# HDS100 Series Oscilloscope Meter

# User Manual

**For product support, visit:www.owon.com.hk/download**

※：The illustrations, interface, icons and characters in the user manual may be slightly different from the actual product. Please refer to the actual product.

**Jan. 2026 edition V1.0.4**

Copyright © LILLIPUT Company. All rights reserved.

The LILLIPUT's products are under the protection of the patent rights, including ones which have already obtained the patent rights and those which are applying for. The information in this manual will replace all materials published.

The information in this manual was correct at the time of printing. However, LILLIPUT will continue to improve products and reserves the rights to change specification at any time without notice.

owon® is the registered trademark of the LILLIPUT Company.

**Fujian LILLIPUT Optoelectronics Technology Co., Ltd.**
No. 19, Heming Road
Lantian Industrial Zone, Zhangzhou 363005 P.R. China

**Tel:** +86-596-2130430 **Fax:** +86-596-2109272

**Web:** www.owon.com **E-mail:** info@owon.com.cn

# General Warranty

We warrant that the product will be free from defects in materials and workmanship for a period of 1 years from the date of purchase of the product by the original purchaser from our company. This warranty only applies to the original purchaser and is not transferable to a third party.

If the product proves defective during the warranty period, we will either repair the defective product without charge for parts and labour, or will provide a replacement in exchange for the defective product. Parts, modules, and replacement products used by our company for warranty work may be new or reconditioned like new. All replaced parts, modules and products become the property of our company.

In order to obtain service under this warranty, the customer must notify our company of the defect before the expiration of the warranty period. Customer shall be responsible for packaging and shipping the defective product to the designated service centre, a copy of the customers proof of purchase is also required.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care.

We shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than our company representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of not our supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

Please contact the nearest Sales and Service Offices for services.

**Excepting the after-sales services provided in this summary or the applicable warranty statements, we will not offer any guarantee for maintenance declared or hinted, including but not limited to the implied guarantee for marketability and special-purpose acceptability. We should not take any responsibilities for any indirect, special, or consequent damages.**

# TABLE OF CONTENTS


## 1. SAFETY INFORMATION .....1

General Safety Requirements ..... 1
Measurement Category ..... 3
Safety Terms and Symbols ..... 4

## 2. QUICK START .....5

General Inspection ..... 5
Install the Batteries ..... 5
Adjusting the Tilt Stand ..... 6
Power on/off ..... 6
Selecting the Range ..... 7
Measurement Connections ..... 7

## 3. INSTRUMENT PANEL ..... 8

Front Panel and Keys ..... 8
Side Panel ..... 10

## 4. HOW TO USE THE MULTIMETER ..... 11

About This Chapter ..... 11
Instrument Interface ..... 11
  Input terminals ..... 13
Making Measurements ..... 13
  Measuring AC or DC Voltage ..... 13
  Measuring Resistance ..... 14
  Measuring Continuity ..... 15
  Measuring Diodes ..... 16
  Measuring Capacitance ..... 16
  Measuring Frequency ..... 17
  Measuring DC or AC Current ..... 18
Multimeter Features ..... 19
  Setting Scale ..... 19
  Setting Range ..... 19
  Making MAX/MIN Measurements ..... 20
  Making Comparative Measurements ..... 20
  Value Hole Mode ..... 21
  Making Relative Measurements ..... 22

## 5. HOW TO USE THE OSCILLOSCOPE .....23

Introduction to the User Interface of the Oscilloscope ..... 23
Measuring System ..... 25

Automatic Measurement ..... 25
Trigger System ..... 26

6. SAVE AND RECALL PICTURE ..... 28

7. SYSTEM SETTINGS ..... 29

8. TECHNICAL SPECIFICATIONS ..... 33

HDS120 Series Multimeter Specification ..... 33
HDS160 Series Multimeter Specification ..... 35
Oscilloscope Specification ..... 37
General Specification ..... 38

9. APPENDIX ..... 39

Appendix A: List of Accessories ..... 39
Appendix B: Maintenance and Cleaning ..... 39
General maintenance ..... 39
Charging and Replacement of Battery ..... 40
Replacement of Lithium Battery ..... 41

# 1.Safety Information

**(Be sure to read the safety information before using this product.)**

## General Safety Requirements

**Before any operations, please read the following safety precautions to avoid any possible bodily injury and prevent this product or any other products connected from damage. In order to avoid any contingent danger, this product is only used within the range specified.**

- **Limit operation to the specified measurement category, voltage, or amperage ratings.**
- **Do not use the oscilloscope meter if it is damaged.** Before you use the oscilloscope meter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- **Do not use the test leads provided for other products.** Use only the certified test leads specified for this product.
- Inspect the test leads for damaged insulation or exposed metal.
- Before use, verify the oscilloscope meter's operation by measuring a known voltage.
- **Only the qualified technicians can implement the maintenance.**
- **Always use the specified battery type.** The power for the oscilloscope meter is supplied with a battery. Observe the correct polarity markings before you insert the batteries to ensure proper insertion of the batteries in the oscilloscope meter.
- **Check all Terminal Ratings.** To avoid fire or shock hazard, check all ratings and markers of this product. Refer to the user's manual for more information about ratings before connecting to the oscilloscope meter.
- Do not operate the oscilloscope meter with the cover or portions of the cover removed or loosened.
- **Use Proper Fuse.** Use only the specified type and rating fuse for the oscilloscope meter.
- **Do not operate if in any doubt.** If you suspect damage occurs to the

oscilloscope meter, have it inspected by qualified service personnel before further operations.

- **Do not operate this product in wet or damp conditions.**
- **Do not operate in an explosive atmosphere.**
- **Keep product surfaces clean and dry.**
- Do not apply more than the rated voltage (as marked on the oscilloscope meter) between terminals, or between terminal and earth ground.
- When measuring current, turn off the circuit power before connecting the oscilloscope meter in the circuit. Remember to place the oscilloscope meter in series with the circuit.
- When servicing the oscilloscope meter, use only the specified replacement parts.
- Use caution when working above 60 V DC, 30 V AC RMS, or 42.4 V peak. Such voltages pose a shock hazard.
- When using the test leads, keep your fingers behind the finger guards on the test leads.
- Remove the test leads from the oscilloscope meter before you open the battery cover.
- To avoid false readings, which may lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator appears and flashes.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- **Use the proper terminals, function, and range for your measurements.** When the range of the value to be measured is unknown, set the rotary switch position as the highest range, or choose the auto ranging mode. To avoid damages to the oscilloscope meter, do not exceed the maximum limits of the input values shown in the technical specification tables.
- Connect the common test lead before you connect the live test lead. When you disconnect the leads, disconnect the live test lead first.
- Before changing functions, disconnect the test leads from the circuit under test.

# Measurement Category

The oscilloscope meter has a safety rating of 1000 V,CAT III.

## Measurement category definition

**Measurement CAT I** applies to measurements performed on circuits not directly connected to the AC mains. Examples are measurements on circuits not derived from the AC mains and specially protected (internal) mains-derived circuits.

**Measurement CAT II** applies to protect against transients from energy-consuming equipment supplied from the fixed installation, such as TVs, PCs, portable tools, and other household circuits.

**Measurement CAT III** applies to protect against transients in equipment in fixed equipment installations, such as distribution panels, feeders and short branch circuits, and lighting systems in large buildings.

**Measurement CAT IV** applies to measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary over current protection devices and ripple control units.

# Safety Terms and Symbols

## Safety Terms

**Terms in this Manual.** The following terms may appear in this manual:

⚠ **Warning:** Warning indicates the conditions or practices that could result in personal injury or death.

⚠ **Caution:** Caution indicates the conditions or practices that could result in damage to this product or other property.

