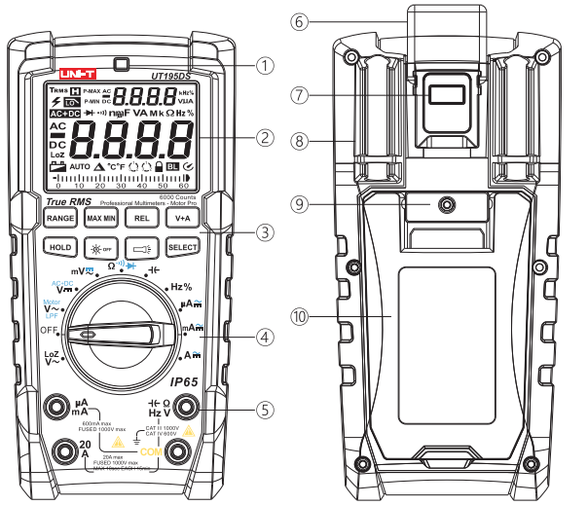
VI. Comprehensive Specifications

1. Overload protection voltage between various input terminals and grounding is 1000V.
2. 20A Terminal (CE): FF 11A H 1000V fast-melting fuse (Φ10×38) mm
3. mA/μA Terminal (CE): FF 600mA H 1000V fast-melting fuse (Φ6×32) mm
4. Maximum Display: 6000 bits
5. Update Rate: UT195E/UT195M 3 times/second, UT195DS: 5 times/second over-range displays “0L”.
6. Others
   Range: MANUAL/AUTO
   Polarity: Automatic
   Operation Temperature: 0℃~40℃ (32℉ ~1047℉)
   Storage Temperature: -10℃~50℃ (14℉ ~122℉)
   Relative Humidity: 0℃ ~ 30℃ below is ≤ 75%, 30℃ ~ 40℃ ≤50%
7. Operation Altitude: 0~2,000 m
8. Batteries in the unit: 6F22 9V
9. Low Battery: LED displays or symbol
10. Overall Dimension: About (195×95×58) mm
11. Weight: About 473g (including batteries)
12. Electromagnetic Compatibility:
    Under 1V/m radio-frequency field: Total accuracy = specified accuracy + 5% of range, there is no specified specification in radio-frequency field of 1V/m and more.

VII. Overall Configuration

1. Auto backlight sensing window
2. LCD display
3. Function button
4. Function selection switch
5. Measurement input terminals
6. Strap hook
7. Flashlight window
8. Multimeter probe locating stand
9. Battery cabinet fixing screw
10. Case support



VIII. Function Selection, Button Definition, and Dual Display Mode

1. Feature Selection

Features	Description
V~ V⎓ V≅	AC or DC Voltage Measurement
Ω	Resistance measurement
⊳|	Diode PN-Junction Voltage Measurement
•)))	Circuit Continuity Measurement
⊣⊢	Capacitance Measurement
Hz	Frequency Measurement
%	Duty Ratio Measurement (only for UT195E/UT195DS)
℃/℉	Temperature Measurement (only for UT195M)
uA≅ mA≅ 10A≅	AC/DC Current Measurement
LPF	AC voltage Low Pass Filter Measurement (UT195DS)
LoZ	On-line AC Voltage Low Impedance Measurement
MOTOR	Three phase Motor Rotary Phase Sequence, Voltage Phase Sequence Identification Measurement (UT195M/UT195DS)
AC+DC	(AC+DC) Measurement (UT195DS)
OFF	Turn off the power

