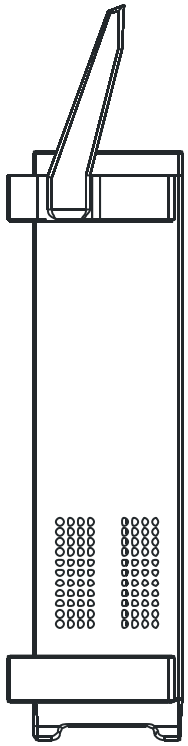
Visual Position 1



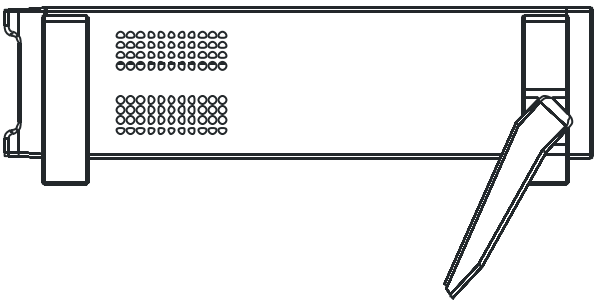
Visual Position 2



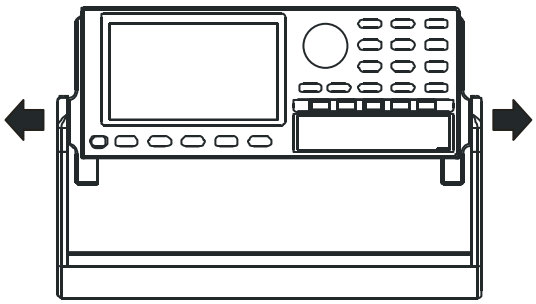
Visual Position 3



Mobile location



Remove location side view



Remove location front view

Remove the handle position. (Pull to both sides until the handle removed.)

3.4 Powering On/Off

3.4.1 Powering ON

The key”⏻” on the bottom left side of the panel is the power switch.

 Powering on

 Powering off

3.4.2 The boot sequence:

Turn on HT3561, A self-test process runs to test devices for errors.

- the whole field light above the VFD;
- The company name, model and version number is displayed;
- Instruments self-test.

3.4.3 Default boot:

The default value will be loaded in the boot after the instrument complete the self-test.

Boot default value is composed of two parts, part of the inherent value of equipment and the value of previous settings.

The inherent value of equipment:

- Measurement mode: R- θ
- Data hold:off
- Trigger Mode: Internal.

Inherit previous value settings :

- Measurement Speed
- Range
- Remote
- Comparators
- Buzzer

3.4.4 Warm-up time:

In order to reach the specified accuracy, instruments need to preheat at least 15 minutes.

3.5 Preparing for Measurement

3.5.1 Connecting the Measurement Leads

If you use a random spin-off of "Kelvin" clip to measure, connect the clip as shown in the following figure.

Screw BNC of measurement cables in the Sense and Drive.

Warning: Forbid putting AC current source or voltage source to access to the measurement client directly. Access energy storage element to the measurement client after discharging.

3.5.2 Selecting the measurement range

Press "量程自动" to switch the manual automatic .While switch to the Auto range state, the word "AUTO" will be displayed on screen, HT3561 will automatically choose the most appropriate measurement range from the following table.

Table3-1 Range number, range resistance and range changes process

Range No.	range resistance	Up range	Down range
1	10mΩ	↓	↑

2	100mΩ	31mΩ ↓ 310mΩ ↓ 3.1Ω ↓ 31Ω ↓ 310Ω ↓ 3.1kΩ	30mΩ ↑ 300mΩ ↑ 3Ω ↑ 30Ω ↑ 300Ω ↑ 3kΩ
3	1Ω		
4	10Ω		
5	100Ω		
6	1kΩ		

In the manual state range, the user can press "量程 ▲" and "量程 ▼" key to manually set the resistance range.

Press "5V50V" key to switch voltage range.