**Terms on the Product.** The following terms may appear on this product:

**Danger:** It indicates an injury or hazard may immediately happen.

**Warning:** It indicates an injury or hazard may be accessible potentially.

**Caution:** It indicates a potential damage to the instrument or other property might occur.

## Safety Symbols

**Symbols on the Product**. The following symbol may appear on the product:

| | | | |
|---|---|---|---|
| ⎓ | Direct current (DC) | ⊟ | Fuse |
| ∼ | Alternating current (AC) | ⚠ | Caution, risk of danger (refer to this manual for specific Warning or Caution information) |
| ≂ | Both direct and alternating current | CAT I | Category I overvoltage protection |
| ⏚ | Ground terminal | CAT II | Category II overvoltage protection |
| CE | Conforms to European Union directives | CAT III | Category III overvoltage protection |
| ⧈ | Equipment protected throughout by double insulation or reinforced insulation | CAT IV | Category IV overvoltage protection |

# 2. Quick Start

## General Inspection

After you get a new oscilloscope meter, make a check on the instrument according to the following steps:

1. **Check whether there is any damage caused by transportation.**

   If it is found that the packaging carton or the foamed plastic protection cushion has suffered serious damage, do not throw it away first till the complete device and its accessories succeed in the electrical and mechanical property tests.

2. **Check the Accessories.**

   The supplied accessories have been already described in the *Appendix A: Enclosure* of this Manual. You can check whether there is any loss of accessories with reference to this description. If it is found that there is any accessory lost or damaged, please get in touch with our distributor responsible for this service or our local offices.

3. **Check the Complete Instrument.**

   If it is found that there is damage to the appearance of the instrument, or the instrument can not work normally, or fails in the performance test, please get in touch with our distributor responsible for this business or our local offices. If there is damage to the instrument caused by the transportation, please keep the package. With the transportation department or our distributor responsible for this business informed about it, a repairing or replacement of the instrument will be arranged by us.

## Install the Batteries

The oscilloscope meter is powered by a 3.7V (18650) battery.

⚠ **Warning:** To avoid false readings, which could lead to possible electric shock or personal injury, please stop using and connect the device to the power supply for charging or replace the battery as soon as the low battery indicator appears.
Before replacing the battery, turn off the meter, disconnect test

leads and any connectors from any circuit under test, remove test leads from the input terminals. Use only the specified battery type.

**Note:**When charging,disconnect test leads from the input to open the charging cover and charge the device.

Use the following procedure to install the battery:

**(1)** Power off, remove test leads and any connectors from the input terminals.

**(2)** Lift the tilt stand and loosen the screws with a suitable Phillips screwdriver and remove the battery cover.

**(3)** Observe the battery polarity indicated inside the battery compartment, Insert the battery.

**(4)** Place the battery cover back in its original position and tighten the screws.

⚠ **Caution:** To avoid instruments being damage from battery leakage, remove the batteries and store them separately if the oscilloscope meter is not going to be used for a long period.

# Adjusting the Tilt Stand

Pull the tilt stand outward to its maximum reach (about 85° to the meter body).

# Power on/off

It can be turned on in the following ways:

- Press the ⏻ button at the bottom left of the host;
- Power on automatically after battery installation.

**Note：**

After the first boot, Reset, or battery removal, you will need to configure th e date and time manually. Please refer to page **29** for detailed instructions on “**System Settings**”, specifically under the **Date | Time** section.

It can be turned off in the following ways:

- Manual shutdown,tap and hold ⏻ button (when the power is connected, the shutdown will enter the standby mode);

- Automatic shutdown, emit a short beep one minute before shutdown, emit a long beep during shutdown;
- Low power automatic shutdown.

## Selecting the Range

- Auto ranging is set as default when the meter is powered on, **Auto** is displayed.
- Under automatic range,press ▲ or ▼ to enter the manual range mode.
- Under manual range, each additional press of ▲ sets the oscilloscope meter to the next higher range; each additional press of ▼ sets the oscilloscope meter to the next lower range.
- Under manual range,press AUTO to enter the auto range mode.

**Note:**Manual range is not available when measuring capacitance.

## Measurement Connections

After selecting the desired measurement function,to avoid instrument damage, do not discretionarily switch the measurement function when measuring.

# 3.Instrument Panel

## Front Panel and Keys

The front panel and keys of the oscilloscope meter are shown in Figure 3-1:

Figure 3-1：Front panel

Description:

| Num | Illustration in multimeter mode | Illustration in oscilloscope mode |
|---|---|---|
| 1 | Display area. | |
| 2 | The **F1 - F4** keys are multi-function keys. In each menu mode, press the corresponding key to select the corresponding menu item. | |
| 3 | Function key,press to select the corresponding function. | Only ≅V and A≅ function. |

| | | |
|---|---|---|
| 4 | Comparative value key. | Trigger menu key. |
| 5 | Function of direction keys▲ ▼:used for changing range.<br>Function of AUTO key:Restore auto gear. | Function of direction keys▲ ▼: used for the amplitude scales.<br>Function of direction keys◀ ▶: used for zooming waveforms and the time base changing.<br>Function of AUTO key:Perform automatic setup. |
| 6 | Relative value key. | Trigger value key,press it will automatically setting the trigger level to half of the current signal's Vpp. |
| 7 | Enter the system settings key. | |
| 8 | Image save key. | |
| 9 | Measurement input port. | |
| 10 | Value hold key. | Stop/Run key. |
| 11 | ⏻:Long press to turn off, short press to turn on or display the status bar. | |
| 12 | Switch key for working state of oscilloscope and multimeter. | |
| 13 | Maximum and minimum value measurement button. | Measurement value display button. |

# Side Panel

Figure 3-2：Side panel

Description:

1. Charging or USB communication interface(Note:The measurement input port is not available when the interface is charging or communicating).
2. Bracket.

# 4.How to Use the Multimeter

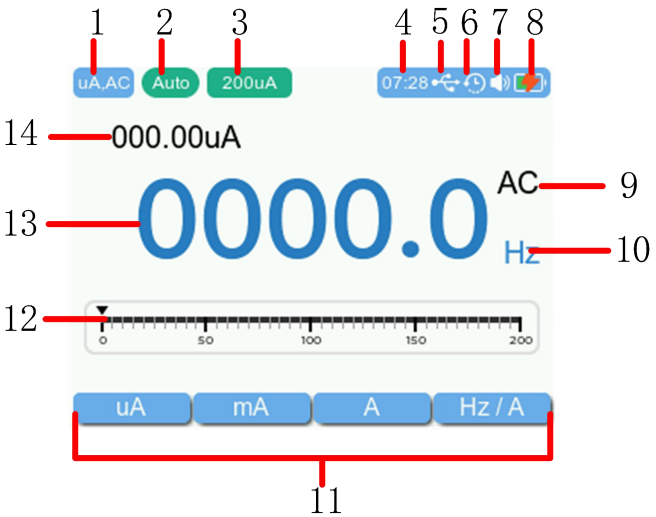
## About This Chapter

This chapter introduces the multimeter function and provides some basic examples of basic operations and how to use the menu.

## Instrument Interface

The oscilloscope meter uses four 4-mm safety banana plug input ends: **A**、**mA**、**COM**、**VΩ** ⯈| ⊣⊢.

Multimeter interface:




Multimeter interface

Description:

1. Measurement type indication:

| Measurement type | Description |
|---|---|
| V,DC、mV,DC | DC voltage measurement |
| V,AC、mV,AC | AC voltage measurement |
| Res | Resistance measurement |
| Cont | On/Off measurement |
| Diode | Diode measurement |
| CAP | Capacitance measurement |

| | |
|---|---|
| Freq | Frequency measurement |
| uA,DC、mA,DC、A,DC | DC current measurement |
| uA,AC、mA,AC、A,AC | AC current measurement |

2. Range indication: **Manu** means manual range; **Auto** means automatic range.
3. Current measurement range.
4. Time display.
5. Indicating that there is a USB cable inserted.
6. Automatic shutdown sign:Displays the flag when enabled. Closing will hide the identity.
7. Operation beep identification:Displays the flag when enabled. Closing will hide the identity.
8. Battery level and charge indication.
9. DC/AC/On-Off/Diode/Capacitance indication.
10. Main unit of measurement.
11. F1~F4 operation menu.
12. Range simulation strip.
13. Main measurement value.
14. Secondary measurement value.

