

HP-90E

DIGITAL MULTIMETER

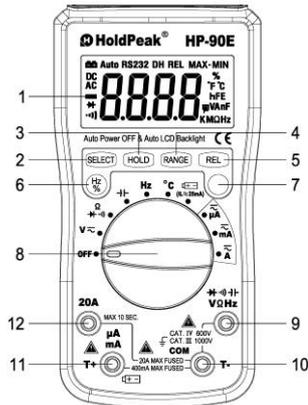
OPERATOR'S MANUAL

1. Overview

The multimeter is characterized at slim size, portable, stable performance and anti-dropping capacity. Using 4000 counts digit LCD monitor with character 22mm high, they offer clear readings. With overall circuitry design centering on large-scale IC A/D converters in conjunction and over-load protection circuit, the meters give excellent performance and exquisite making as a handy utility instrument.

The meters can be used to measure DC & AC voltage, DC & AC current, resistance, capacitor, frequency, duty cycle, temperature, battery test, positive diode voltage fall and audible continuity.

2. Panel Layout



- ① LCD display: 4000 counts digit, full function symbol display.
- ② SELECT key: This key work on the " Ω \rightarrow \rightarrow \rightarrow " range, press the key to choose resistance, diode or continuity test, on the voltage or current range, change to DC or AC; If press and hold SELECT key to power on, "Auto Power Off" function will be disabled.
- ③ HOLD key: Press the "HOLD" key to lock display value, and the "DH" sign will appear on the display, press it again to exit.
- ④ RANGE Key: Press the "RANGE" key, the meter enters manual range mode, press it more than 2 seconds again, return to auto mode.
- ⑤ REL Key: Press the "REL" key, the meter enters relative measuring mode, "REL" is displayed on the LCD and the present reading becomes the reference value and displayed on the display. Relative measurement $REL \frac{\text{measurement value}}{\text{Reference value}}$.
- ⑥ Hz/% Key: On "ACV/ACA" or "Hz" range, press the "Hz/%" key, you can choose the Frequency or Duty Cycle measurement.
- ⑦ CDS sensor: The CDS sensor can reaction to the ambient brightness range, then automatically control the LCD backlight to lighten or go out.
- ⑧ Rotary Switch: use this switch to select functions and ranges.
- ⑨ VHz Ω \rightarrow \rightarrow \rightarrow Input Jack
- ⑩ COM and Temperature "+" Input Jack
- ⑪ μ A mA BATT and Temperature "+" Input Jack
- ⑫ 20A Input Jack

3. Safety Information

3-1 The meters are designed according to IEC-1010 concerning electronic measuring instruments with an over-voltage category 600V (CAT IV) and pollution 2.

3-2 Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition.

3-3 safety symbols:

- Important safety information, refer to the operating manual.
- Dangerous voltage may be presence.
- Double insulation (protection Class II)

4. Special Cautions for Operation

4-1 The meters can be safe only according to standard procedures when used in conjunctions with the supplied test leads. To replace damaged test leads with only the same model or same electric specifications.

4-2 To avoid risk of electric shock, do not use the meters before the cover is in place.

4-3 The range switch should be right position for the testing.

4-4 To avoid electric shock and damaging the instruments, the input signals are forbidden to exceed the specified limits.

4-5 When measuring TV set or switched power, attention should be paid to the possible pulses that may bring destruction to the circuit.

4-6 Range switch position is forbidden to be changed at random during measurement.

4-7 Take caution against shock in the course of measuring voltage higher than DC 60V & AC 30V.

4-8 Protection fuse should be replaced only with same type and same

specification.

4-9 After operation is finished, set function switch at OFF range to save battery power.

4-10 If the meter is without usage for long time, take out battery to avoid damage by battery leakage.

5. GENERAL SPECIFICATIONS

5-1 Max Voltage between input terminal and Earth Ground: CAT IV 600V

5-2 Over-range Indication: display "OL" for the significant digit.

5-3 Automatic display of negative polarity "-".