Tip:

Manual range can be used effectively to improve measurement speed.
If equipment can not choose the appropriate range in the automatic range, please execute zero adjust.
Please refer to the "Clear Calibration" section about zero adjusting.

3.5.3 Select the sampling rate

The sampling process is generated from the measurement – analog - digital conversion - to display the measurement results of operations and sub-election results. This period is known as the sampling time period. Sampling rate refers to the completion of the sampling frequency per second.

HT3561 provides for the user to choose three rates, It is capable of using the "speed" button to the cycle set:

Fast speed
Medium speed
Slow speed

Reference：

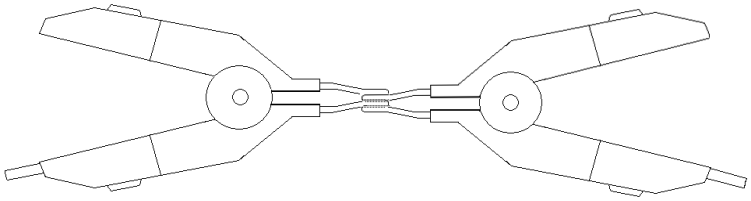
More information on the sampling rate, please see "Appendix A".

3.5.4 Zero adjust

For accurate measurements, zero-adjust needs to be performed before

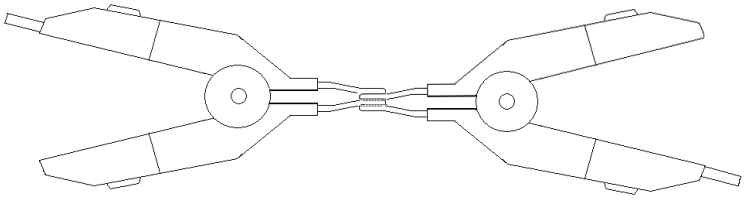
measurement.

1. Press " 清零 7 " key to get ready to zero clear. Connect the leads as shown below.



Pic3-6 Right connection

The below example is wrong!



Pic3-7 Wrong connection

2. Click " 确定 ↵ " button to start zero-adjust. In the automatic measurement mode, the equipment will do zero-adjust to all measurement ranges. In manual mode equipment only do zero-adjust to the current mode.

After zero-adjust is completed, the data will be stored in nonvolatile memory.

3. After zero-adjust, instruments can return to the measurement mode automatically.

3.5.5 Show the deviation

HT3561 can show the value and the deviation of comparator operation results in the second line of the VFD in addition to show VFD direct value.

Keys "Δ/%",can choose the following optional options:

Δ Absolute deviation

Δ% Relative deviation

High/In/Low comparator results

Details:

$$\text{Absolute deviation}\Delta ABS = \text{direct reading value} - \text{nominal value}$$

$$\text{Relative deviation}\Delta = \frac{\text{direct reading value} - \text{nominal value}}{\text{nominal value}} \cdot 100$$

Example: nominal value is 100 ， direct reading value is 90Ω

Absolute deviation Δ ABS = 90 － 100 = -10.0000Ω

Relative deviation Δ = (90-100)/100 • 100 = -10%

Reference: Details on the nominal value set refer to "Comparator" section.

3.5.6 Keyboard lock

Click "key lock" key can lock or unlock the keyboard.

Only click "键锁 5" is valid after the keyboard being locked, the other key is invalid.

instructing keyboard has been locked .

3.5.7 20mV clamp protection (Only HK3560 have this Funtion)

In the measurement of contact resistance, the actual open circuit voltage should clamp below 20mV to protect the oxide film of metal surface from breaking down.

Click "20mV" button to open or close the open-circuit voltage of 20mV clamp protection.

20mV displayed on the screen means that 20mV clamp open.

4 Comparator

In this chapter you will learn the following:

- Comparator on/off.
- Comparator record number setting.
- Setting the comparator number: including nominal value (reference value) of comparison gear and limit value.
- Setting comparator buzzer: include turning on the buzzer, setting ring volume and setting status.