## Measurement units

| Sign | Description | |
|---|---|---|
| M | Mega | 1E+06 (1000000) |
| k | kilo | 1E+03 (1000) |
| m | milli | 1E–03 (0.001) |
| μ | micro | 1E–06 (0.000001) |
| n | nano | 1E–09 (0.000000001) |

| Sign | Description | Measurement type |
|---|---|---|
| V | Voltage | Voltage |
| A | Ampere | Current |
| Ω | Ohm | Resistance |

| | | |
|---|---|---|
| Hz | Hertz | Frequency |
| % | Percent | Duty cycle |
| F | Farad | Capacitance |

## Input terminals

The terminal connections for the different measurement functions of the oscilloscope meter are described in the table below.

**Warning:** Before starting any measurement, observe the rotary switch position of the oscilloscope meter, and then connect the test leads to the correct terminals.

**Caution:** To avoid damaging the oscilloscope meter, do not exceed the rated input limit.

| Measurement key | Input terminals | | Overload protection |
|---|---|---|---|
| ≅V | VΩ ⊣⊢ | COM | 750 VAC/1000 VDC |
| Ω•))) ⊣⊢ | VΩ ⊣⊢ | COM | 250 VAC/300 VDC |
| A≅ | mA | COM | 600mA/1000V fast-acting fuse |
| | A | COM | 10A/1000V fast-acting fuse |

# Making Measurements

**Note:**When the stylus is inserted into the measurement input port **A**、**mA**、**VΩ ⊣⊢** , the instrument automatically switches to the default measurement type.

## Measuring AC or DC Voltage

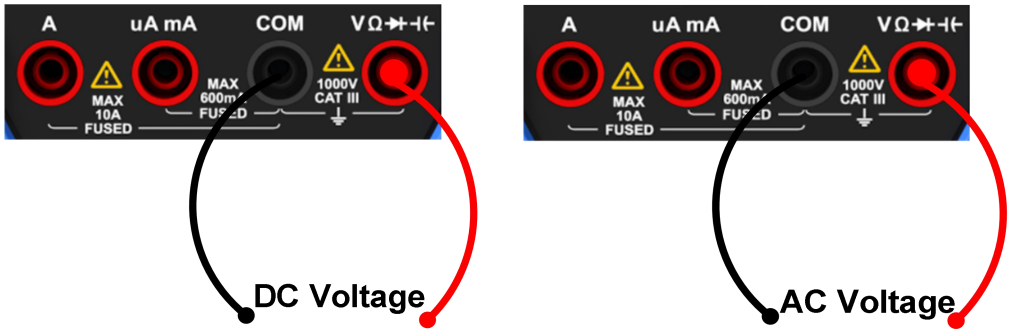
**Warning:** Do not measure any voltage of over 1000 Vdc or 750 Vac rms to avoid instrument damage or electric shock.
Do not apply more than 1000 Vdc or 750 Vac rms between the common terminal and the earth ground to avoid instrument

damage or electric shock.

This oscilloscope meter displays DC voltage values as well as their polarity. Negative DC voltages will display a negative sign on the left of the screen.

1. Press ≅V to switch **DC Voltage measurement** mode, ***,DC** will be displayed in the upper left corner(* denotes mV or V).Then press ≅V to switch into **AC Voltage measurement** mode, ***,AC** will be displayed in the upper left corner(* denotes mV or V).And then press F1 or F2 to select mV or V measurement function,press ▲ or ▼ to up and down measurement scales.
2. Connect the black test lead to the **COM** terminal and the red test lead to the VΩ terminal.

   **DC/AC Voltage Measurement connect test leads:**




3. Probe the test points and read the display.

**Note:**When measuring AC voltage, press F4 to cycle through frequency measuring and original measuring.

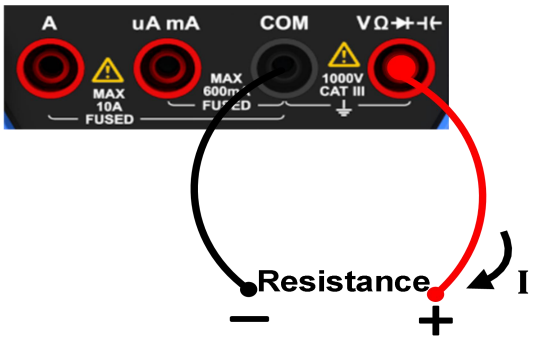
## Measuring Resistance

⚠ **Caution:** To avoid possible damage to your oscilloscope meter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before measuring resistance.

1. Press Ω to enter resistance testing mode,**Res** will be displayed in the upper left corner.

2. Connect the black test lead to the **COM** terminal and the red test lead to the **VΩ ⊣⊢** terminal.

**Resistance Measurement connect test leads:**



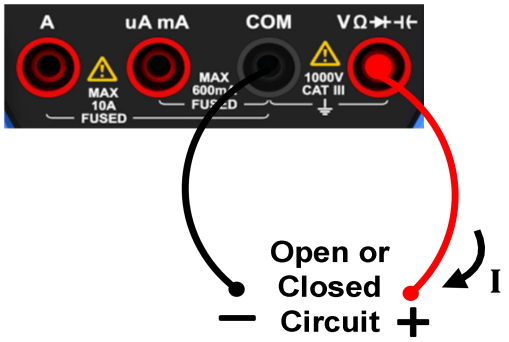

3. Probe the test points and read the display.

## Measuring Continuity

**Caution:** To avoid possible damage to your oscilloscope meter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before testing for continuity.

1. Press to enter continuity testing mode,**Cont** will be displayed in the upper left corner.
2. Connect the black test lead to the **COM** terminal and the red test lead to the **VΩ ⊣⊢** terminal.

**Continuity Measurement connect test leads:**



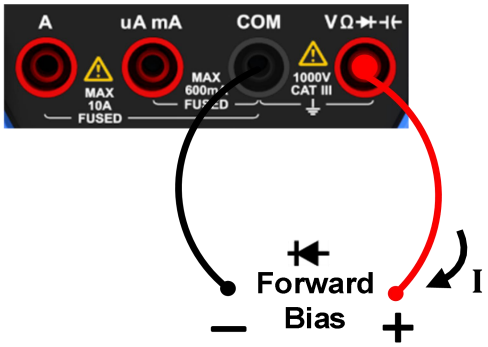

3. Probe the test points to measure the resistance in the circuit. When the reading is below 50 Ω, the oscilloscope meter will beep continuously.

## Measuring Diodes

**Caution:** To avoid possible damage to your oscilloscope meter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before testing diodes.

1. Press to enter diode testing mode,**Diode** will be displayed in the upper left corner.
2. Connect the black test lead to the **COM** terminal and the red test lead to the VΩ terminal.

**Diode Measurement connect test leads:**




3. Connect the red test lead to the positive terminal of the diode and the black test lead to the negative terminal .
4. Read the diode forward bias. If the test lead connection is reversed, the oscilloscope meter will display "OL".

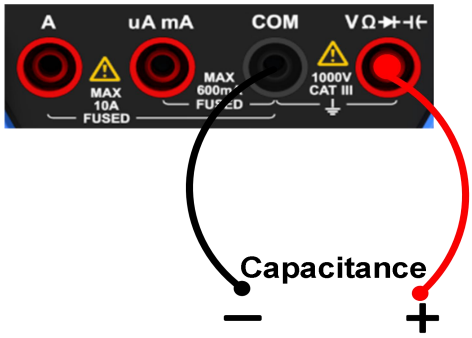
## Measuring Capacitance

**Caution:** To avoid possible damage to the oscilloscope meter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC voltage function to confirm that the capacitor is fully discharged.