5-4 Low Battery Indication: "E" displayed.

5-5 Max LCD display: 4000 counts digit.

5-6 Auto range & Manual range control

5-7 Auto Power Off: When measurement exceeds 30 minutes without switching mode and pressing key, the meter will switch to standby mode. Press any key to exit standby mode. When restart the system, press and hold SELECT key to disable auto power off.

5-8 Auto LCD backlight

5-9 Fuse protection: 400mA/250V PPTC Resettable Fuse
F-20A/250V Fuse (\varnothing 5x20mm)

5-10 Power supply: 9V battery (6F22)

5-11 Operating Temp.: 0°C to 40°C (relative humidity <85%)

5-12 Storage Temp.: -10°C to 50°C ((relative humidity <85%)

5-13 Guaranteed precision Temp.: $23 \pm 5^\circ\text{C}$ (relative humidity <70%)

5-14 Dimension: 193x88x41mm

5-15 Weight: approx. 320g (including battery)

6. Testing Specifications

Accuracy is specified for a period of year after calibration and at 18°C to 28°C (64°F to 82°F) with relative humidity to 70%.

6-1 DC Voltage

Range	Resolution	Accuracy
400mV	0.1mV	$\pm(0.5\% \text{ of rdg} + 2 \text{ digits})$
4V	1mV	
40V	10mV	
400V	100mV	
1000V	1V	$\pm(0.8\% \text{ of rdg} + 2 \text{ digits})$

-- Impedance: 10M Ω , More than 100M Ω on 400mV range

-- Overload protection: 250V DC or AC rms for 400mV range, effective 1000V DC or 750V AC rms for other ranges

6-2 AC Voltage

Range	Resolution	Accuracy
400mV	0.1mV	$\pm(1.2\% \text{ of rdg} + 3 \text{ digits})$
4V	1mV	
40V	10mV	
400V	100mV	$\pm(0.8\% \text{ of rdg} + 3 \text{ digits})$
750V	1V	

--The 400mV range be selected by press "RANGE" key only

-- Impedance: 10M Ω , More than 100M Ω on 400mV range

-- Overload protection: 250V DC or AC rms for 400mV range, effective 1000V DC or 750V AC rms for other ranges

-- Frequency Range: 40 to 400Hz

-- Response: average, calibrated in rms of sine wave

6-3 DC Current

Range	Resolution	Accuracy
400 μ A	0.1 μ A	$\pm(1.2\% \text{ of rdg} + 2 \text{ digits})$
4000 μ A	1 μ A	
40mA	10 μ A	
400mA	100 μ A	
4A	1mA	$\pm(2.0\% \text{ of rdg} + 3 \text{ digits})$
20A	10mA	

-- Overload protection: 400mA/250V PPTC Resettable Fuse

F-20A/250V Fuse, 20A up to 10 seconds

6-4 AC Current

Range	Resolution	Accuracy
400 μ A	0.1 μ A	$\pm(1.5\% \text{ of rdg} + 3 \text{ digits})$
4000 μ A	1 μ A	
40mA	10 μ A	
400mA	100 μ A	
4A	1mA	$\pm(2.5\% \text{ of rdg} + 5 \text{ digits})$
20A	10mA	

-- Overload protection: 400mA/250V PPTC Resettable Fuse

F-20A/250V Fuse, 20A up to 10 seconds

-- Frequency Range: 40 to 400Hz

-- Response: average, calibrated in rms of sine wave

6-5 Resistance

Range	Resolution	Accuracy
400 Ω	0.1 Ω	$\pm(1.0\% \text{ of rdg} + 3 \text{ digits})$
4k Ω	1 Ω	
40k Ω	10 Ω	$\pm(1.0\% \text{ of rdg} + 2 \text{ digits})$
400k Ω	100 Ω	
4M Ω	1k Ω	
40M Ω	10k Ω	$\pm(1.5\% \text{ of rdg} + 3 \text{ digits})$