2. Button Definition:

- RANGE Button: Press to change Auto/Manual range, it will jump upward one stall when it is pressed once, and jump to minimum range when pressing at maximum range. If this button is pressed for more than 2 seconds or changed by rotary disc, it will exit the manual range mode. (Only suitable for: V≅ Ω I≅).
- MAX MIN Button: Press to enter manual range mode and display the maximum value, press it again to display the minimum value, and press it again to display maximum and minimum value. If this button is pressed for more than 2 seconds or changed by rotary disc, it will exit the data record mode. (Only suitable for: V≅ Ω I≅ ℃/℉).
- REL Button: Press to enter MANUAL range mode. Take the current displayed value as reference, the different value between measurement value and reference value will be displayed. Press it again to exit relative measurement. (Only suitable for: V≅ I≅ ℃/℉ ⊣⊢).
- HOLD Button: (suitable for full range)
  Press this button, displayed value is locked and held, LCD will display " ⊡ " indicator. Press it again, the lock is released and enter normal measurement mode.
- A-OFF Button: Auto turn off backlight function. If need to restart the backlight function, turn function knob to OFF stall and restart.
- LIGHT Button: Turn on or off the flashlight lighting function.
- Hz% Button: Select Hz or % measurement mode.
- PEAK Button: Voltage peak Vp-p, and current peak measurement.
  Current peak Ip-p: Catch maximum value of signal current when measuring (PEAK-max/PEAK-min)

Remarks:

This function has the same recording mode as that of MAX MIN, but the largest difference between them is that the response time for the peak (PEAK) record is much shorter (250μs).

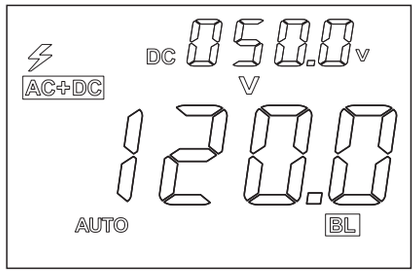
When measuring the actual peak of a sine wave signal, the recording function of the peak can measure the surge of the power supply much more accurate, the transient value of surge.

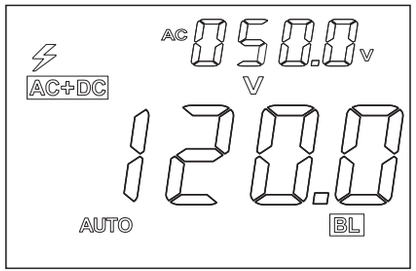
- SELECT Button: Press to select function (only suitable for combined range). Long press SELECT button when powering on the meter, Auto-OFF function can be cancelled.

3. Operation Instruction of Dual Display Mode (only for UT195DS):

AC+DC measurement:

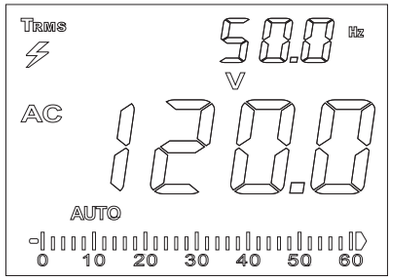
In DCV mode, short press SELECT button to enable AC+DC mode: Main display shows AD+DC value, the secondary display will automatically switch to show ACV or DCV value with a time interval of 2s.

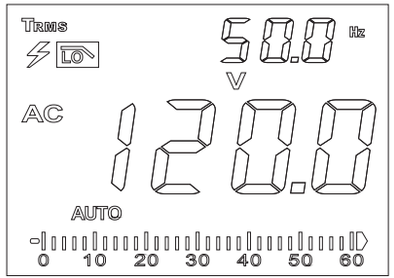




Voltage Measurement Function

In ACV mode, main display shows ACV value, the secondary display shows frequency. Short press "SELECT" button to enter L-Pass Filter function, main display shows voltage value and the secondary display shows frequency.



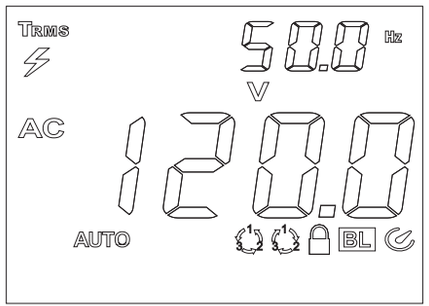


4. Motor rotation direction and phase sequence measurement

In ACV voltage mode, long press SELECT button for more than 2 seconds to enable motor rotation direction function. Main display shows the current voltage value and the secondary display shows operation frequency. When resting Motor function, short press SELECT button once to enable phase sequence measurement. Long press SELECT button (more than 2 seconds) to exit Motor function.