4.1 Comparator on/off

The comparator of HT3561 is off by default, you can press the " 分选 · " to turn it on.

Comparator system will no longer work after comparators being turned off. The handler interface of the comparator output signal also will be turned off.

4.2 Choosing Comparator record number

1. Press "shift + 分选 · " to set comparator.
2. The lower right corner shows record number. The flickering record number Rec.09 means that it is ready to set the record number.
3. Press the "量程 ▲" or "量程 ▼" to choose record number. You may select numbers in the range from 01 to 30.
4. After the choosing record number, you can:

   a) Click " 确定 ↵ " to enter the comparing value interface to input a nominal value, upper and lower limits.

   b) Or press " 退回 ← " to quit from the comparator setting. Gear number is auto-save and used for subsequent calculations.

4.3 Comparison value settings

Resistance settings

Voltage settings

1. Press “shift” and “分选 ·” to enter the comparator setting.
2. According to the method of the last section, set up a record number and press "OK" to enter the comparison value of input interface. The current value flashes.
3. Press the "量程 ▼" or “量程 ▲” to select a nominal value in the first line, the higher limit of second line (HIGH) and lower limit of the third line (LOW), as well as the voltage nominal value, the higher limit value and lower limit value.
4. Press the number keys to enter the value you want. Shift + number key to choose uint.
5. Click "确定 ↵" button or "shift + flat rate" to complete the current input value.
6. Repeat step 3 to 5 to complete the other input values.
7. Press the "退回 ←" key to return to the measurement state.

Tips: The use skills: when the current value blink, you do not have to press "确定 ↵" button to enter the input line, but input directly by the numeric keys.

Note: In the digital input line, click "确定 ↵" button means that ratio is 1.

For example: Press 10 and "确定 ↵" to the input value was 10Ω.

4.4 Buzzer setting

4.4.1 Turn on the buzzer:

Click "讯响 9" key to turn on or turn off the buzzer.

“ ” means the buzzer is working.

4.4.2 Beep-mode setting:

1. Press "shift + 讯响 9" button to enter the buzzer setting interface.
2. When the first line displaying blink "BEEP-V",you can set the volume of beeper.Press 确定 to enter it and adjust knob to choose beep volume.
3. Adjust knob to choose the first display line shows for the "BEEP-B", you can set beep-mode. The second display line shows the current beep-mode state (GD or NG).
4. Press " 确定 " button to enter the buzzer setting. You can set whether pass (GD) beep nor failed (NG) beep.
5. Press "退回" button to cancel settings and return to a higher level menu.
6. Press "退回" again to over setting, the setting value has been stored and returned to the measurement state.

4.5 Comparator work

Turn on comparator, the current measured value compare with the upper limit and lower limit.

Conditions	**Results**
Lower limit value<the current value <Upper limit value	IN
The current value ≤ Lower limit	LO
The current ≥ value upper limit	HI

Comparator output truth table:

Resistance / Voltage	Hi	IN	Lo
Hi	NG	NG	NG
IN	NG	GD	NG
Lo	NG	NG	NG

Note: The comparing results of voltage (Hi / IN / Lo) will not output, the compare results of resistance output, the qualified compare results (NG / GD) will output.

For example: The current comparator value is as follows:

Resistance nominal value	**Resistance upper limit**	**Resistance lower limit**
100 mΩ	120 mΩ	80 mΩ
Voltage nominal value	**Voltage upper limit**	**Voltage lower limit**
1.5 V	1.52 V	1.48 V

Battery measurement, the measured resistance value: 100 mΩ, voltage 1.40 V, then the compare result of its output is "NG IN".

Battery measurement, the measured resistance value: 100 mΩ, voltage 1.51 V, then the compare result of its output is "GD IN".

Battery measurement, the measured resistance value: 150 mΩ, voltage 1.51 V, then the compare result of its output is "NG Hi".

Battery measurement, the measured resistance value: 60 mΩ, voltage 1.50 V, then the compare result of its output is "NG Lo".

