



**EM 128**

# **AUTOMOTIVE MULTIMETER**

OWNER'S MANUAL

Read this owner's 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 batteries or fuses. If the defect has been caused by a misuse or abnormal operating conditions, the repair will be billed at a nominal cost.

## SAFETY INFORMATION

EM128 automotive multimeter has been designed according to IEC-1010 concerning electronic measuring instruments with a measurement category (CAT II 600 V) and Pollution degree 2.

### **Warning**

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

- a. 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.

- b. 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.
- c. Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.
- d. Do not operate the meter around explosive gas, vapor, or dust.
- e. Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.
- f. Before use, verify the meter's operation by measuring a known voltage.
- g. When measuring current, turn off circuit power before connecting the meter in the circuit. Remember to place the meter in series with the circuit.
- h. When servicing the meter, use only specified replacement parts.
- i. Use with caution when working above 30V ac rms, 42V peak, or 60V dc. Such voltages pose a shock hazard.

- j. When using the probes, keep your fingers behind the finger guards on the probes.
- k. Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- l. Remove the test leads from the meter before you open the battery door.
- m. Do not operate the meter with the battery door or portions of the cover removed or loosened.
- n. To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator ( "⎓ " ) appears.
- o. Remaining endangerment:  
When an input terminal is connected to dangerous live potential it is to be noted that this potential at all other terminals can occur!
- p. CATII-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.

# GENERAL DESCRIPTION

EM128 automotive multimeter is a compact 3 3/4-digit instrument for measuring DC and AC voltage, DC and AC current, resistance, diode and continuity. It can also test tachometer (RPM), dwell angle, temperature, duty cycle, and many other parameters concerning about automotive servicing. They can be operated easily and be ideal instruments for the vehicle drivers and servicer.

## Caution

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

- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, diode.
- Use the proper terminals, function, and range for your measurements.
- Before measuring current, check the meter's fuses and turn off the power to the circuit before connecting the meter to the circuit.
- Before rotating the range switch to change functions, disconnect test leads from the circuit under test.

- Remove test leads from the Meter before opening the Meter case.

## ELECTRICAL SYMBOLS

- ~ AC (Alternating Current)
- ≡ DC (Direct Current)
- ⚠ Important safety information. Refer to the manual.
- ⚡ Dangerous voltage may be present.
- ⏏ Earth ground
- ⏏ Fuse
- CE Conforms to European Union directives
- Double insulated
- ⚡ Low battery
- ➡ Diode

# FEATURE

1. Test dwell angle and tacho(RPM) of the engine with 2 cylinders, 3 cylinders, 4 cylinders, 5 cylinders, 6 cylinders, 8 cylinders.
2. Test DC/AC voltage, DC/AC current, resistance, diode, frequency, duty cycle, temperature, continuity.
3. LCD display, max. reading 3260
4. Autorange function for the test: DC/AC voltage, DC/AC current, resistance.
5. Overload protection for all range.

# GENERAL SPECIFICATIONS

display: 3 3/4 digits LCD with a max. reading 3260,  
digital height: 26mm.

Polarity: Auto polarity indication.

Overrange Indication : "OL"

Auto Zeroing Function

Sampling Rate : Approximate 3 times per sec.

Operating temperature: 0-40°C,

Storage temperature: -10-50°C,

Battery : single 9V battery

Low battery indication : "  " on LCD.

Relative humidity: < 75%

Auto power off: automatically turns off if you don't turn the rotary switch or press a button for 10 minutes (To arouse it, press "HOLD")

Size: 200 X 93 X 50mm

Weight: about 400g

## SPECIFICATIONS

Accuracy is specified for a period of one year after calibration and at  $23 \pm 5^{\circ}\text{C}$  with relative humidity up to 75%. Accuracy specifications take the form of:

$\pm ([ \% \text{ of Reading}] + [\text{number of Least Significant Digits}])$

### DC Voltage ( Autorange )

Range	Resolution	Accuracy
326mV	0.1mV	$\pm (0.5\% + 5)$
3.26V	1mV	$\pm (0.7\% + 5)$
32.6V	10mV	
326V	0.1V	
1000V	1V	

Input impedance :  $10\text{M}\Omega$  ( for 326mV range:  $> 100\text{M}\Omega$  )

Overload protection: DCV1000V; ACV750V



## AC Voltage ( Autorange )

Range	Resolution	Accuracy
326mV	0.1mV	$\pm(1.0\% + 3)$
3.26V	1mV	
32.6V	10mV	
326V	0.1V	
750V	1V	$\pm(1.2\% + 3)$