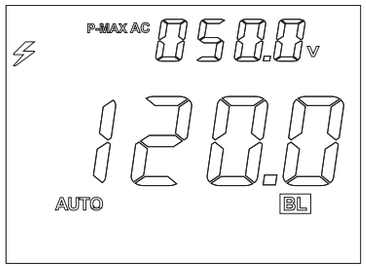
Steps: Phase sequence measurement (Detection condition: Above AC 80V, frequency is 40Hz to 80Hz, and it will keep on waiting if the range is exceeded).

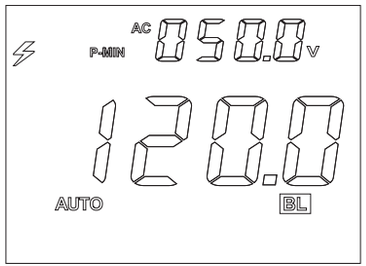
a. In ACV mode, press and hold SELECT button for at least 2 seconds automatically, then automatically jump to 600.0V range and wait for input signal. It will keep on waiting if there is no input.
b. After the first phase sequence is measured and locked, insert the probe into another phase, the LCD displays 1→2→3 or 3→2→1; if not move the probe to change input signal, it will time out in 5 seconds.
c. Press SELECT button for at least 2 seconds to automatically exit phase sequence mode.
Press SELECT button (for at least 2 seconds) to exit Motor function.



5. PEAK Value Measurement

Press PEAK button in ACV mode to enter peak measurement mode: main display shows ACV value, the secondary display shows P-MAX. Short press PEAK button, "P-MAX" and "P-MIN" will be displayed respectively. Long press PEAK button for at least 2 seconds to exit peak measurement function.





IX. Measurement Operating Instruction

Check the internal 6F22 9V batteries first, if " " or " " symbol appear on the screen, replace the batteries in time. In addition, attention should be paid to the symbol beside the probe sockets, this is to warn you of not exceeding the indicated number for the measured voltage or current so as to guarantee the measurement safety!

1. AC/DC Voltage Measurement (See Figure 1)

1) Parallel the meter to the load for measurement.
2) When meter input impedance is about 10MΩ, this kind of load may cause measurement error in high impedance circuit. In most cases, if circuit impedance is less than 10kΩ, the error can be ignored (0.1% or less).

3) AC measurement value is true RMS.

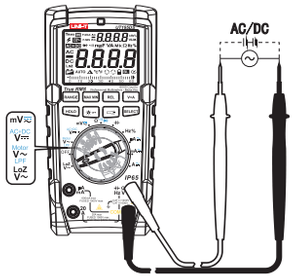
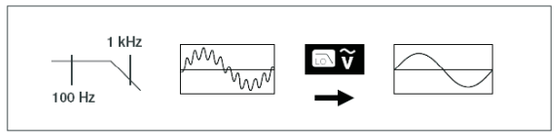


Figure 1

2. Low Pass Filter (LPF) Measurement (for UT195DS)

1) Parallel the meter to the load for measurement.
2) In ACV mode, press SELECT button to enter LOW PASS FILTER, this filter can intercept voltage higher than 1kHz. As shown in the following figure. the low pass filter can measure the combined sine wave signal generated by the inverter and variable frequency motor.



3. PEAK Value Measurement (for UT195DS)

1) Parallel the meter to the load for measurement.
2) Press PEAK button once to activate the peak value detection function. Response time of capture is 250 μs, it can precisely measure the transient values of P-MAX and P-MIN. Long press PEAK button to exit peak measurement.

4. MOTOR Phase Sequence Measurement Function (See Figure 2)

1) Parallel the meter to the load for measurement.
2) In ACV mode, long press SELECT button for no less than 2 seconds to enable the MOTOR phase rotation measurement function, at this moment, LCD screen will show flashing“ 🔒 ”symbol (only for UT195M/UT195DS).
3) Set the first voltage source for COM terminal, fix the black probe at L3, the red probe will measure L1 for the first time. Wait till the “ 🔒 ” on the LCD is locked, change the red probe to L2 within 5 seconds, now the 1-2-3 symbol will be displayed on LCD, indicating forward rotation phase sequence.
4) Set the first voltage source for COM terminal, fix the black probe at L3, the red probe will measure L2 for the first time. Wait till the “ 🔒 ” on the LCD is locked, change the red probe to L1 within 5 seconds, now the 3-2-1 symbol will be displayed on LCD, indicating reverse rotation phase sequence.
5) During the measurement, short press SELECT button once to restart the MOTOR measurement (only for UT195DS). Long press SELECT button for at least 2 seconds again to exit the MOTOR phase rotation measurement function.

