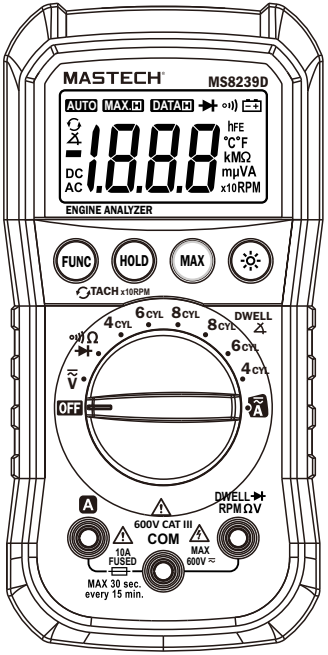
MASTECH® MS8239D

DIGITAL ENGINE ANALYZER

OPERATOR'S MANUAL



CAT III
600V

MASTECH®

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1. Safety Information

⚠Warning
To ensure safe operation, and in order to exploit to the full the functionality of the meter, please follow the directions in this section carefully.

This instrument has been designed according to IEC-1010 concerning electronic measuring instruments with an overvoltage category CAT III 600V and pollution 2.

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

With proper use and care, the digital meter will give you years of satisfactory service.

1.1 Preliminary

1.1.1 When using the meter, the user must observe all normal safety rules concerning:
- Protection against the dangers of electrical current
- Protection of the meter against misuse

1.1.2 When the meter is delivered, check that it has not been damaged in transit.

1.1.3 When poor condition under harsh preservation or shipping conditions caused, inspect and confirm this meter without damage.

1.1.4 Test leads must be in good condition. Before using, verify that the insulation of test leads is not damaged and the leads metal wire core is not exposed.

1.15 Full compliance with safety standards can be guaranteed only if used with test leads supplied. If necessary, they must be replaced with the same model or same electric ratings.

1.2 During Use

1.2.1 Before using, you must select the right input jack, function and range.

1.2.2 Never exceed the protection limit values indicated in specifications for each range of measurement.

1.2.3 When the meter is linked to a measurement circuit, do not touch unused terminals.

1.2.4 At the manual range, when the value scale to be measured is unknown beforehand, set the range selector at the highest position.

1.2.5 Do not measure voltage if the voltage on the terminals exceeds 600V above earth ground.

1.2.6 Always be careful when working with voltages above 60V DC or 30V AC rms, keep fingers behind the probe barriers while measuring.

1.2.7 Never connect the meter leads across a voltage source while the transform switch is in the current, resistance, temperature, diode or continuity mode. Doing so can damage the meter.

1.2.8 Before rotating the transform switch to change functions and ranges, disconnect test leads from the circuit under test.

1.2.9 Never perform resistance, temperature, diode and continuity measurements on live circuits.

1.2.10 Never use the meter under the condition of the explosive air, steam or dirt.

1.2.11 If any faults or abnormalities are observed, the meter can not be used any more and it has to be checked out.

1.2.12 Never use the meter unless the rear case is in place and fastened fully.

1.2.13 Please do not store or use meter in areas exposed to direct sunlight, high temperature, humidity or condensation.

1.3 Symbols

⚠	Note-Important safety information, refer to the instruction manual.
⚠	Caution, possibility of electric shock
⧈	Equipment protected throughout by double insulation or reinforced insulation.
⏚	Earth (ground) TERMINAL
AC	Alternating current
DC	Direct current
⊳|	Diode
•)))	Continuity buzzer
≂	AC or DC (alternating current or direct current)
4	Engine dwell
RPM	Round per minute
×10	Reading multiplies 10
MAX-H	The maximum value is being held.
DATA-H	This indicates that the display data is being held.
AUTO	Auto range
🔋	Low battery indicator, need to replace new ones

CAT III: MEASUREMENT CATEGORY III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.

1.4 Maintenance

1.4.1 Please do not attempt to adjust or repair the meter by removing the rearcase while voltage is being applied. A technician who fully understands danger involved should only carry out such actions.