1. Press to enter capacitance testing mode,**CAP** will be displayed in the upper left corner.
2. Connect the black test lead to the **COM** terminal and the red test lead to

the VΩ ⊣⊢ terminal.

**Capacitance Measurement connect test leads:**

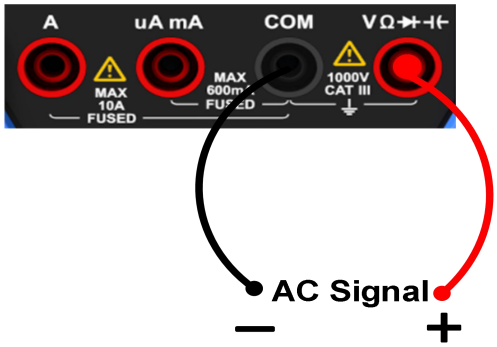



3. Probe the test points and read the display.

## Measuring Frequency

1. Press to enter frequency measurement mode,**Freq** will be displayed in the upper left corner.
2. Connect the black test lead to the **COM** terminal and the red test lead to the VΩ ⊣⊢ terminal.

**Frequency Measurement connect test leads:**




3. Probe the test points and read the display.
4. Press F4 to switch between the frequency and duty cycle measurements.

**Note:**When measuring AC voltage or AC current,press F4 to cycle through frequency measuring and original measuring.

To measure the frequency of signal with large amplitude, it is recommended to

press F4 to measure the frequency in AC voltage measurement mode.

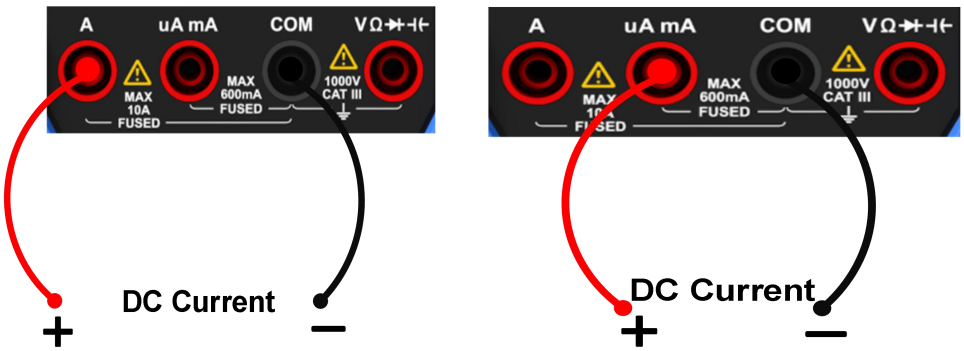
## Measuring DC or AC Current

⚠ **Warning:** Never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 250 V. Doing so will cause damage to the oscilloscope meter and possible electric shock or personal injury.

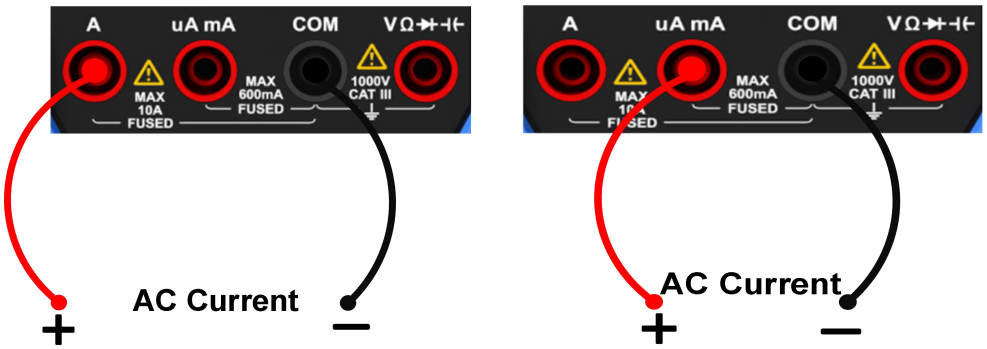
⚠ **Caution:** To avoid possible damage to the oscilloscope meter or to the equipment under test, check the oscilloscope meter's fuse before measuring current. Use the proper terminals, function, and range for your measurement. Never place the test leads in parallel with any circuit or component when the leads are plugged into the current terminals.

1. Turn off the power of the measured circuit. Discharge all high-voltage capacitors.
2. Connect the black test lead to the **COM** terminal.
3. Press A≅ to switch **DC Current measurement** mode, ***,DC** will be displayed in the upper left corner(* denotes uA、mA or A).Then press A≅ to switch into **AC Current measurement** mode, ***,AC** will be displayed in the upper left corner(* denotes uA、mA or A).Press F1 ~ F3 to select uA、mA or A.When choosing uA or mA,connect the red test lead to the mA terminal;when choosing A,connect the red test lead to the A terminal.

**DC Current Measurement connect test leads:**




**AC Current Measurement connect test leads:**




4. Disconnect the circuit path to be tested. Connect the black test lead to one side of the circuit (with a lower voltage); connect the red test lead to the other side (with a higher voltage). Reversing the leads will produce a negative reading, but will not damage the oscilloscope meter.
5. Turn on the power of the measured circuit, and read the display. Press ▲ or ▼ to the position with higher range. When "OL" is displayed, it indicates the input exceeds.
6. Turn off the power of the measured circuit and discharge all high-voltage capacitors. Remove the test leads and restore the circuit to the original condition.

**Note:** When measuring AC current, press F4 to cycle through frequency measuring and original measuring.

# Multimeter Features

## Setting Scale

1. Press AUTO to enter automatic gear mode.
2. In the automatic gear mode,press ▲ or ▼ to enter manual gear mode.

## Setting Range

1. Press ≅V to switch into **DC Voltage measurement,**then press F1 or F2 to select mV or V,and then press ▲ or ▼ to up and down

measurement scales.

2. Press ≅V to switch into **AC Voltage measurement,**then press F1 、F2 or F4 to select mV、V or Hz/V,and then press ▲ or ▼ to up and down measurement scales.
3. Press A≅ to switch into **DC Current measurement,**then press F1 ~ F3 to select uA、mA or A,and then press ▲ or ▼ to up and down measurement scales.
4. Press A≅ to switch into **AC Current measurement,**then press F1 ~ F4 to select uA、mA、A or Hz/A,and then press ▲ or ▼ to up and down measurement scales.

## Making MAX/MIN Measurements

Press MAXMIN **to** enter **MAX/MIN measurement.**When the button is pressed, it will automatically enter the manual gear mode. Press the button again to exit the MAXMIN mode and resume the automatic gear mode.

## Making Comparative Measurements

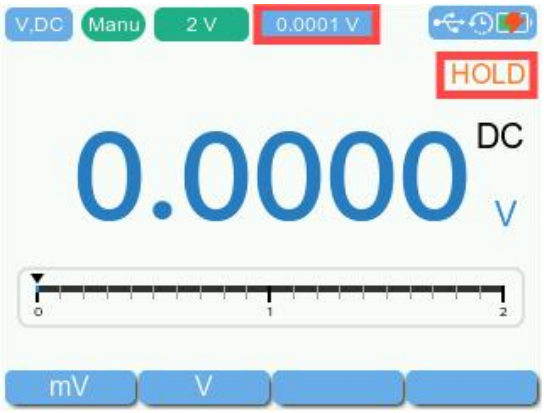
In multimeter mode,press COMP to enter comparison measurement mode.(Before using this function, it is necessary to set the corresponding comparison range. For detailed instructions on setting up, please refer to page 29, “System Settings”.)

- When the condition is met for being outside the range: If the current measurement value displayed on the main screen is outside the comparison range, it will be considered as a pass.
- When the condition is met for being outside the range: If the current measurement value displayed on the main screen is inside the comparison range, it will be considered as a fail.
- When the condition is met for being inside the range: If the current measurement value displayed on the main screen is inside the comparison range, it will be considered as a pass.
- When the condition is met for being inside the range: If the current measurement value displayed on the main screen is outside the comparison range, it will be considered as a fail.