⚠ **Note:**

1) Phase sequence measurement condition: Above AC 80V, frequency is 40 Hz to 80 Hz, the flashing "🔒" symbol will be displayed on LCD screen and it will keep on waiting if range of frequency response is exceeded.
2) Multi-harmonic anti-interference decoding mode is set in the chip of UT195DS products. The high-frequency interference signal will be filtrated by a special filter circuit built in the chip, this will be suitable for the measurement in variable-frequency voltage fields. Measurement phase sequence lock time is about 10s more or less.
3) When measuring UT195M products in variable frequency condition, due to the impact of multiple-harmonic PWM, measurement phase sequence lock time is much slower (about 30s more or less), and the frequency range is only suitable from 50 Hz to 80 Hz, and the unstable state of phase sequence measuring may occur.

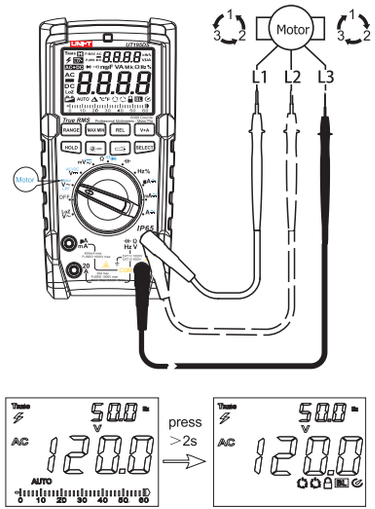


Figure 2

5. LoZ (Low impedance) Measurement

1) Parallel the meter to the load for measurement.
2) To eliminate the stray voltage, the Loz (Low impedance is about 300kΩ) function of meter provides a low impedance on the whole conductor circuit so as to obtain much more accurate measurement value. Turn rotation switch to LoZ, meter displays AC voltage in main display.

⚠ Note:

- Do not input voltage higher than 1000Vrms. Much higher voltage is possible to be measured, but the meter may be damaged!
- When measuring high voltage, special attention should be paid to avoid electric shock!
- In low pass filter measurement mode, meter will automatically change to manual mode. Press RANGE button to select corresponding range.
- Measure the known voltage before using the meter to confirm whether the function of the product is correct or not!

6. Resistance and Circuit Continuity Measurement (See Figure 3a+3b)

Parallel the meter to the measured circuit for measurement.

⚠ Note:

- If open circuit or resistance value of measured resistance exceeds the meter maximum range, the "0L" will be displayed.
- When measuring on-line resistance, turn off all power supplies in measured circuit and discharge all residual charges on all capacitors before measurement. In this way, the correct measuring can be assured.

- In low resistance measurement, probe will cause resistance measurement error of about 0.1Ω to 0.2Ω. To obtain precise reading, first short-circuit the probes, then use REL relative measurement mode to ensure measurement accuracy.
- If the resistance value is less than 0.5Ω when probe is in short circuit, check for any loosening or other causes with the probes.
- When measuring high resistance, the reading will be stable after a few seconds. This is normal for high resistance measurement.
- Use resistance measurement function can self-check the built-in fuses, see Figure 3b for more detail.
- Do not input higher than 30V of DC or AC voltage.
- Circuit continuity measurement: If the resistance between two measured ends is more than 50Ω, the circuit will be considered as open, the buzzer will not sound; if the resistance between two measured ends is no more than 10Ω, the circuit is considered as good continuity, the buzzer will sound continuously.

⚠ Note:

- When checking the on-line circuit continuity, turn off all power supplies in measured circuit and discharge all residual charges on all capacitors before measurement.
- Do not input voltage higher than DC or AC 30V to avoid personal injury!