1.4.2 Before opening the battery cover or case of the meter, always disconnect test leads from all tested circuits.

1.4.3 To avoid the wrong reading causing electricity attack, when the meter displays“🔋”, you must change the battery.

1.4.4 Do not use abrasives or solvents on the meter, use a damp cloth and mild detergent only.

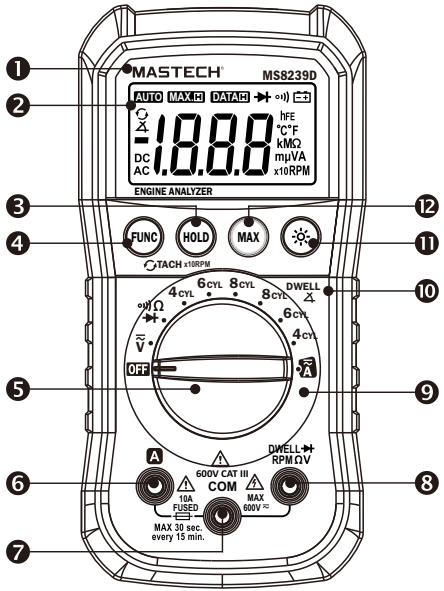
1.4.5 Always set the power switch to the OFF position when the meter is not in use.

1.4.6 If the meter is to be stored for a long period of time, the batteries should be removed to prevent damage to the unit.

2. Description

- This meter is a portable professional measuring instrument with handsome LCD and back light easily reading.
- Single operation of a transform switch makes measurement convenient. Overload protection and low battery indication are provided, this meter is ideal for use in the fields, workshop, school, hobby and home applications.
- This meter has function of auto range and manual range.
- This meter has function of auto warning.
- This meter has function of auto power off.
- This meter is with the functions of data hold and max imum value hold.
- When using, it can show ranges engineering unit enunciators measuring results.

2.1 Names of Components



(1) LCD Cover

(2) LCD Display

(3) HOLD Button

(4) Function Button

(5) Transform Switch

(6) ⎓ 10A Jack

(7) COM Jack

(8) Input Jack

(9) Range Flags

(10) Panel

(11) ☀ Button

(12) MAX. H Button

2.2 Switch, Buttons And Input Jack Elucidation

- **ON/OFF** Button
  This Button is used to the switch of power.
- **RANGE Button**
  This button is used to transform Auto range or manual range.
- **FUNC.** Button
  This button is used to transform function.
  DATA-H Button
  This Button is used to the switch of data hold.
- **MAX.H** Button
  This Button is used to the switch of maximum value hold.
- **☀ Button**
  This button is used to the switch of back light.
  Transform Switch
  This switch is used to select functions and desired ranges.
- **10A** Jack
  Input terminal for current 0~10A.
  INPUT Jack
  Input terminals except A.
- **COM** Jack
  Common terminal for measurement.

3. 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 75%.

3.1 General Specifications

3.1.1 Auto ranges and manual range.
3.1.2 Overrange protection for all ranges.
3.1.3 Max. Voltage Between Terminals And Earth Ground: 600V DC or AC
3.1.4 Operating Altitude: 2000 meters (7000 ft.) maximum
3.1.5 LCD Display: 16mm height character
3.1.6 Max. Show Value: 1999 (3 1/2)
3.1.7 Polarity Indication: '-'indicates negative polarity.
3.1.8 Over range Indication: Display 'OL'
3.1.9 Sampling Time: approx. 0.4 second
3.1.10 Unit showing: showing of function and electrical capacity.
3.1.11 Low Battery Indication: "[battery]" displayed
3.1.12 Auto power off time: 15 min.
3.1.13 Power Supply: 1.5V×2 AAAbattery.
3.1.14 Operating Temperature: 0°C to 40°C(32°F to 104°F)
3.1.15 Storage Temperature: -10°C to 50°C(10°F to 122°F)
3.1.16 Dimension: 150×74×42mm
3.1.17 Weight: approx. 250g(including battery)

3.2 Electrical Specifications

Circumstance Temperature: 23±5°C Relative Humidity: < 75%.

