

EM3490 Series

Digital Multimeter

Users Manual

Read this manual thoroughly before use

WARRANTY

This instrument is warranted to be free from defects in material and workmanship for a period of one year. Any instrument found defective within one year from the delivery date and returned to the factory with transportation charges prepaid, will be repaired, adjusted, or replaced at no charge to the original purchaser. This warranty does not cover expandable items such as battery or fuse. If the defect has been caused by a misuse or abnormal operating conditions, the repair will be billed at a nominal cost.

INTRODUCTION

This series multimeters are compact 3 1/2-digit digital multimeters designed to measure DC and AC voltage, DC current, resistance, diode and continuity. Some models also have battery, frequency, transistor hFE or LED test function or signal output function.

They feature low battery indication and full-range overload protection. They are easy to operate and are ideal test tools.

Except where noted, the descriptions and instructions in this manual apply to EM3490, EM3491, EM3492, EM3493 and EM3498. Illustration uses EM3498.

Different models have different functions, see the following table:

FUNC MODEL	DCV	ACV	DCA	OHM	▶+	•))	BATT	⌋*	FREQ	hFE	LED
EM3490	✓	✓	✓	✓	✓	✓				✓	✓
EM3491	✓	✓	✓	✓	✓	✓	✓				
EM3492	✓	✓	✓	✓	✓	✓		✓		✓	✓
EM3493	✓	✓	✓	✓	✓	✓	✓				
EM3498	✓	✓	✓	✓	✓	✓			✓	✓	✓

* "⌋" represents the signal output function.

SAFETY INFORMATION

The meter has been designed according to IEC 61010 concerning electronic measuring instruments with a measurement category (CAT II 600V) and pollution degree 2.


Warning

To avoid possible electric shock or personal injury, follow these guidelines:

- Do not use the meter if it is damaged. Before you use the meter, inspect the case. Pay particular attention to the insulation surrounding the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity.

Replace damaged test leads before you use the meter.

- Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.
- Do not operate the meter where explosive gas, vapor, or dust is present.
- Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.
- Before use, verify the meter's operation by measuring a known voltage.
- When measuring current, turn off circuit power before connecting the meter in the circuit. Remember to place the meter in series with the circuit.
- When servicing the meter, use only specified replacement parts.
- Use caution when working with voltage above 30V ac rms, 42V peak, or 60V dc. Such voltages pose a shock hazard.
- When using the probes, keep your fingers behind the finger guards on the probes.
- When making connections, connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- Remove the test leads from the meter before you open the battery cover or the case.
- Do not operate the meter with the battery cover or portion of the case removed or loosened.

- To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator () appears.
- Do not use the meter if the meter, a test lead or your hand is wet.
- Do not touch any naked conductor with hand or skin; and do not ground yourself while using the meter.
- Do not use the meter in a manner not specified by this manual or the safety features provided by the meter may be impaired.
- Adhere to local and national safety codes. Individual protective equipment must be used to prevent shock and arc blast injury where hazardous live conductors are exposed.
- When an input terminal is connected to dangerous live potential, it is to be noted that this potential can occur at all other terminals!
- **CAT II** - Measurement Category II is for measurements performed on circuits directly connected to low voltage installation. (Examples are measurements on household appliances, portable tools and similar equipments.)
Do not use the meter for measurements within Measurement Categories III and IV.

Caution

To avoid possible damage to the meter or to the equipment under test, follow these guidelines:

- Disconnect circuit power and discharge all capacitors thoroughly before testing resistance, diode, transistor, LED or continuity.
- Use the proper terminals, function, and range for your measurements.
- Before turning the rotary switch to change functions, disconnect the test leads from the circuit under test.
- Remove all test leads from the meter before testing transistor or LED.

Electrical Symbols

~ Alternating Current

≡ Direct Current

⎓ Both direct and alternating current

⚠ Caution, risk of danger, refer to the operating manual before use.

⚡ Caution, risk of electric shock.

