

# USER GUIDE

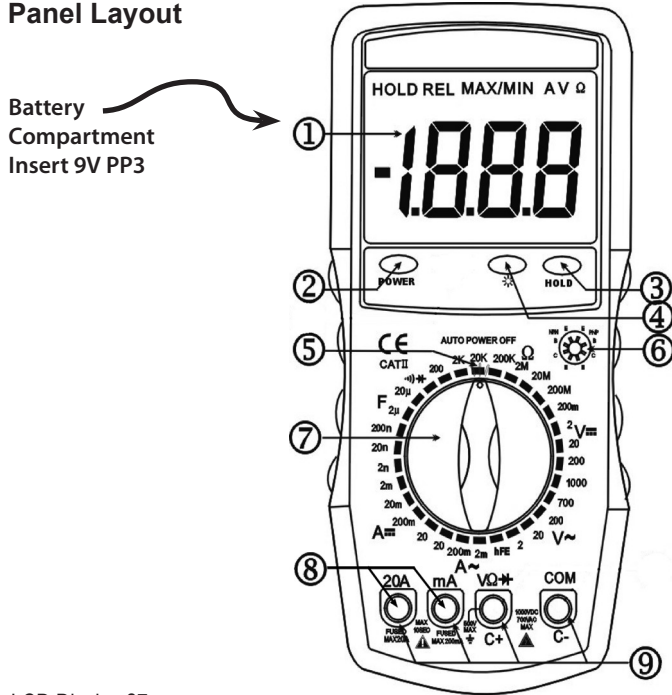
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## 1. Overview

This multimeter is characterized by a compact rugged construction with protective holster and stand. The LCD Screen with 27mm display gives clear readings even in low light when the backlight can be switched on. Features include dual slope A/D converter using C-MOS technology for auto-zeroing, polarity selection and over-range indication. Full overload protection is provided.

Before use you will need to fit a 9V PP3 battery (not supplied) in the compartment located on the back of the meter. To open the compartment remove the cross headed screw from the lid and lever open, clip the terminal studs over the battery terminal caps, close the compartment lid and screw tightly shut.

## 2. Panel Layout



Battery Compartment Insert 9V PP3

- 1) LCD Display 27mm
- 2) POWER Switch: Boot Up / Shutdown
- 3) Data-hold Switch (HOLD): Pressing this button, the meter enters the auto data hold mode and "HOLD" is displayed on the LCD.
- 4) Back Light Button Switch: Pressing the button turns the backlight on, pressing it again turns it off.
- 5) Function switch indicator lamp
- 6) hFE Input Socket
- 7) Rotary Switch: use this switch to select functions and ranges
- 8) Mechanical blocking system.
- 9) V/Ω Input Socket, 20A Input Socket, mA Input Socket & COM Input Socket

## SPECIFICATIONS

### 3.1 GENERAL CHARACTERISTICS

- 3.1.1 3 1/2 digit big LCD max. Indication 1999.
- 3.1.2 Auto-Zero & Auto-Polarity.
- 3.1.3 Overrange: indication of "1" or "-1".
- 3.1.4 Low battery indication: "E9"
- 3.1.5 Power supply: 9V Zinc-carbon battery.
- 3.1.6 Safety standards: The meter complies with IEC1010 Double Insulation, Pollution Degree 2, overvoltage Category II.
- 3.1.7 Protective terminal socket covers prevent operational mistakes
- 3.1.8 Optimum operating temperature for accuracy: 23°C±5°C
- 3.1.9 Temperature range: Operating: 0°C to 40°C Storage: -20°C to 60°C
- 3.1.10 Humidity range:  
Operating : max 75%RH Storage: max 80%RH
- 3.1.11 Size: 190mm x 88.5mm x 27.5mm
- 3.1.12 Weight: Approx 320g (including battery).
- 3.1.13 Accessories: Operation manual, Test leads, Temperature test probe & zip-up case.

## 3.2 MEASUREMENT SPECIFICATION

Environment :

Temperature : 23°C±5°C relative humidity: max 75%

### 3.2.1 DC Voltage

| Range | Resolution | Accuracy                  |
|-------|------------|---------------------------|
| 200mV | 100µV      | ±(0.5% of rdg + 8 digit ) |
| 2V    | 1mV        | ±(0.5% of rdg + 8 digits) |
| 20V   | 10mV       | ±(0.5% of rdg + 8 digits) |
| 200V  | 100mV      | ±(0.5% of rdg + 8 digits) |
| 1000V | 1V         | ±(1.5% of rdg + 8 digits) |

Overload Protection : 1000V DC/700Vrms AC on other ranges.