3.2.1 Dc Voltage

Range	Resolution	Accuracy
200mV	0.1mV	±(0.7% of rdg + 2 digits)
2V	0.001V	
20V	0.01V	
200V	0.1V	
600V	1V	

- Input Impedance: 10MΩ
- Overload Protection:
  200mV range: 250V DC or AC rms,
  2V-600V ranges: 600V DC or AC rms.
- Max. Input Voltage: 600V DC

3.2.2 AC Voltage

Range	Resolution	Accuracy
200mV	0.1mV	±(0.8% of rdg + 3 digits)
2V	0.001V	
20V	0.01V	
200V	0.1V	
600V	1V	±(1.0% of rdg + 3 digits)

- Input Impedance: 10MΩ
- Overload Protection:
  200mV range: 250V DC or AC rms,
  2V-600V ranges: 600V DC or AC rms.
- Frequency Range: 40 to 400Hz
- Response: Average, calibrated in rms of sine wave.
- Max. Input Voltage: 600V rms AC

3.2.3 DC Current

Range	Resolution	Accuracy
2.000A	0.001A	±(2.0% of rdg+10 digits)
10.00A	0.01A	

- Overload Protection: unfused.
- Max. Input Current: 10A
- voltage drop: 2A range: 20mV,
  10A range: 200mV

3.2.4 AC Current

Range	Resolution	Accuracy
2.000A	0.001A	±(3.0% of rdg+10 digits)
10.00A	0.01A	

- Overload Protection: unfused.
- Max. Input Current:: 10A
- Frequency Range: 40 to 400Hz
- Response: Average, calibrated in rms of sine wave.
- voltage drop：2A range: 20mV, 10A range: 200mV

3.2.5 Resistance

Range	Resolution	Accuracy
200Ω	0.1Ω	±(1.0% of rdg +3 digits)
2kΩ	0.001kΩ	±(1.0% of rdg +1 digit)
20kΩ	0.01kΩ	
200kΩ	0.1kΩ	
2MΩ	0.001MΩ	
20MΩ	0.01MΩ	±(1.0% of rdg +5 digits)

- Open Circuit Voltage: 0.25V
- Overload Protection: 250V DC or 250V rms AC

3.2.6 Continuity

Range	Function
∘ı))	Built-in buzzer will sound, if resistance is lower than 50Ω±20Ω

- Open circuit voltage: approx. 0.5V
- Overload Protection: 250V DC or 250V rms AC

3.2.7 Engine Dwell

Range	Resolution	Accuracy
4CYL	0.1°	±(3°)
6CYL	0.1°	
8CYL	0.1°	

- Overload Protection: 250V DC or rms AC

3.2.8 Engine Rev

Range		Accuracy
4CYL	10RPM	±(3.0% of rdg + 3 digits)
6CYL	10RPM	
8CYL	10RPM	

- Overload Protection: 250V DC or rms AC

3.2.12 Diode

Range	Resolution	Function
⊣▶⊢	1mV	Display :read approximate forward voltage of diode.

- Forward DC Current: approx. 1mA
- Reversed DC Voltage: approx.1.5V
- Overload Protection: 250V DC or rms AC

4. Operating Instruction

4.1 Power-up

Press the "**ON/OFF**" button to turn the meter ON or OFF.

4.2 Data Hold

If you need data hold when measuring, you can put on "**DATA-H**" button, it will hold the reading; if you put the button again, data hold is not continue.

4.3 Maximum Value Hold

If you need data hold when measuring, you can put on **"MAX. H"** button, it will hold the maximum value; if you put the button again, maximum value hold is not continue.

4.4 Function Transform

Put down the "**FUNC**." when measuring the current and voltage. Meter will be transformed between DC and AC range. Put **"FUNC."** when measuring the temperature, meter will transform between and °F range. Put **"FUNC."** when measuring the diode and continuity, meter will transform among them.

4.5 Back Light

If the light is dark to make the reading difficult when measuring, you can press "☀" button for two seconds to turn on the back light, which will last for 15 seconds. Continuous pressing the button for two seconds will turn off the back light.

Note:

- LED is the main source of back light. Its working current is large, although the meter has the timer equipment (time is 15 seconds and it will off automatically after 15 seconds);often use back light will shorten thebatteryife, you'd better not to use the back light so frequently if it's not necessary.
- When the battery voltage is less than 2.8V, it will show"▭". But if you use back light at the same time, maybe "▭" will come up even if the battery voltage is more than 2.8V, because the working current is higher and the voltage will decline. (When "▭" shows, the accuracy of the measurement can not be assured.) You need not replace the battery. When you use normally (back light is not using), "▭" will not show up. You need replace it till "▭"show again.