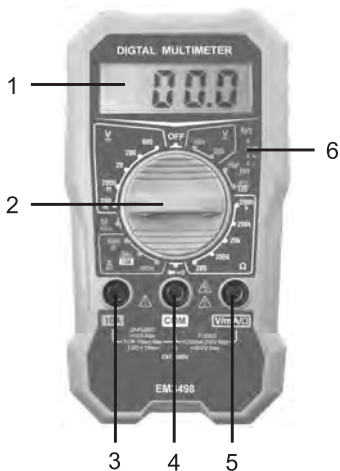
⊥ Earth (ground) Terminal

⊞ Fuse

CE Conforms to European Union directives

- ☐ The equipment is protected throughout by double insulation or reinforced insulation.

FRONT PANEL



1. Display

3 1/2-digit LCD, with a max reading of 1999

2. Function / Range Switch

Used to select desired function and/or range as well as to turn on or off the meter.

To preserve battery life, set this switch to the " **OFF** " position when the meter is not in use.

3. " 10A " Terminal

Plug-in connector for the red test lead for current (200mA - 10A) measurements.

4. " COM " Terminal

Plug-in connector for the black test lead.

5. " V/mA/Ω " Terminal

Plug-in connector for the red test lead for DC voltage, AC voltage, DC current (< 200mA), resistance, frequency, battery, diode and continuity measurements.

6. Transistor/LED Test Socket (EM3490, EM3492 and EM3498 only)

GENERAL SPECIFICATION

Display: 3 1/2-digit LCD, with a max. reading of 1999

Overrange Indication: Only figure " 1 " shown on the display

Negative Polarity Indication: Negative sign " – " shown on the display automatically

Sampling Rate: About 2 to 3 times/sec

IP Degree: IP20

Operation Environment: Temperature: 0°C to 40°C

Relative Humidity: < 75%

Storage Environment: Temperature: -10°C to 50°C

Relative Humidity: < 85%

Battery: 9V battery, 6F22 or equivalent, 1 piece

Low Battery Indication: "  " shown on the display

Size: 137 X 75 X 30mm

Weight: About 147g (including battery)

SPECIFICATION

Accuracy is specified for a period of one year after calibration and at 18°C to 28°C, with relative humidity < 75%.

Accuracy specifications take the form of:

± ([% of Reading]+[number of Least Significant Digits])

AC Voltage

Range	Resolution	Accuracy
200V	100mV	± (1.2% + 10)
600V	1V	

Frequency Range: 40Hz - 400Hz

Response: Average, calibrated in rms of sine wave

Max. Allowable Input Voltage: 600V

DC Voltage

Range	Resolution	Accuracy
200mV	100 μ V	\pm (0.5% + 5)
2000mV	1mV	\pm (0.8% + 5)
20V	10mV	
200V	100mV	
600V	1V	\pm (1.0% + 5)

Input Impedance: 1M Ω

Max. Allowable Input Voltage: 600V

DC Current

Range	Resolution	Accuracy
200 μ A	0.1 μ A	\pm (1.0% + 5)
2000 μ A	1 μ A	
20mA	10 μ A	
200mA	100 μ A	\pm (1.2% + 5)
10A	10mA	\pm (2.0% + 5)

Overload Protection:

250mA/250V Fast acting fuse (for " **V/mA/ Ω** " terminal inputs only)

There is no fuse protection for " **10A** " terminal inputs.

Max. Allowable Input Current: 10A

(For inputs > 2A: measurement duration < 10 secs,
interval > 15 minutes)

Max. Test Voltage Drop: 200mV

Note: Only EM3490 and EM3491 have the 200 μ A range.

Resistance

Range	Resolution	Accuracy
200 Ω	0.1 Ω	$\pm (1.2\% + 5)$
2000 Ω	1 Ω	$\pm (1.0\% + 5)$
20k Ω	10 Ω	
200k Ω	100 Ω	
2000k Ω	1k Ω	$\pm (1.2\% + 5)$
20M Ω	10k Ω	$\pm (1.5\% + 5)$

Open Circuit Voltage: < 3V

Overload Protection: 250V

Note: Only EM3493 has 20M Ω range.