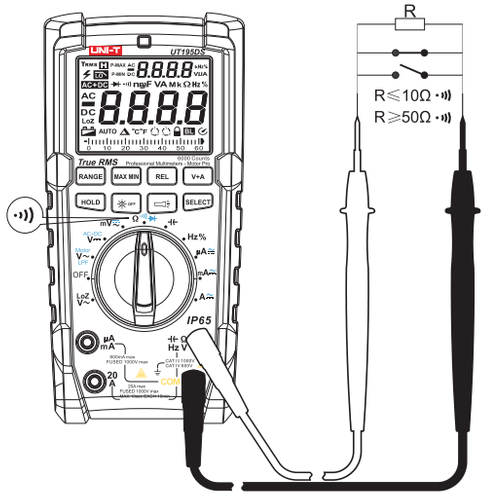


Figure 3a

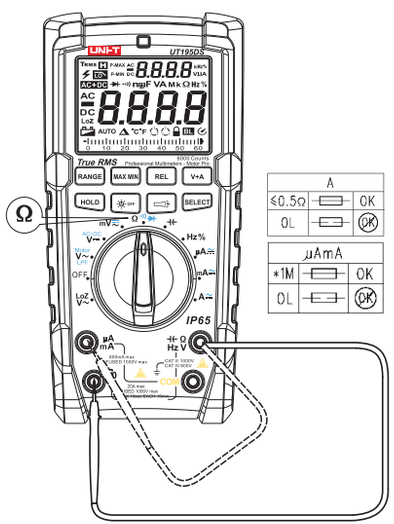


Figure 3b

7. Diode Measurement (see Figure 4)

If measured diode is open circuit or polarity is connected reversely, “0L” will be displayed. For silicon PN-junction, it is a normal value of about 500 ~ 800mV.

⚠ Note:

- When measuring on-line diode, turn off all power supplies in measured circuit and discharge all residual charges on all capacitors before measurement.
- Diode test voltage range is about 3.0V (about 3.5V for UT195E)
- Do not input voltage higher than DC or AC 30V to avoid personal injury!

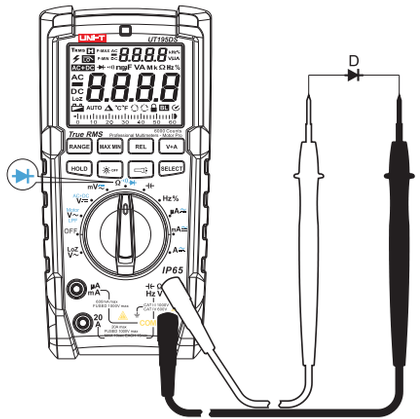


Figure 4

8. Capacitance Measurement (See Figure 5)

Meter will display a fixed reading when there is no input, this is the intrinsic capacitance value in the meter. For small range capacitance measurement, measured value must subtract this value to guarantee the measurement accuracy. For this purpose, the relative measurement REL function of the meter can be used to subtract it automatically so as to measure reading conveniently.

⚠ Note:

- If measured capacitance is short circuit or capacitance value exceeds the maximum range of meter, the “0L” will be displayed.
- For large capacitance measurement, it will take several seconds to measure and this is normal.
- Fully discharge the residual charges of the capacitance before measurement, this is much more important for high voltage capacitance. This is to avoid meter damage and personal

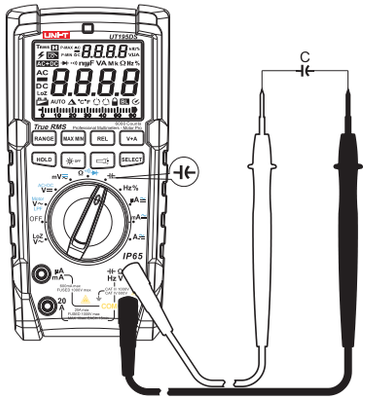


Figure 5

9. Frequency/Duty Ratio Measurement (See Figure 6)

At the frequency measurement stall, press Hz/% button can select frequency/duty ratio measurement mode (for UT195E)

⚠ Note:

- Do not input voltage higher than DC or AC 30V to avoid personal injury!