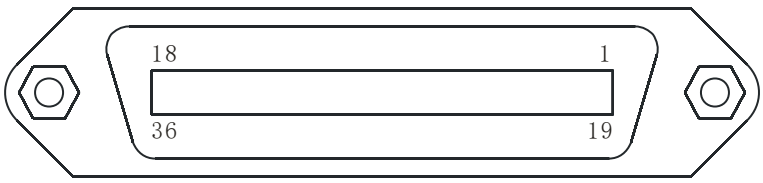
5 Handler Interface

Note: The processor (Handler) interface is the optional interface.
You will learn the following:

- Terminal
- Connect and interface schematics
- Periodic table

HK3560 provide users with a powerful processor interface, the interface includes the comparator signal, such as EOC (measurement signal), TRIG (External trigger start), comparators record number and other input signal. Through the interface, the apparatus can easily make up with the user's system control components to complete automatic control function.

5.1 Terminals blocks and signal specification



Pic5-1 Terminal Blocks

Power supply side

Port number	Terminal Name	Meaning
1	GND	Internal power supply
17	EXT.GND	Users power supply
18	EXT.GND	Users power supply
19	VCC	Internal power
35	EXT.DC+5V	Users provide terminal circuit +5 V power. Note: Terminal power supply is not provided by the apparatus, but by the users.
36		

Comparison of the output signal

3	EOC	Measurement completion signal（busy signal）.
9	NG	Fail comparator output.
8	GD	Qualified comparator output.
7	HI	The ultra-comparator (fail) output.
6	IN	Qualified comparator output.
5	LO	Under the ultra-comparator (fail) output.

External control signal input

11	Comp 4	Optional terminal of comparator record gear optional 1~30
12	Comp 3	
13	Comp 2	
14	Comp 1	
15	Comp 0	
16	Trig	Measurement trigger side

Comparator record gear selection table

COMP 4-0	**Record number**	**COMP 4-0**	**Record number**	**COMP 4-0**	**Record number**	**COMP 4-0**	**Record number**
11111	No change	10111	7	01111	15	00111	23
11110	0	10110	8	01110	16	00110	24
11101	1	10101	9	01101	17	00101	25
11100	2	10100	10	01100	18	00100	26
11011	3	10011	11	01011	19	00011	27
11010	4	10010	12	01010	20	00010	28
11001	5	10001	13	01001	21	00001	29
11000	6	10000	14	01000	22	00000	No change

Electrical Parameters:

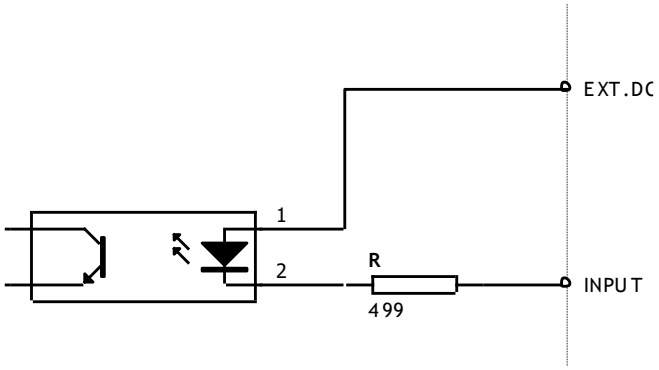
Power Requirements: +5 ~ 8VDC

Output signal: The pull-up resistor built-collector output.
Optocoupler isolation.
Active-low.
Maximum voltage: power supply voltage.
Maximum current: 5 ~ 8mA.