Transistor hFE Test (EM3490, EM3492 and EM3498 only)

Range	hFE	Test Current	Test Voltage
PNP & NPN	0 - 1000	$I_b \approx 10\mu\text{A}$	$V_{ce} \approx 2.8\text{V}$

Battery Test (EM3491 and EM3493 only)


Range	Description	Test Condition
1.5V	The working voltage of the battery will be shown on the display so that the quality of the battery can be judged.	The test current is about 20mA.
9V		The test current is about 5mA.

Frequency (EM3498 only)



Range	Resolution	Accuracy
20kHz	10Hz	$\pm (1.5\% + 5)$

Input Voltage: 0.2V rms - 20V rms

Signal Output (EM3492 only)

Range	Output Signal	Output Level
	square wave signal of about 50Hz	about 3Vp-p

Diode and Continuity

Range	Description	Remark
	The approximate forward voltage drop of the diode will be shown on the display.	Open Circuit Voltage: about 2.8V
	<p>The built-in buzzer will sound if the resistance is less than about 50Ω.</p> <p>The buzzer will not sound if the resistance is more than about 150Ω.</p> <p>The buzzer may or may not sound if the resistance is between 50Ω and 150Ω.</p>	Open Circuit Voltage: about 2.8V

OPERATING INSTRUCTION

Measuring DC Voltage

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **V/mA/Ω** " terminal.
2. Set the range switch to desired \underline{V} range position.
If the magnitude of the voltage to be measured is not

known beforehand, set the range switch to the highest range first and then reduce it range by range until satisfactory resolution is obtained.

3. Connect the test leads across the source or circuit to be tested.
4. Read the reading on the display. The polarity of the red test lead connection will be indicated as well.

Note:

To avoid electric shock to you or damages to the meter, do not apply a voltage higher than 600V between the terminals.

Measuring AC Voltage

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **V/mA/Ω** " terminal.
2. Set the range switch to desired \sim range position. If the magnitude of the voltage to be measured is not known beforehand, set the range switch to the highest range first and then reduce it range by range until satisfactory resolution is obtained.
3. Connect the test leads across the source or circuit to be tested.
4. Read the reading on the display.

Note:

To avoid electric shock to you or damages to the meter, do

not apply a voltage higher than 600V between the terminals.

Measuring DC Current

1. Connect the black test lead to the " **COM** " terminal. If the current to be measured is less than 200mA, connect the red test lead to the " **V/mA/Ω** " terminal. If the current is between 200mA and 10A, connect the red test lead to the " **10A** " terminal instead.
2. Set the range switch to desired **A** range position.
3. Turn off power to the circuit to be tested. Discharge all capacitors.
4. Break the circuit path to be tested, and connect the test leads in series with the circuit.
5. Turn on power to the circuit, then read the display. The polarity of the red test lead connection will be indicated as well.

Note:

If you don't know the magnitude of the current to be measured beforehand, set the range switch to the highest range first and then reduce it range by range until satisfactory resolution is obtained.


Measuring Resistance

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **V/mA/Ω** " terminal.
2. Set the range switch to desired Ω range position.
3. Connect test leads across the object to be tested.
4. Read the reading on the display.

Note:


1. For measurements $> 1M\Omega$, the meter may take a few seconds to stabilize reading. This is normal for high resistance measurements.
2. When the input is not connected, i.e. at open circuit, " 1 " will be displayed as an overrange indication.
3. Before measurement, disconnect all power to the circuit to be tested and discharged all capacitors thoroughly.

Diode Test

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **V/mA/Ω** " terminal. (**Note:** The polarity of the red lead is positive " + ".)
2. Set the range switch to the  position.
3. Connect the red test lead to the anode of the diode to be tested and the black test lead to the cathode of the diode.

4. The display shows the approximate forward voltage drop of the diode. If the connection is reversed, " 1 " will be shown on the display.


Continuity Test

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **V/mA/Ω** " terminal.
2. Set the range switch to  position.
3. Connect the test leads across the circuit to be tested.
4. If the resistance is less than about 50Ω, the built-in buzzer will sound.