-- Overload protection: 250V DC or AC rms

6-6 Capacitance

Range	Accuracy	Resolution
51.2nF	±(3.0% of rdg + 10 digits)	10pF
512nF		100pF
5.12µF	±(2.5% of rdg + 5 digits)	1nF
51.2µF		10nF
100µF		100nF

-- Overload protection: 250V DC or AC rms

6-7 Frequency

Range	Accuracy	Resolution
5.12Hz	± (0.1% of rdg + 5 digits)	0.001Hz
51.2Hz		0.01Hz
512Hz		0.1Hz
5.12kHz		1Hz
51.2kHz		10Hz
512kHz		100Hz
5.12MHz		1kHz

-- Sensitivity: sine wave 0.6V rms (5.12MHz: 1.5V rms)

-- Overload protection: 250V DC or AC rms

6-8 Duty cycle

0.1%~99.9%: ± (2.0% of rdg + 2 digits), Frequency lower than 10kHz

-- Sensitivity: sine wave 0.6V rms

-- Overload protection: 250V DC or AC rms

6-9 Temperature

Range	Accuracy	Resolution	
°C	-20~150°C	± (3°C+ 1digit)	1°C
	150~1000°C		

-- NiCr-NiSi sensor

-- Overload protection: 400mA/250V PPTC Resettable Fuse

6-10 Battery test

Range	Accuracy	Test Condition
	±(1.5% of rdg + 5 digits)	Loading Current Approx. 25mA

-- Battery voltage range: 1.5V~12V

-- Overload protection: 400mA/250V PPTC Resettable Fuse

6-11 Diode and Audible continuity test

Range	Description	Test Condition
	Display read approximately forward voltage of diode	Forward DC current approx. 0.4mA Reversed DC voltage approx. 1.5V
	Built-in buzzer sounds if resistance is less than 100Ω	Open circuit voltage approx. 0.5V

Overload protection: 250V DC or AC rms

7. OPERATING INSTRUCTIONS

7-1 Attention before operation

7-1-1 Check battery. When the battery voltage drop below proper operation range, the symbol will appear on the LCD display and the battery need to be changed.

7-1-2 Pay attention to the besides the input jack which shows that the input voltage or current should be within the specified value.

7-1-3 The range switch should be positioned to desired range for measurement before operation.

7-2 Measuring DC & AC Voltage

7-2-1 Connect the black test lead to COM jack and the red to V Ω Hz jack.

7-2-2 Set the rotary switch at the desired "V " range position, it shows symbol for testing DC voltage, if you want to test AC voltage, push "SELECT" button switch, then if you want to test AC 400mV, push "RANGE" to choose.

7-2-3 Connect test leads across the source or load under measurement.

7-2-4 You can get reading from LCD. The polarity of the red lead connection will be indicated along with the DC voltage value.

NOTE:

1. means you can't input the voltage more than 1000V, it's possible to show higher voltage, but it may destroy the inner circuit or pose a shock.

2. Be cautious against shock when measuring high Voltage.

7-3 Measuring DC & AC Current

7-3-1 Connect the black test lead to COM jack and the red to the µAmA jack for a maximum 400mA current , for a maximum 2A or 20A current, move the red lead to the 20A jack.

7-3-2 Set the rotary switch at the desired "uA " & "mA " & "A " range position, it shows symbol for testing DC current, if you want to test AC current, push "SELECT" button switch.

7-3-3 Connect test leads in series with the load under measurement.

7-3-4 You can get reading from LCD. The polarity of the red lead connection will be indicated along with the DC current value.

NOTE:

1. When the value scale to be measured is unknown beforehand, set the range selector at the highest position.

2. When only "OL" is displayed, it indicates over-range situation and the higher range has to be selected.

3. means the socket mA's maximum current is 400mA and 20A's

maximum current is 20A, over 400mA current can be protected by the PPTC resettable fuse, but over 20A current will destroy the fuse. On the 20A range, the measuring time should be less than 10 seconds to prevent precision from affecting by circuit heating.