Input impedance: 10M $\Omega$

Frequency: 40Hz to 400Hz

Overload protection: DCV1000V; ACV750V

## DC Current ( $\mu$ A and mA Range are Autorange )

Range	Resolution	Accuracy
326 $\mu$ A	0.1 $\mu$ A	$\pm(1.2\% + 3)$
3260 $\mu$ A	1 $\mu$ A	
32.6mA	10 $\mu$ A	
326mA	0.1mA	
10A	10mA	$\pm(2.0\% + 5)$

Overload protection: F0.5A/250V ( for 10A range:  
F10A/250V)

## **AC Current ( $\mu$ A and mA Range Is Autorange)**

Range	Resolution	Accuracy
326 $\mu$ A	0.1 $\mu$ A	$\pm(1.5\% + 5)$
3260 $\mu$ A	1 $\mu$ A	
32.6mA	10 $\mu$ A	
326mA	0.1mA	
10A	10mA	$\pm(3.0\% + 5)$

Overload protection: F0.5A/250V (for 10A range:  
F10A/250V)

Frequency: 40Hz to 400Hz

## Resistance ( Autorange )

Range	Resolution	Accuracy
326Ω	0.1Ω	$\pm(1.0\% + 5)$
3.26kΩ	1Ω	$\pm(0.8\% + 5)$
32.6kΩ	10Ω	
326kΩ	0.1kΩ	
3.26MΩ	1kΩ	
32.6MΩ	10kΩ	$\pm(3.0\% + 7)$

## Frequency (Manual Range)

range	resolution	accuracy
320Hz	0.1Hz	$\pm(1.5\% + 5)$
3200Hz	1Hz	
32kHz	0.1kHz	

## Tacho

Range	Scope( RPM )	Resolution	Accuracy
RPM	0 ~ 3260	1 RPM	$\pm(1.5\% + 5)$
10 X RPM	10 X (0 ~ 3260)	10 X RPM	

## Dwell Angel (Manual Range)

Range	Scope( ° )	Resolution	Accuracy
2 cylinder	0 ~ 180	0.1°	$\pm (2.0\% + 5)$
3 cylinder	0 ~ 120		
4 cylinder	0 ~ 90		
5 cylinder	0 ~ 72		
6 cylinder	0 ~ 60		
8 cylinder	0 ~ 45		

## Duty Cycle

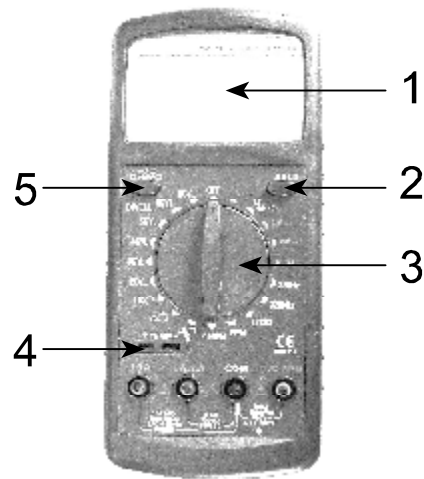
Range	Scope( % )	Resolution	Accuracy
Duty	0 ~ 99.9	0.1	$\pm (2.0\% + 5)$

## Temperature

Range	Resolution	Accuracy
750°C	1°	-20~<0°C (-4~<32°F) $\pm (2.0\% + 5)$ 0~400°C (32~752°F) $\pm (1.5\% + 3)$ 401~750°C (752~1382°F) $\pm (1.8\% + 4)$
1400°F	1°	

# instruction for the panel

1. LCD
2. data hold button
3. rotary switch
4. input jack for  
type k thermocouple
5. function-selection button  
("  $\Omega$  /  $\rightarrow$  + /  $\rightarrow$  ) " button)



## OPERATION INSTRUCTION

### Testing AC/DC Voltage

1. Insert the black test lead into the "COM" jack, red test lead into the "V $\Omega$  RPM " jack.
2. Set the rotary switch in " V $\approx$  " position, press the "  $\Omega$  /  $\rightarrow$  + /  $\rightarrow$  ) " button to select the DC/AC function according to symbol "DC" or "AC" on the display.
3. Connect the test leads to the circuit to be measured.
4. Read the reading on the display.
5. For dc voltage, the polarity of the red test lead will be displayed as well as the value.