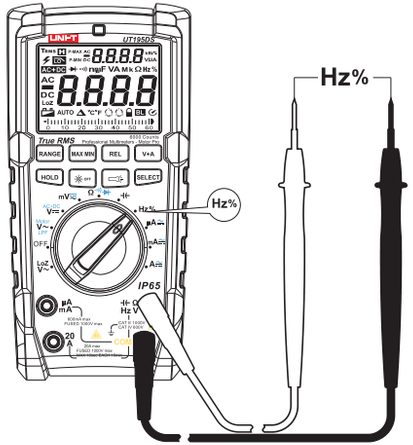


Figure 6

10. Temperature Measurement (Only for UT195M) (See Figure 7)

Temperature sensor: Only for K type (nickel-chromium~nickel-silicon) thermocouple. If “0L” is displayed after powering on the meter, connect K type temperature sensor to measure ℃ (Celsius) or ℉ (Fahrenheit).

℉=1. 8 x ℃ + 32

⚠ Note:

- The point K type (nickel-chromium~nickel-silicon) thermocouple provided by the accessories is only suitable for the temperature measurement below 230℃/446℉.

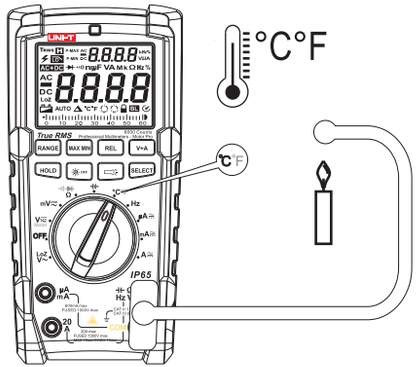


Figure 7

11. AC/DC Current Measurement (See Figure 8)

Connect the meter to the load in series for measurement.
AC measurement display value is true RMS.

⚠ Note:

- Before connecting the meter to the loop to be measured, turn off the power supply in the circuit.
- Proper input port and function position should be used during measurement. If cannot estimate the current, start measurement from high range.
- Fuses are set in 20A and mA/μA input sockets. Do not parallel the probe to any circuit, especially power terminal, for it will damage the meter and endanger personal safety!
- It is available to continuously measure the current up to 10A. When measuring current of 10A~20A, it should not take more than 30 seconds. It is suggested to wait for 15 minutes before measuring the low current continuously with the meter after measuring the current higher than 10A.

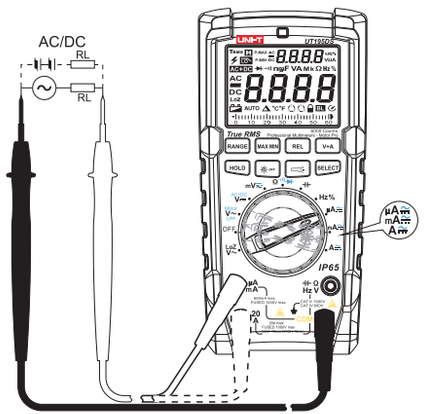


Figure 8

12. Other Functions

- Auto-off: During measurement, if any knob switch is not turned within about 15 minutes, the meter will turn on the auto-off function to save energy. Rotate function switch in auto-off mode, the meter will auto wake up.
- Auto backlight: In case the instrument is placed in a dark environment after turning it on, the backlight function will be turned on immediately. If the instrument is placed in a bright environment again, the backlight function will be turned off in 30 seconds.
  In addition, the auto backlight function will be turned off after pressing OFF button while the backlight is on, if it is necessary to restart the backlight function, just turn off the unit and turn it on again.
- Press and hold SELECT button in power off state and power on the meter, auto-off function will be cancelled. Recover auto-off function to restart.
- Buzzer: The buzzer will sound when measured AC voltage is more than 750 V, DC voltage is more than 1000 V and the current value is more than 20 A.
- Low voltage testing: Detect the internal VDD while the power is supplied, when it is less than 7.5V, ▭ or ▭ low battery symbol will be displayed.