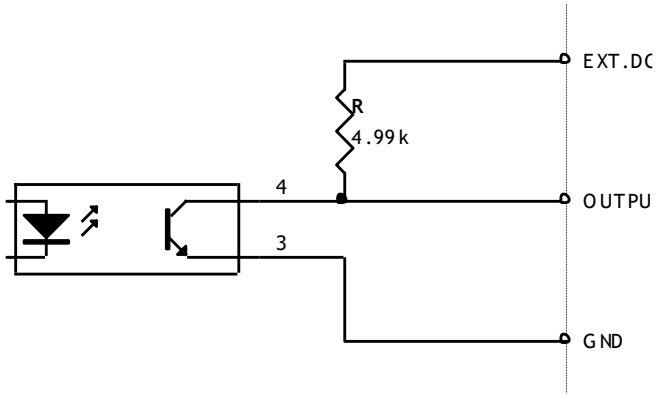
Input signal: Photoelectric isolation.
Active-low.
Maximum current: 30mA

Note: In order to avoid damage to interfaces, do not to exceed the power supply voltage requirements.
Please connect after turning off the machines in order to avoid damaging interface.
If the output signal is used to control relays, the relays must use reverse energy to release diode.

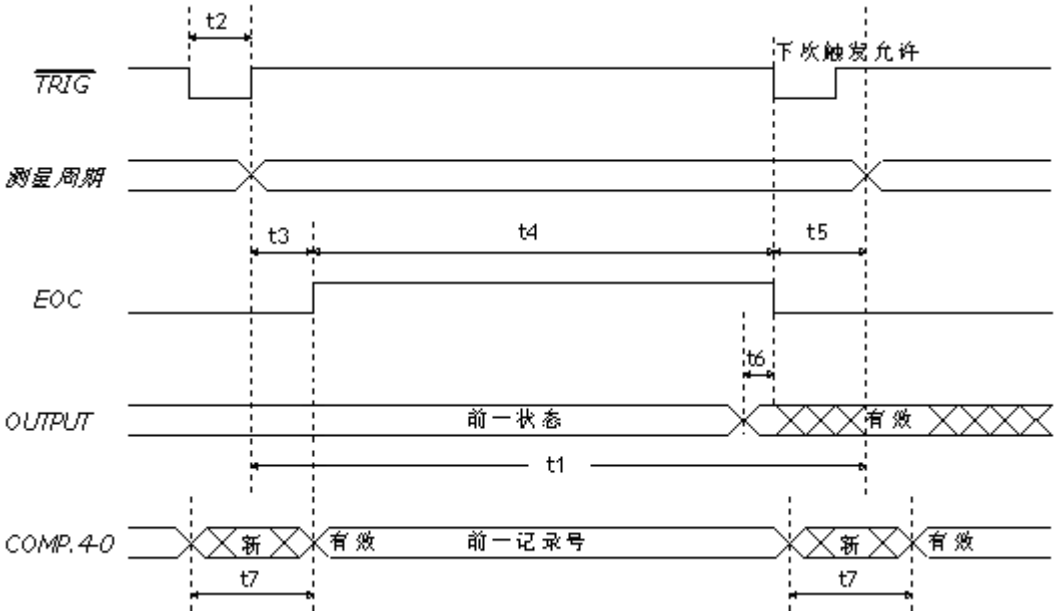
Input schematic



Output schematic



5.3 The periodic table



	Description		Time (approx.)		
			min	Type	max
t1	One conversion cycle (Range maintain, the internal trigger)	Fast-speed	52ms	54ms	56ms
		Medium-speed	115ms	125ms	130ms
		Slow-speed	0.45s	0.5s	0.55s
t2	Trig Signal pulse width			1ms	-
t3	Trig Effective to the beginning of the conversion interval		-	25μs	
t4	A/D conversion and computing time（EOC[BUSY]） (Range maintain, the external trigger）	Fast-speed	44ms	46ms	48ms
		Medium-speed	186ms	188ms	190ms
		Slow-speed	1.05s	1.056s	1.07s
t5	output the results time (secondary display off)		7ms	8ms	9ms
t6	Comparator output to the end time of EOC		-	10μs	-
t7	comparator records number pulse width			1ms	-

Appendix specification

Appendix A, you will learn the following:

- Specifications.
- General specifications.
- Dimensions.

Specifications

The following data was obtained under the following conditions:

Temperature condition: 23 ℃ ± 5 ℃

Humidity condition: 80% R.H.