## DC/AC Current

1. Connect the black test lead to the "COM" jack, red test lead to the " $\mu$ AmA" jack (when the current to be measured is between 326mA and 10A, connect the red test lead to "10A"jack instead )
2. Set the rotary switch in "  $\mu$ A", "mA" or "10A" position, press the "  $\Omega/\rightarrow/\rightarrow/\rightarrow$  " to select the DC or AC function according to the symbol "DC" or "AC" on display
3. Connect the test leads in series with the load to be measured.
4. Read the reading on the display. For dc current, the polarity of the red test lead will be displayed too.

## Testing Resistance

1. Connect the black test lead to the " COM " jack, red test lead to the " V $\Omega$  RPM " jack.
2. Set the rotary switch in "  $\Omega$  " position. The polarity of the red test lead is positive. The display shows "OL"
3. Connect the test leads across the load to be measured.
4. Read the reading on the display.

## Testing Diode

1. Connect the black test lead to the " COM " jack and the red test lead to the " V $\Omega$  RPM "
2. Set the rotary switch to "  $\Omega$  " position, Press "  $\Omega$  /  $\rightarrow$  + /  $\bullet$  ) " button to make the display show "  $\rightarrow$  + " .  
The polarity of the red test lead is positive.
3. Connect the test leads across the diode (red test lead to the positive pole of the diode, black test lead to the negative pole of the diode ),
4. Read the forward voltage on LCD. If the diode is reversed, the display will show "OL".

## Audible Continuity

1. Insert the black test lead to " COM " jack, insert the red test lead to " V $\Omega$  RPM " jack.
2. Set the rotary switch to "  $\Omega$  " position, Press the "  $\Omega$  /  $\rightarrow$  + /  $\bullet$  ) " button to make the display show "  $\bullet$  ) " .  
The polarity of the red test lead is positive.
3. Connect the test leads across the circuit to be measured. If its resistance is less than about 50 $\Omega$  , the buzzer will sound. If the input terminals open, the display will show " OL".

## Frequency Measurement

1. Connect the black test lead to the " COM "jack and the red test lead to the " V $\Omega$  RPM " jack.
2. Set the rotary switch in "320Hz", "3200Hz" or "32kHz" position according to the actual situation.
3. Connect the test leads to the circuit to be measured.
4. Read the frequency value displayed on the LCD.

## Measuring Temperature

1. Set the rotary switch in "750°C" or "1400°F " position,  
The display will show the temperature of the environment.
2. Insert type k thermocouple to the TEMP socket according to the correct polarity.
3. Connect the type K thermocouple to the object to be measured.
4. Read the reading on the display and it is the true temperature of the measured object.



## **Measuring Dwell Angle**

1. Connect the black test lead to the " COM " jack and the red test lead to the "  $V\Omega$  RPM " jack.
2. Set the rotary switch to the desired " DWELL " range according to the cylinders of the motor to be measured.
3. Connect the black test lead to the iron bars or the negative pole of the battery, and the red test lead to the distributor terminal of the ignition coil.
4. Start the motor to set it in idle- speed. Read the value of the dwell angle on the LCD.


## **Testing Duty Cycle**

1. Connect the black test lead to " COM " jack, red test lead to "  $V\Omega$  RPM " jack
2. Set the rotary switch in " DUTY " position
3. Connect the test leads to the circuit to be measured.
4. Read the reading on the display.

## Measuring Tacho

1. Connect the black test lead to the " COM " jack and the red test lead to the " VΩ RPM " jack.
2. Set the rotary switch to " RPM " ( or " 10 X PRM " ) position .
3. Connect the black test lead to the iron bars or the negative pole of the battery, and the red test lead to the distributor terminal of the ignition coil.
4. Start the motor, read the reading on the display, divide this reading by the number of cylinder, the result is the turning speed (tacho).

## BATTERY REPLACEMENT

When the symbol "  " appears on the display, it shows that the battery should be replaced. To replace the batteries, remove the screws on the case, replace the exhausted batteries with the new batteries of the same type, rejoin the cover and reinstall the screws.

# FUSE REPLACEMENT

Fuse rarely needs replacement and is blown almost always as a result of operator's error.

This meter uses a fuse: F10A/250V and a fuse: F0.5A/250V

To replace the fuses, remove the screws on the case, replace the damaged fuses with new fuses with the specified ratings, rejoin the cover and reinstall the screws.

## ACCESSORIES

Owner's Manual: 1piece

Test leads: 1pair

Battery : 9V battery     one unit

Type K thermocouple     one unit