## Value Hole Mode

The value hold mode keeps the current reading on the display.

1. Press ▶/II ,the current reading will be maintained,**HOLD** will be displayed.Simultaneously, the device will continue to display the actual measurement value in the status bar at the top of the main screen.
2. Press it again to exit the mode.

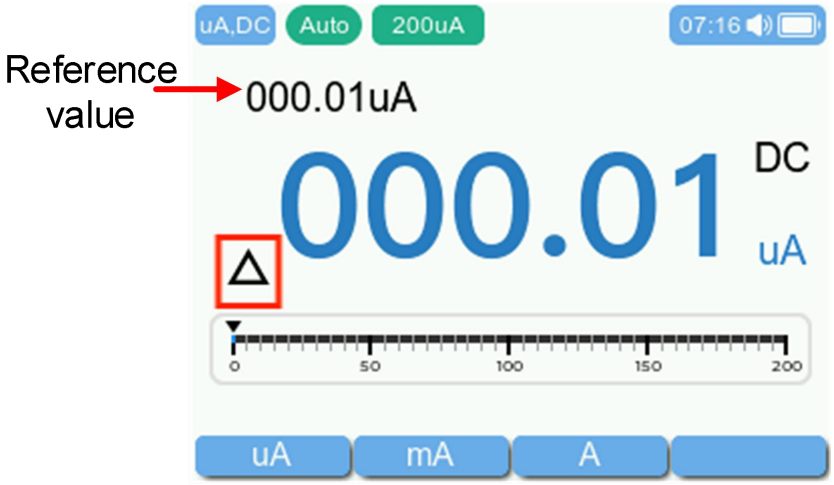


## Making Relative Measurements

When making relative measurements, reading is the difference between a stored reference value and the input signal.

1. Press REL to enter the relative mode, △ will be shown on the display.

   The measurement value when pressing REL as the reference value.In this mode,△(current reading) = input value - reference value.
2. Press it again to exit the mode.




In relative measurement, the manual range mode will be activated automatically. (When the range is exceeded, the relative value mode cannot be turned on, that is, this function is only available under the manual range mode.)

# 5.How to Use the Oscilloscope

## Introduction to the User Interface of the Oscilloscope

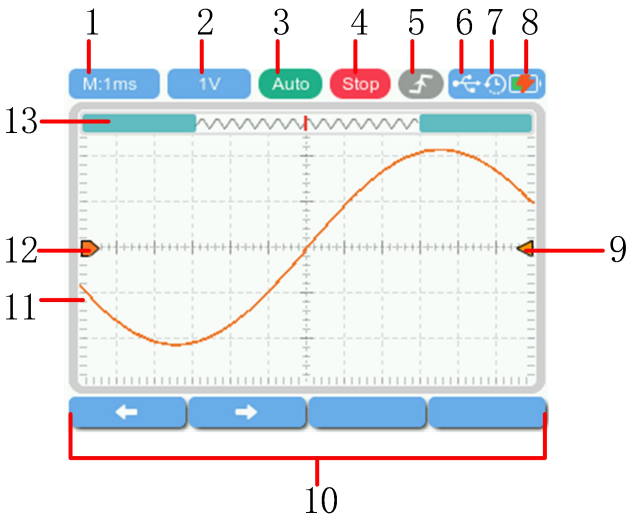



Figure 3-3：Oscilloscope Interface

Description:

1. Time base(In the vertical direction,the per grid denotes time).
2. Amplitude(In the vertical direction,the per grid denotes voltage or current).
3. Trigger operation mode:

   Auto: In this trigger mode,if the specified trigger condition is not detected, the oscilloscope will initiate a forced triggering and acquisition process to display the waveform.This triggering method is suitable for unknown signal levels or when displaying DC signals, as well as when trigger conditions occur frequently and there is no need for forced triggering.When the base time is greater than or equal to 100 milliseconds, enter the scanning mode.

   Normal: In this trigger mode, the oscilloscope only performs triggering and acquisition when the specified trigger condition is detected.This triggering method is applicable to low repetition rate signals, selective capture of specific events determined by trigger settings, and ensuring a stable display by preventing automatic triggering by the

oscilloscope.

Single: In this trigger mode,the oscilloscope performs a single triggering and acquisition only when the specified trigger condition is detected, and then stops.This triggering method is suitable for situations where a single capture of a specific event is needed for subsequent analysis (enabling translation and scaling of the current displayed waveform, with subsequent waveform data not overwriting the current waveform).After a single triggering, the oscilloscope enters the "STOP" state.

4. The trigger status indicates the following information:

   Trig：A trigger has been detected and post trigger information is being collected.

   Ready:All pre-trigger data have been obtained and the oscilloscope is ready.

   Scan:Continuously collect and display waveform data.

   Stop:Stop collecting waveform data.

5. Trigger edge type.
6. It indicates that there is a USB disk connecting.
7. Automatic shutdown sign:Displays the flag when enabled. Closing will hide the identity.
8. Battery level and charge indication..
9. Trigger level horizontal position.
10. F1~F4 operation menu.
11. Waveform display area.
12. Channel waveforms.
13. Waveform scroll bar.

# Measuring System

## Automatic Measurement

In oscilloscope mode,press MAXMIN can display automatic measurement value,the screen displays six measurement types in the lower left corner:Freq、Max、Min、Vpp、Avg and Rms.

### The automatic measurement of voltage parameters

The oscilloscopes provide automatic voltage measurements including Avg, Vpp, Rms, Max, Min and Vamp. Figure 3-4 below shows a pulse with some of the voltage measurement points.

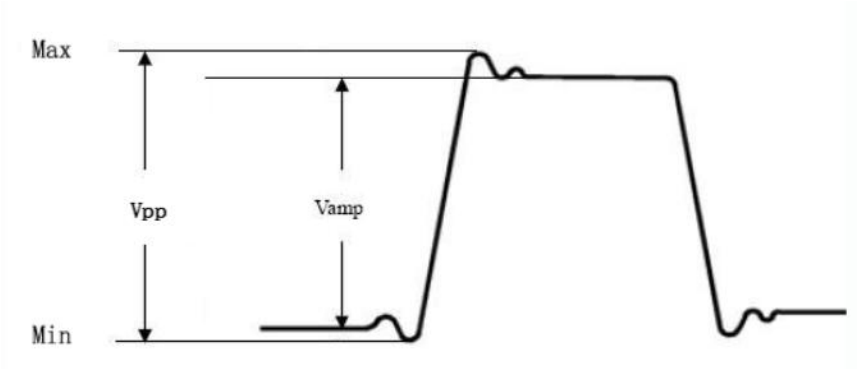



Figure 3-4

**Avg**：<1 cycle: The whole displayed waveform is used for calculation;

>1 cycle: A waveform of n cycles is used for calculation.

**Vpp**：Peak-to-Peak Voltage.

**Rms**：<1 cycle: The whole displayed waveform is used for calculation;

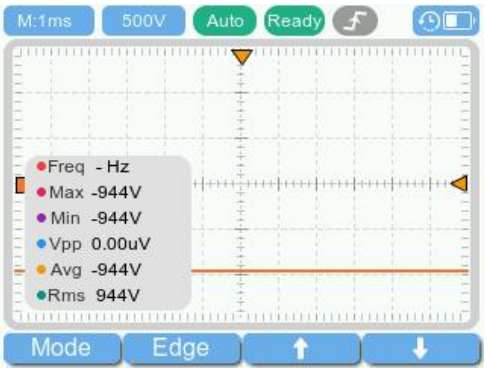
>1 cycle: A waveform of n cycles is used for calculation.

**Max:**The most positive peak voltage measured over the entire waveform.

**Min:**The most negative peak voltage measured over the entire waveform.

**Measurement:**

1. Press DMM to switch into oscilloscope mode.
2. Press MAXMIN to open or close automatic measurement function.The measurement values of the waveform will be displayed in the lower left corner of the screen.