Zero-adjust: Clear before measurement

Warm-up time: > 60 minutes

Calibration Time: 1 year

Sampling rate: Fast-speed: about 20 times / sec

Medium-speed: about 9 times / sec

Slow-speed: 2times / sec

Measurement current accuracy: 1%

The accuracy of the measurement current frequency: 1kHz±0.1Hz

Resistance indicator

Range		Max value	Resolution	Fast	Medium	Slow	Test current
1	**10mΩ**	32.00mΩ	10μΩ	0.5%+4 counts	0.5%+2 counts	0.5%+2 counts	10mA
2	**100mΩ**	320.0mΩ	100μΩ	0.5%+4 counts	0.5%+2 counts	0.5%+1 counts	10mA
3	**1Ω**	3.200Ω	1mΩ	0.5%+4 counts	0.5%+2 counts	0.5%+1 counts	1mA
4	**10Ω**	32.00Ω	10mΩ	0.5%+4 counts	0.5%+2 counts	0.5%+1 counts	0.1mA
5	**100Ω**	320.0Ω	100mΩ	0.5%+4 counts	0.5%+2 counts	0.5%+1 counts	5μA
6	**1kΩ**	3.200kΩ	1Ω	0.5%+4 counts	0.5%+2 counts	0.5%+1 counts	2μA

Voltage indicators

Range		Max value	Resolution	Fast	Medium	Slow
1	**5V**	6.000V	1mV	0.1%+4 counts	0.1%+1 counts	0.1%+ 1 counts
2	**50V**	60.00V	10mV	0.1%+4 counts	0.1%+1 counts	0.1%+ 1 counts

General Specification:

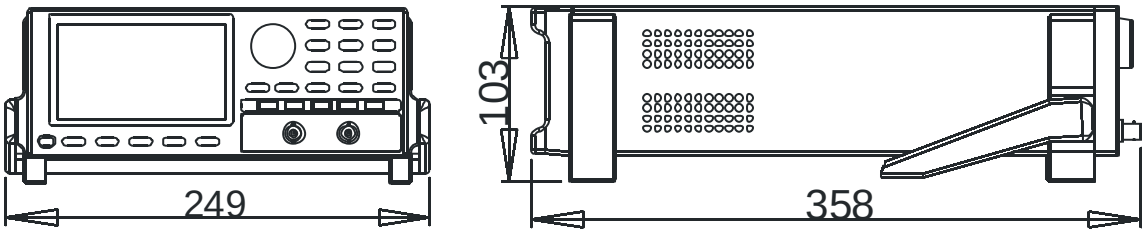
Screen: a vacuum four-color screen (VFD), the screen size of 98mmx55mm.
Display parameters: direct reading, the percentage of error and compare the results.
Maximum readings: resistance 3200, voltage 6000.
Trigger: Internal, external and remote trigger.
Range: automatic and manual.
Clear: Short-circuit clear.
Comparators: output NG-LO, GD-IN, NG-HI, the built-in compare record of 30 components.
Buzzer: GD, NG, off settings.
Measurement side: 4 client (including the two detect-side and two drive-side).
Interface: RS232 interface;
Optional: Processor (Handler) interface;
Optional: GPIB (IEEE488) interface.
Programming languages: SCPI

Environment: Indicators: temperature 15 ℃ ~ 35 ℃ Humidity <80% RH
Operation: Temperature 10 ℃ ~ 40 ℃ Humidity 10 ~ 90% RH
Storage: Temperature 0 ℃ ~ 50 ℃ Humidity 10 ~ 90% RH

Power: 198V ~ 252VAC 48.5Hz ~ 52.5Hz
Fuse: 0.2A s-melting
Power: 15VA maximum
Weight: 3.5kg appro.

Random Annex: Manual, HK9350 Kelvin four-terminal cable, HK9360 measurement probe, HK9800 communications cable, AC power cord, warranty certificate.

Dimensions



K

k