Input impedance : 10MΩ on all ranges

### 3.2.2 AC voltage (Average sensing, calibrated to rms of sine wave)

| Range | Resolution | Accuracy                   |
|-------|------------|----------------------------|
| 2V    | 1mV        | ±(1.5% of rdg + 10 digit ) |
| 20V   | 10mV       | ±(1.5% of rdg + 10 digits) |
| 200V  | 100mV      | ±(1.5% of rdg + 10 digits) |
| 700V  | 1V         | ±(2.5% of rdg + 10 digits) |

Frequency Range: 40 to 400Hz

Response: average, calibrated in rms of sine wave

### 3.2.3 DC Current

| Range | Resolution | Accuracy                   |
|-------|------------|----------------------------|
| 2mA   | 1µA        | ±(0.8% of rdg + 8 digits)  |
| 20mA  | 10µA       | ±(0.8% of rdg + 8 digits)  |
| 200mA | 100µA      | ±(1.2% of rdg + 8 digits)  |
| 20A   | 10mA       | ±(2.0% of rdg + 10 digits) |

Overload protection: 0.2A/250V fuse 20A/250V fuse 20A up to 15 seconds

Note: [1] 10A range: not fused

### 3.2.4 AC Current

| Range | Resolution | Accuracy                   |
|-------|------------|----------------------------|
| 2mA   | 1µA        | ±(1.0% of rdg + 8 digits)  |
| 20mA  | 100µA      | ±(2.0% of rdg + 8 digits)  |
| 20A   | 10mA       | ±(3.0% of rdg + 15 digits) |

Frequency : 40~200Hz

Overload protection : 0.2A /250V fuse,20A/250V fuse 20A up to 15 seconds

### 3.2.5 Resistance

| Range | Resolution | Accuracy                          |
|-------|------------|-----------------------------------|
| 200Ω  | 0.1Ω       | ±(1.2% of rdg + 15 digits)        |
| 2KΩ   | 1Ω         | ±(0.8% of rdg + 8 digits)         |
| 20KΩ  | 10Ω        | ±(0.8% of rdg + 8 digits)         |
| 200KΩ | 100        | ±(0.8% of rdg + 8 digits)         |
| 2MΩ   | 1KΩ        | ±(0.8% of rdg + 8 digits)         |
| 20MΩ  | 10KΩ       | ±(2.5% of rdg + 15 digits)        |
| 200MΩ | 100KΩ      | ±(5.0% of (rdg-10rdg + 30 digits) |

Overload protection :250V DC/250Vrms AC for all range.

### 3.2.6 Capacitance

| Range | Resolution | Accuracy                   |
|-------|------------|----------------------------|
| 2nF   | 1pF        | ±(2.5% of rdg + 25 digits) |
| 20nF  | 10pF       | ±(2.5% of rdg + 20 digits) |
| 200nF | 100pF      | ±(2.5% of rdg + 20 digits) |
| 2µF   | 1nF        | ±(2.5% of rdg + 20 digits) |
| 20µF  | 10nF       | ±(2.5% of rdg + 20 digits) |

Overload Protection :36V DC/36Vrms AC for all range

### 3.2.7 Transistor hFE Test

| Range | Test Range  | Test Current / Voltage                     |
|-------|---|--|
| hFE   | Display reads approx. hFE value (0~1000) of transistor under test (NPN and PNP Type ) | Best Current approx 10µA Voltage approx 3V |



### 3.2.8 Diode test and Audible Continuity Test

| Range | Description  | Test Condition   |
|-------|--|--|
| ➔     | Display shows approximate forward Voltage of diode.    | Forward DC current approx 1.5mA Reversed DC voltage approx. 3V |
| 🔊     | Built-in buzzer sounds if resistance is less than 80Ω. | Open circuit voltage approx 3V                                 |



Overload protection: 250V DC/250Vrms AC

## 4. OPERATING INSTRUCTIONS

### Preliminary Note:

1. If the battery is weak. Display will show “”. The battery should be replaced
2. The “” logo or next to the test lead sockets warns that the input voltage or current should not exceed the indicated values. This is to prevent damage to internal circuitry.
3. The FUNCTION switch should be set to the range to be used before operation.



### 4.1 DC Voltage Measurement

- 1) Set the FUNCTION switch to “” range to be used.
- (2) Connect the BLACK test lead to the “COM” socket and the RED test lead to the “” socket
- (3) Connect the test leads across the source or load under measurement.

#### Note:

1. If the voltage range is not known beforehand. set the FUNCTION switch to the highest range and work down.
2. When “1” is displayed, this indicates overrange and the FUNCTION switch must be set to a higher range.
3. Don't apply more than DC 1000V to the input, indication is possible at higher voltage but there is danger of damaging the internal circuitry.
4. Use extreme caution to avoid contact with high tension circuits when measuring high voltages


### 4.2 AC Voltage Measurement

- (1) Set the FUNCTION switch to “” range to be used.
- (2) Connect the BLACK test lead to the “COM” socket and the RED test lead to the “” socket.
- (3) Connect the test leads across the source or load under measurement.