3. Press ≅V to enter voltage measurement,press F1 or F2 to select **mV** or **V** measurement unit,and then press ▲ or ▼ to up and down measurement gear,press ◄ or ► to adjust time base gear.
4. Press A≅ to enter current measurement,press F1 ~ F3 to select **uA**、**mA** or **A** measurement unit,and then press ▲ or ▼ to up and down measurement gear,press ◄ or ► to adjust time base gear.
5. Press ▶/II to enter pause mode,if you press F1 or F2 can horizontally shift the waveform and press ◄ or ► to zoom in or out the waveform.
6. Press REL, automatically setting the trigger level to half of the current signal's Vpp.

## Trigger System

The trigger determines when the oscilloscope starts to acquire data and display waveforms. Once the trigger is set correctly, it can convert an unstable display into a meaningful waveform.

When the oscilloscope starts to acquire data, it first acquires enough data to draw the waveform on the left side of the trigger point. The oscilloscope continuously acquires data while waiting for the trigger condition to occur. When a trigger is detected, the oscilloscope continuously acquires enough

data to draw a waveform on the right of the trigger point.

The trigger mode of this series of oscilloscopes is edge trigger.

The edge trigger mode is to trigger on the trigger electrical level of the edge of the input signal, that is, trigger on the rising and falling edges of the input signal.

Press COMP to enter edge trigger menu.

The description of the trigger system setting menu is as follows:

| Function Menu | Setting | Description |
|---|---|---|
| Mode | Auto | Waveforms can be acquired without detecting trigger conditions. |
| | Normal | The waveform is acquired only when the trigger conditions are met. |
| | Single | When a trigger is detected, a waveform is sampled and then stopped. |
| Edge | | Trigger on the rising edge of the signal. |
| | | Trigger on the falling edge of the signal. |

**Mode:**Press F1 can cycle through Auto、Normal or Single.

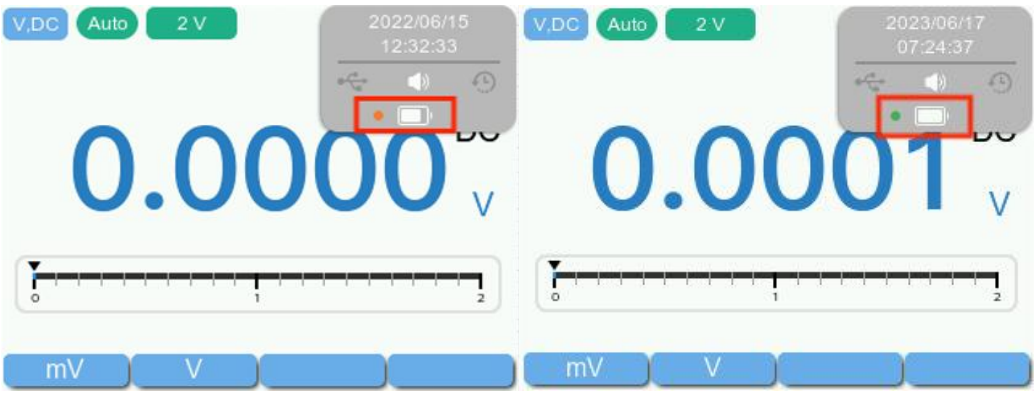
**Edge:**Press F2 can cycle through rising edge and falling edge.

**Trigger level position:**Press F3 or F4 can up and down trigger level position.

# 6.Save and Recall Picture

1. **Save picture:**Press button will initiate the process of capturing a screenshot.Upon completion, a prompt will appear containing information about the directory where the screenshot is saved.By default, it is possible to save up to 20 screenshots, with new captures overwriting older ones once the limit is reached.

**Note:**The dot next to the battery will display orange if the storage space is insufficient, and it will display green if the storage space is adequate.




2. **Recall picture:**Upon connecting the USB cable to a computer,to open the saved image, select the path where the image is stored.

# 7.System Settings

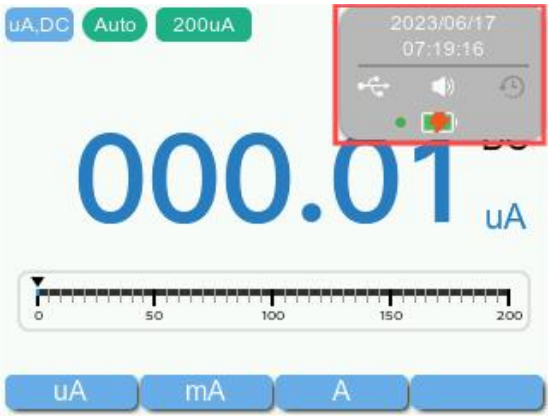
Press ⚙ to enter the system function menu.Press F1 or F2 to select the desired function menu,and then press F3 or F4 to select desired setting.

- **Date|Time**

Select **Date|Time** page,you can do the following.
The description of the option is as follows:

| Page options | Description |
|---|---|
| Date,Time | Set the required time. |
| Hour 12h | Set the display mode to 12-hour format. |
| Date Tran | Set the time display format. |

1. Press the power button ⏻ can display the hidden time icon;press any button, can hide the date.




2. **Time setting:**Select **Date,Time** option.Press ◄ or ► to select year、month、day、hour、minute and second,and then press F3 or F4 to set required time.

3. **12-hour format setting:**Select **Hour 12h** option.Press AUTO the time display will be in the 12-hour format and press it again will switch to 24-hour format.

4. **Date display settings:**Select **Date Tran** option.Press AUTO the date will be displayed in the format of DD/MM/YYYY (day/month/year),and press it again,the date will be displayed in the format of YYYY/MM/DD.

- **Display**

Select **Display** page,you can do the following.
The description of the option is as follows:

| Page options | Description |
|---|---|
| Dark Mode | Set the multimeter display mode |
| Brightness | Adjust brightness High, Mid or Low. |

1. **Multimeter display mode setting:**Select **Dark Mode** option,and then press AUTO ,the "Reboot device Press again" prompt box will pop up on the screen. Pressing the AUTO button at the same time will restart the device and apply the new display mode.Press any key to undo the action currently being performed.

2. **Brightness setting:**Select **Brightness** option,and then press AUTO ,the brightness varies between Low, Mid, and High.

- **Sound**

Select **Sound** page,you can do the following.
The description of the option is as follows:

| Page options | Description |
|---|---|
| Key Sound | Set the key operation prompt tone. |
| Volume | Set the volume. |
| Warning | Set alarms. |

1. **Key Sound setting:**Select **Key Sound** option,and then press AUTO will produce a sound prompt;press it again will be no sound prompt upon pressing a key.

2. **Volume setting:**Select **Volume** option,press F4 will increase volume; press F3 will decrease volume.The sound is set to maximum by

default.

3. **Warning setting:**Select **Warning** option,and then press AUTO an alarm notification will be enabled;press it again will there will be no alarm notification(Such as: probe socket detection.).

- **System**

Select **System** page,you can do the following.

The description of the option is as follows:

| Page options | Description |
|---|---|
| Auto Power Off | Set automatic shutdown. |
| Power Off | Set the automatic shutdown time. |
| Reset | Restore default setting. |
| About | Display information about the instrument. |

1. **Automatic shutdown setting:**Select **Auto Power Off** option,and then press AUTO will enable automatically shut down.When enabled, the device will automatically power off after a specified period of inactivity; pressing the button again will require manual shutdown.
2. **Automatic shutdown time setting:**Select **Power Off** option.Press AUTO the shutdown time will change between 5 min and 30 min.
3. **Reset setting:**Select **Reset** option,and then press AUTO ,"Reset settings Press again" will pop up on screen, press AUTO at the same time,the device will restart and restore default setting.Press any key to undo the action currently being performed..