7-4 Measuring Resistance

7-4-1 Connect the black test lead to COM jack and the red to V Ω Hz jack.

7-4-2 Set the rotary switch at the desired "Ω " range position.

7-4-3 Connect test leads across the resistance under measurement.

7-4-4 You can get reading from LCD.

NOTE:

1. For measuring resistance above 1MΩ , the mete may take a few seconds to get stable reading.

2. When the input is not connected, i.e. at open circuit, the figure 'OL' will be displayed for the over-range condition.

3. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors have been discharged fully.

7-5 Measuring Capacitance

7-5-1 Connect the black test lead to COM jack and the red to V Ω Hz jack.

7-5-2 Set the rotary switch at the desired "F " range position.

7-5-3 Connect test leads across the capacitance under measurement.

7-5-4 You can get reading from LCD.

NOTE: Max. input overload: 250V rms < 10sec

1. Capacitors should be discharged before being tested.

2. When testing large capacitance, it will take longer time before the final indication (For 100µF, it will take about approx. 15 seconds).

3. When testing small capacitance (≤100nF) , to assure the measurement accuracy, first press "REL", then go on measuring.

7-6 Measuring Frequency & Duty cycle

7-6-1 Connect the black test lead to COM jack and the red to V Ω Hz jack.

7-6-2 Set the rotary switch at the desired "Hz" range position.

7-6-3 Push "Hz/%" key to choose Frequency or Duty cycle test.

7-6-4 Connect the probe across the source or load under measurement.

7-6-5 You can get reading from LCD.

7-7 Measuring Temperature

7-7-1 Connect the black banana plug of the sensor to COM (T-) jack and the red banana plug to the µAmA (T+) jack.

7-7-2 Set the rotary switch at the desired "°C" range position.

7-7-3 Put the sensor probe into the temperature field under measurement.

7-7-4 You can get reading from LCD.

NOTE: Max. input over-load: 250V rms < 10sec

1. The accessory of the meter WRNM-010 type contact thermocouple limit temperature is 250 °C(300 °shortly), please use special probe for test higher temperature.

2. Please don't change the thermocouple at will, otherwise we can't guarantee to measure accuracy.

3. Please don't importing the voltage in the temperature function.

7-8 Battery Testing

7-8-1 Connect the black test lead to COM jack and the red to µAmA jack.

7-8-2 Set the rotary switch at the desired "B " range position.

7-8-3 Connect test leads across the source or load under measurement.

7-8-4 You can get reading from LCD. The loading current is approx. 25mA (positive), it is no loading current when the display is negative.

7-9 Diode & Audible continuity Testing

7-9-1 Connect the black test lead to COM jack and the red to V Ω Hz jack.

7-9-2 Set the rotary switch at the "Ω " range position, push "SELECT" to choose Diode or Audible continuity measurement.

7-9-3 On diode range, connect the test leads across the diode under measurement, display shows the approx. forward voltage of this diode.

7-9-4 On Audible continuity range, connect the test leads to two point of circuit, if the resistance is lower than approx. 100Ω, the buzzer sounds.

NOTE: Make sure the power is cut off and all capacitors need to be discharged under this measurement.

8. Maintenance

8-1 Before attempting to remove the battery door or open the case, be sure that test leads have been disconnected from measurement circuit top avoid electric shock hazard.

8-2 To avoid electrical shock, remove test leads from measurement circuits before replacing the fuse. For protection against fire, replace fuses only with specified ratings: F-20A/250V fuse.

8-3 Your must replace the test leads if the lead is exposed, and should adopt the leads with the same specifications as origin.

8-4 Use only moist fabric or small amount of detergent but not chemical solution for cleaning.

8-5 Do not use the meter before the back cover is properly closed and screw secured. Upon any abnormality, stop operation immediately and send the meter for maintenance.

8-6 Please take out the battery when not using for a long time.

9. Accessories

[1] Test Leads: electric rating 1000V 20A

[2] "K" type thermocouple sensor probe

[3] Operator's Manual

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