#### Note:

1. see DC voltage measurement note 1~2.
2. Don't apply more than 700Vrms AC to the input, indication is possible at higher voltage but there is danger of damaging the internal circuitry.
3. Use extreme caution to avoid contact with high tension circuits when measuring high voltage.


### 4.3 DC current Measurement

- (1) Set the FUNCTION switch to the “” range to be used.
- (2) Connect the BLACK test lead to the “COM” socket and the RED test lead to the “mA” socket for a maximum of 200mA. for a maximum of 20A, move the RED test lead to “20A”.socket.
- (3) Connect the test leads in series with the load under measurement.

#### Note:

1. If the current range is not known beforehand.set the FUNCTION switch to high range and work down.
2. When “1” is display,overrange is being indicated and the FUNCTION switch must be set to a higher range.
3. The maximum input current is 200mA or 20A depending upon the socket used. Excessive current will blow the fuse which must be replaced. The fuse rating should be 200mA or 20A and no more to avoid damage to internal circuitry.



### 4.4 AC Current Measurement

- (1) Set the FUNCTION switch to “” range to be used.
- (2) Connect the BLACK test lead to the “COM” socket and the RED test lead to the “mA” socket for a maximum of 200mA, for a maximum of 20A, move the RED test lead to the “20A”.socket.
- (3) Connect the test leads in series with the load under measurement.

#### Note:

1. If the current range is not known beforehand..set the FUNCTION switch to high range and work down.
2. When “1” is display,overrange is being indicated and the FUNCTION switch must be set to a higher range.
3. The maximum input current is 200mA or 20A depending upon the socket used. Excessive current will blow the fuse which must be replaced. The fuse rating should be 200mA or 20A and no more to avoid damage to internal circuitry.

### 4.5 Resistance Measurement

- (1) Set the FUNCTION switch to “” range to be used
- (2) Connect the BLACK test lead to the “COM” socket and the RED test lead to the “” socket.
- (3) Connect the test leads across the resistance under measurement.

#### Note:

1. If the resistance value being measured exceeds the maximum value of the range selected,an overrange indication will be displayed (“1”). Select a higher range. For resistance of approximately 1 Mega Ohm and above. the meter may take a few seconds to stabilize. This is normal for high resistance readings.
2. When the input is not connected (open circuit), “1” will be displayed to indicate overrange condition.
3. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors are fully discharged.



### 4.6 Capacitance Measurement

- (1) Set the FUNCTION switch to “F” range to be used.
- (2) Insert the capacitor under measurement into the two sockets “C-” and “C+” on the front panel.

#### Note:

1. Capacitors should be discharged before being inserted into the test-sockets.
2. When testing large capacitance, note that there will be a certain time lag before the final indication.
3. Do not connect an external voltage or charged capacitor (especially larger capacitors ) to measuring terminals.


### 4.7 Diode Measurement and Audible Continuity Test

- (1) Set the FUNCTION switch to the “” range and connect the test leads across the diode under measurement, display shows the approx. forward voltage of this diode.
- (2) Connect the BLACK test lead to “COM” socket and the RED test lead to the “” socket..
- (3) Connect the test leads to either ends of the part of the circuit to be tested, if the resistance is lower than approx. 80Ω,the buzzer will sound.

### 4.8 Back light

Press button “” to switch on display back light, press again to switch off back light.

## 5. MAINTENANCE

- (1) The multimeter is a precision electronic device. Do not tamper with the circuitry. to avoid damage:
  - A: Never connect more than 1000V DC or 750Vrms AC.
  - B: Never connect a source of voltage when the function switch is set to measure resistance.
  - C : Never operate the meter unless the battery cover is in place and fully closed.
  - D : Test leads should be disconnected and POWER switched off before Battery and/or fuse replacement.
- (2) Turn off the power if the meter is not in use, remove the battery if the meter is not likely to be used for a long period.
- (3) If the “” sign appears in the display, open the compartment cover, remove the spent battery and replace it with a battery of the same type. For fuse replacement follow the same the same steps.
- (4) Please take out the battery when not using for a long time.

## 9. Accessories

- [1] Test Leads: electric rating 1000V 10A
- [2] Fuse: F-200mA/250V - fitted
- [3] Operator's Manual
- [4] Holster
- [5] Zip-up protective case

For any further information or queries please contact

**Philex Customer Careline: 08457 573 479**  
(Local rate – UK only)

**Technical Support: [www.philex.com/support](http://www.philex.com/support)**



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