- **DMM**

Select **DMM** page,you can do the following:

The description of the option is as follows:

| Page options | Description |
|---|---|
| Cont SENS | Set the on-off value(HDS120 series device can not be set). |
| Comp Range | Set comparison range. |
| Out Range Pass | Set the comparison pass condition range as outside the interval. |

1. **Set on-off range:**Select **Comp Range** option, and then press F3 or F4 can modify the range of the interval (left and right intervals will be automatically determined).
2. **Set out range pass:**Select **Out Range Pass** option,and then press AUTO to enable or disable the option.Enabling this option sets the comparison pass condition as outside the interval. Disabling this option sets the comparison pass condition as inside the interval.

# 8. Technical Specifications

Standard conditions: The environment temperature is 18℃ to 28℃,the relative humidity is less than 80%.

**Note**:

When measuring AC voltage, accuracy guarantee range is 10% to 100% of the range.

When measuring DC voltage,AC/DC current or capacitance, accuracy guarantee range is 5% to 100% of the range.

## HDS120 Series Multimeter Specification

| Function | | Measurement Range | Resolution/ Frequency Range | Accuracy ± (% of reading + LSB) | |
|---|---|---|---|---|---|
| DC Voltage (V) | mV | 20.000mV | 0.001mV | ±(0.1%+20dig) | |
| | | 200.00mV | 0.01mV | ±(0.1%+6dig) | |
| | V | 2.0000V | 0.1mV | ±(0.1%+5dig) | |
| | | 20.000V | 1mV | | |
| | | 200.00V | 10mV | | |
| | | 1000.0V | 0.1V | ±(0.15%+5dig) | |
| AC Voltage (V) | mV | 20.000mV[1] | 0.001 mV | VRMS Freq range: 40Hz-1000Hz | ±(0.6%+10dig) |
| | | 200.00mV | 0.01mV | | |
| | V | 2.0000V | 0.1mV | | |
| | | 20.000V | 1mV | | |
| | | 200.00V | 10mV | | |
| | | 750.0V[2] | 0.1V | | ±(0.8%+10dig) |
| DC Current (A) | μA | 200.00μA | 0.01μA | ±(0.6%+10dig) | |
| | | 2000.0μA | 0.1μA | ±(0.5%+10dig) | |
| | mA | 20.000mA | 1μA | ±(0.6%+10dig) | |
| | | 200.00mA | 10μA | ±(0.5%+10dig) | |
| | A | 2.0000A | 100μA | ±(1.0%+10dig) | |
| | | 10.000A | 1mA | ±(2.0%+10dig) | |
| AC Current (A) | μA | 200.00μA[3] | 0.01μA | VRMS Freq range: 40Hz-1000Hz | ±(0.8%+10dig) |
| | | 2000.0μA | 0.1μA | | |
| | mA | 20.000mA[3] | 1μA | | |
| | | 200.00mA | 10μA | | |

| | | | | | |
|---|---|---|---|---|---|
| | A | 2.0000A[3] | 100μA | | ±(1.5%+10dig) |
| | | 10.000A [4] | 1mA | | ±(2.5%+10dig) |
| **Resistance(Ω)** | | 200.00Ω | 0.01Ω | ±(0.8%+10dig) | |
| | | 2.0000kΩ | 0.1Ω | ±(0.3%+5dig) | |
| | | 20.000kΩ | 1Ω | ±(0.3%+5dig) | |
| | | 200.00kΩ | 10Ω | | |
| | | 2.0000MΩ | 100Ω | | |
| | | 20.000MΩ | 1kΩ | ±(0.5%+5dig) | |
| | | 100.00MΩ | 10kΩ | ±(5.0%+10dig) | |
| **Capacitance(F)** | | 2.000nF | 1pF | ±(5.0%+10dig) | |
| | | 20.00nF | 10pF | ±(3.0%+10dig) | |
| | | 200.0nF | 100pF | | |
| | | 2.000μF | 1nF | | |
| | | 20.00μF | 10nF | | |
| | | 200.0μF | 100nF | | |
| | | 2.000mF | 1μF | | |
| | | 20.00mF[5] | 10μF | | |
| **Frequency[6] (Hz)** | | 200.00Hz | 0.01Hz | ±(0.1%+5dig) | |
| | | 2.0000kHz | 0.1Hz | | |
| | | 20.000kHz | 1Hz | | |
| | | 200.00kHz | 10Hz | | |
| | | 2.0000MHz | 0.1kHz | | |
| | | 20.000MHz | 1kHz | | |
| **Duty Cycle[7] (%)** | | 0.1% -99.9% (Typical：Vrms=1 V, f=100Hz) | 0.1% | ±(1.2%+3dig) | |
| | | 0.1%-99.9%(≥ 1 kHz) | | ±(2.5%+10dig) | |
| **Diode** | | 3.0000V | 0.0001V | ±(1.0%+10dig) | |
| **Continuity** | | 1000.0Ω | 0.1Ω | | |
| **Maximum Reading** | | 20000 | | | |

[1] The frequency shows 50% – 100 % of the measurement range.

[2] The frequency shows 15% – 100 % of the measurement range.

[3] The frequency shows 50% – 100 % of the measurement range.

[4] When measuring current, for 10A the measuring duration should not be over 2 minutes within 10 minutes, and in this 10 minutes, no other current should flow through except within the measuring duration.

[5] When measuring capacitance, for the 20.00mF range, the measuring duration should be over 30 seconds.

[6] When measuring frequency, the typical waveform is Square or Sine. The signal meets the following conditions:

| Frequency | Amplitude(rms) |
|---|---|
| 1 Hz – 20 MHz | ≥ 1 V |

[7] When measuring duty cycle, the typical waveform is Square.

**Note: when measuring resistance and capacitance, the influence of the resistance reactance of the pen itself on the measured value should be considered.**

# HDS160 Series Multimeter Specification

| Function | Measurement Range | Resolution/ Frequency Range | Accuracy ± (% of reading + LSB) | |
|---|---|---|---|---|
| DC Voltage (V) | 60.000 mV | 0.001 mV | ±(0.10%+10dig) | |
| | 600.00 mV | 0.01 mV | ±(0.05%+5dig) | |
| | 6.0000 V | 0.0001 V | | |
| | 60.000 V | 0.001 V | | |
| | 600.00 V | 0.01 V | ±(0.10%+5dig) | |
| | 1000.0 V[3] | 0.1 V | ±(0.10%+10dig) | |
| AC Voltage (V) | 60.000 mV | 0.001 mV | Freq. : 20 Hz – 45 Hz | ±(1.0%+30dig) |
| | 600.00 mV | 0.01 mV | | |
| | 6.0000 V | 0.0001 V | | |
| | 60.000 V | 0.001 V | | |
| | 600.00 V | 0.01 V | | |
| | 750.0 V | 0.1 V | | |
| | 60.000 mV | 0.001 mV | Freq. : 45 Hz – 65 Hz | ±(0.5%+30dig) |
| | 600.00 mV | 0.01 mV | | |
| | 6.0000 V | 0.0001 V | | |
| | 60.000 V | 0.001 V | | |
| | 600.00 V | 0.01 V | | |