Note:

Before test, disconnect all power to the circuit to be tested and discharged all capacitors thoroughly.

Signal Output (EM3492 only)

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **V/mA/Ω** " terminal.
2. Set the range switch to the  position.
3. An output signal will appear between the probes of the test leads. The voltage of the signal is about 3Vp-p.

Note:

Don't apply voltage to the terminals when the range switch is in the " $\text{V}\overline{\text{L}}$ " position.

Battery Test (EM3491 and EM3493 only)

1. Connect the black test lead to the "**COM**" terminal and the red test lead to the "**V/mA/ Ω** " terminal.
2. According to the rated voltage of the battery to be tested, set the range switch to the corresponding **BATT** range position ("**1.5V**" or "**9V**" position).
3. Connect the test leads to the two terminals of the battery to be tested.
4. Read the battery's working voltage value on the display.

Measuring Frequency (EM3498 only)

1. Connect the black test lead to the "**COM**" terminal and the red test lead to the "**V/mA/ Ω** " terminal.
2. Set the range switch in **20KHz** position.
3. Connect the test leads across the source or circuit to be tested.
4. Read the reading on the display.

Note:

The voltage of input signal should be between 0.2V rms and 20V rms. If the voltage exceeds 20V rms, the error of reading may exceed the specified accuracy range.

Transistor hFE Test (EM3490, EM3492 and EM3498 only)

1. Identify whether the transistor to be measured is NPN or PNP type, then set the range switch to the corresponding **hFE** position.
2. locate the emitter, base and collector leads of the transistor, then insert these leads into the respectively corresponding holes of the transistor test socket on the meter.
3. The display shows the approximate hFE value.

LED Test (EM3490, EM3492 and EM3498 only)

1. Set the range switch to **LED** position (" $\frac{\text{NPN}}{\text{LED}}$ " position).
2. Insert the two leads of the LED to be tested into the " + " and " - " holes of the LED test socket on the

meter, make sure that the anode of this LED is connected to the " + " hole and the cathode of this LED is connected to the " - " hole.

3. If the LED lights up, it is good. If the LED is dead, it is abnormal or you have reversed the polarity connection.

MAINTENANCE

Warning

Except replacing fuse and battery, never attempt to repair or service the meter unless you are qualified to do so and have the relevant calibration, performance test, and service instructions.

Store the meter in a dry place when not in use. Don't store it in an environment with intense electromagnetic field.

General Maintenance

Periodically wipe the case with a damp cloth and a little mild detergent. Do not use abrasives or solvents.


Dirt or moisture in the terminals can affect readings. Clean the terminals as follows:

1. Turn off the meter and remove all the test leads from the meter.
2. Shake out any dirt which may exist in the terminals.
3. Soak a new swab with alcohol.
4. Work the swab around in each terminal.

If the meter fails, check the battery and fuse, and/or review this manual to verify proper use of the meter.


Replacing Battery and Fuse

Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator () appears.

To prevent damage or injury, use only replacement fuse specified.

Before opening the battery cover or the case , turn off the meter and remove the test leads.

When the symbol "  " appears on the display, the battery is low and must be replaced immediately. To replace the battery, remove the screw on the battery cover and remove the battery cover. Replace the exhausted

battery with a new one of the same type. Reinstall the battery cover and the screw.

To replace the fuse, remove the screw on the battery cover and remove the battery cover. Then remove the screws on the back cover and remove back cover. Replace the blown fuse with a new one of the same ratings. Reinstall the back cover, the battery cover and all the screws properly.

This meter uses one fuse: 250mA/250V, Fast, Ø5X20mm

ACCESSORIES

Manual: 1 piece

Test Lead: 1 pair

NOTE

1. This manual is subject to change without notice.
2. Our company will not take the other responsibilities for any loss.
3. The contents of this manual can not be used as the reason to use the meter for any special application.

DISPOSAL OF THIS ARTICLE

Dear Customer,

If you at some point intend to dispose of this article, then please keep in mind that many of its components consist of valuable materials, which can be recycled.

Please do not discharge it in the garbage bin, but check with your local council for recycling facilities in your area.