| | | | | |
|---|---|---|---|---|
| | 750.0 V | 0.1 V | | |
| | 60.000 mV | 0.001 mV | Freq. : 65 Hz – 1 kHz | ±(0.7%+30dig) |
| | 600.00 mV | 0.01 mV | | |
| | 6.0000 V | 0.0001 V | | |
| | 60.000 V | 0.001 V | | |
| | 600.00 V | 0.01 V | | |
| | 750.0 V | 0.1 V | | |
| **DC Current (A)** | 600.00 uA | 0.01 uA | ±(0.15%+20dig) | |
| | 6000.0 uA | 0.1 uA | ±(0.15%+10dig) | |
| | 60.000 mA | 0.001 mA | ±(0.15%+20dig) | |
| | 600.00 mA | 0.01 mA | ±(0.15%+10dig) | |
| | 6.0000 A | 0.0001 A | ±(0.50%+10dig) | |
| | 10.000 A | 0.001 A | | |
| **AC Current (A)[1]** | 600.00 uA | 0.01 uA | Freq. : 20 Hz– 1 kHz | ±(0.5%+20dig) |
| | 6000.0 uA | 0.1 uA | | |
| | 60.000 mA | 0.001 mA | | |
| | 600.00 mA | 0.01 mA | | |
| | 6.0000 A | 0.0001 A | | ±(1.5%+20dig) |
| | 10.000 A | 0.001 A | | |
| **Resistance (Ω)** | 600.00 Ω | 0.01 Ω | ±(0.15%+10dig) | |
| | 6.0000 kΩ | 0.0001 kΩ | ±(0.15%+5dig) | |
| | 60.000 kΩ | 0.001 kΩ | | |
| | 600.00 kΩ | 0.01 kΩ | | |
| | 6.0000 MΩ | 0.0001 MΩ | ±(0.30%+5dig) | |
| | 60.000 MΩ | 0.001 MΩ | ±(1.00%+10dig) | |
| **Diode** | 3.0000 V | 0.0001 V | ±(1.0%+10dig) | |
| **Continuity** | 1000.0 Ω | 0.1 Ω | Threshold can be adjusted, step by 1.0Ω | |
| **Frequency [2]** | 60.000 Hz | 0.001 Hz | ±(0.2%+10dig) | |
| | 600.00Hz | 0.01 Hz | | |
| | 6.0000 kHz | 0.0001 kHz | | |
| | 60.000 kHz | 0.001 kHz | | |
| | 600.00 kHz | 0.01 kHz | | |
| | 6.0000 MHz | 0.0001 MHz | | |
| | 60.000 MHz | 0.001 MHz | | |
| **Capacitance[3]** | 6.0000 nF | 0.0001 nF | ±(4.0%+50dig) | |
| | 60.000 nF | 0.001 nF | ±(2.5%+20dig) | |

| | | | | |
|---|---|---|---|---|
| | 600.00 nF | 0.01 nF | ±(2.0%+20dig) | |
| | 6.0000 uF | 0.0001 uF | | |
| | 60.000 uF | 0.001 uF | | |
| | 600.00 uF | 0.01 uF | | |
| | 6000.0 uF | 0.1 uF | ±(4.0%+20dig) | |
| | 60.000 mF | 0.001 mF | ±(5.0%+20dig) | |
| **Cycle duty[4]** | 0.1% ~ 99.9%, Vrms=1V | 0.10% | 1 kHz | ±(1.2%+3dig) |
| | | | >1 kHz | ±(2.5%+3dig) |
| **Maximum Reading** | 60000 | | | |

[1] When measuring current, for 10A the measuring duration should not be over 2 minutes within 10 minutes, and in this 10 minutes, no other current should flow through except within the measuring duration.

[2] When measuring frequency, the typical waveform is Square or Sine. The signal meets the following conditions:

| Frequency | Amplitude(rms) |
|---|---|
| 1 Hz – 20 MHz | ≥ 1 V |

[3] When measuring capacitance, for the 20.00mF range, the measuring duration should be over 10 seconds.

[4] When measuring duty cycle, the typical waveform is Square.

**Note: when measuring resistance and capacitance, the influence of the resistance reactance of the pen itself on the measured value should be considered.**

# Oscilloscope Specification

| **Characteristics** | **Instruction** |
|---|---|
| **Analog bandwidth[1]** | 1MHz (only ACV scale) |
| **Maximum sample** | 5.0MSa/s |
| **Channel** | 1 |
| **Input impedance** | approximately 10MΩ |
| **Time base range** | 2.5us~10s/grid |
| **Time base accuracy** | ±(0.01% + 0.1div) |
| **Voltage vertical sensitivity range** | 30mV~500V/grid |

| | |
|---|---|
| **Current vertical sensitivity range** | 100μA~5A/grid |
| **DC Gain Accuracy** | ±(5% + 0.2div) |
| **Maximum voltage limit** | 1000V DC+AC Peak value |
| **Maximum current limit** | 15A DC+AC Peak value |
| **Trigger mode** | Auto/Normal/Single |
| **Autoset** | Time base/Vertical amplitude/Trigger value |
| **Trigger edge** | Rise edge/Fall edge |
| **Measurement function** | Vmax,Vmin,Vpp,Vavg,Vrms,Freq |

**[1]: The simulated bandwidth of 1MHz attenuates to -5 dB.**

# General Specification

| **Characteristics** | **Instruction** |
|---|---|
| **Sleep Mode** | √ |
| **Low battery indication** | √ |
| **Backlight** | √ |
| **Input Protection** | √ |
| **Input Impedance** | ≥ 10 MΩ |
| **Battery** | Single 18650 3.7v |
| **Display** | 2.8 inch<br>IPS:320*240 resolution |
| **Weight** (without package) | Approx. 0.33kg(without battery) |
| **Dimension** | 188mm(Length)* 93mm(Width)*41.5mm(Depth) |
| **Working temperature** | 0℃ to 40℃ |
| **Storage temperature** | －10℃ to 60℃ |
| **Relative Humidity** | ≤ 80% |
| **Altitude** | Operating: 3,000 meters<br>Non-operating: 15,000 meters |

**Interval Period of Adjustment:** One year is recommended for the calibration interval period.

# 9.Appendix

## Appendix A: List of Accessories

- 1 set of probes
- 1 quick guide
- 1 USB-TYPEC line

## Appendix B: Maintenance and Cleaning

### General maintenance

Do not store or place the instrument in a place where the LCD screen will be exposed to direct sunlight for a long time.

**Caution**: Do not let spray, liquid or solvent touch the instrument or probe to prevent damage to the instrument or probe.

**Cleaning**:

Check the instrument and probe frequently according to the operation. Clean the external surface of the instrument as follows:

1. Please wipe the floating dust outside the instrument and probe with a soft cloth. When cleaning the LCD, be careful not to scratch the transparent LCD protection screen.

2. Wipe the instrument with a damp but non dripping soft cloth. Please disconnect the power supply. It can be scrubbed with soft detergent or water. Do not use any abrasive chemical cleaning agent to avoid damaging the instrument or probe.

**Warning**: Please make sure the instrument is dry before re-energizing to avoid electrical short circuit or personal injury caused by moisture.

# Charging and Replacement of Battery

During the long-term storage of the device, the battery may be too low due to the self-discharge of the lithium battery and the device cannot be turned on. This is a normal phenomenon.
Prior to the first power-on after storage, the device should undergo a pre-charge of 0.5 to 1 hour. The specific duration should be adjusted according to the storage period to ensure the lithium battery voltage recovers to the normal operating range, guaranteeing proper device startup.
For devices that will be idle for extended periods, to prevent battery performance degradation or irreversible damage caused by over-discharge, it is recommended to remove the battery and perform periodic maintenance.

## Battery Charging

The lithium battery may not be fully charged when delivered. The power supply and battery indicator symbols in the upper right corner of the screen are explained as follows:

| Model | Charging | Discharging |
|---|---|---|
| 100 series device | ≥2.5 hours | ≥24 hours |

symbol indicates the power-on charging status;

symbol indicates battery power supply;

symbol indicates that there is only about five minutes of use time left.

Please charge as soon as possible according to the relevant tips to avoid damage to the battery.

## Charging Method

Connect the oscilloscope meter to a computer or other equipment through a USB data cable for charging (pay attention to the load capacity of the power supply equipment to avoid abnormal operation of the equipment).

**Note:** To avoid overheating of the battery during charging, the ambient temperature must not exceed the allowable value given in the technical specifications.

## Charging Indicator Light Status

(1) Power button not illuminated: Power not connected.
(2) Power button flashing: Power connected, charging in progress.
(3) Power button solid: Power connected, charging complete.

## Replacement of Lithium Battery

Generally, the battery does not need to be replaced. However, when necessary, it can only be replaced by qualified personnel, and only **lithium batteries of the same specification** can be used.