4.6 Auto Warning

If the input voltage is larger than 2V at the range and if the input current is larger than 10A, buzzer will have a long sound

4.7 Auto Power Off

- If there's no any operation within fifteen minutes after power is on, meter will auto power off with five short sounds and a long sound in a minute.
- After auto power off, if stir the transform switch or put down any button of "**FUNC**.", "**DATA-H**", "**MAX.H**", "**RANGE**", meter will recover the working condition.
- If presses the "**FUNC**" when power is on, auto power off disab

4.8 Preparation For Measurement

- Put on the **"ON/OFF"** button. If the battery voltage is less than 3.8V, display will show "" , the battery should be changed at this time.
- The "⚠" besides the input jack shows that the input voltage or current should be less than specification on the sticker of the meter to protect the inner circuit from damaging.
- Select a function and a range for the item to be measured through rotating the transform switch accordingly. When the value scale to be measured is unknown beforehand, set the range selector at the highest position.
- When connection, first connect to the public testing line, then to the electriferous testing line. When you'll remove it, you should remove the elecriferous one.

4.9 Measuring Dc Voltag

⚠ WARNING
You can't input the voltage which more than 600V DC, it's possible to show higher voltage, but it's may destroy the inner circuit.
Pay attention not to get an electric shock when measuring high voltage.

4.8.1 Connect the black test lead to the **COM** jack and the red test lead to the **INPUT** jack.
4.8.2 Set the transform switch at the V range position.
4.8.3 Put down the **"FUNC."** to enter the DC measurement.
4.8.4 Connect test leads across the source or load under measurement.
4.8.5 You can get a reading from LCD display. The polarity of the red test lead connection will be indicated.

4.10 Measuring Ac Voltage

⚠ WARNING
You can't input the voltage which more than 600V rms AC, it's possible to show higher voltage, but it's may destroy the inner circuit. Pay attention not to get an electric shock when measuring voltage.

4.9.1 Connect the black test lead to the **COM** jack and the red test lead to the **INPUT** jack.
4.9.2 Set the transform switch at the V range position.
4.9.3 Put down the "**FUNC**." to enter the AC measurement.1
4.9.4 Connect test leads across the source or load under measurement.
4.9.5 You can get reading from LCD.

4.11 Measuring Dc Current

⚠ WARNING
Shut down the power of the tested circuit, then connect the meter with the circuit for measurement.

4.10.1 Connect the black test lead to the **COM** jack and the red test lead to the **10A** jack.
4.10.2 Set the transform switch at the A range position.
4.10.3 Put down the "**FUNC**." to enter the DC measurement.
4.10.4 Connect test leads in series with the load under measurement.
4.10.5 You can get reading from LCD. The polarity of red test lead will be indicated.

4.12 Measuring AC Current

⚠ WARNING
Shut down the power of the tested circuit, then connect the meter with the circuit for measurement.

4.11.1 Connect the black test lead to the **COM** jack and the red test lead to the **10A** jack.
4.11.2 Set the transform switch at the A range position.
4.11.3 Put down the "**FUNC**." to enter the AC measurement.
4.11.4 Connect test leads in series with the load under measurement.
4.11.5 You can get reading from LCD.

4.13 Measuring Resistance

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

4.12.1 Connect the black test lead to the **COM** jack and the red test lead to the **INPUT** jack.
4.12.2 Set the transform switch at the Ω range position.
4.12.3 Connect test leads across the resistance under measurement.
4.12.4 You can get reading from LCD.

4.14 Measuring Engine Dwell

413.1 Connect the black test lead to the **COM** jack and the red test lead to the I**NPUT** jack.

4.13.2 Set the transform switch at the desired DWELL range position according to the measured cylinder of the engine.

4.13.3 Connect the black test lead to the iron or the negative pole of the storage cell, and the red one to the low voltage connection pole of the divider or the negative pole of the ignition winding for measurement.

4.13.4 You can get reading from LCD after the engine is started.

4.15 Measuring Rev

4.14.1 Connect the black test lead to the **COM** jack and the red test lead to the **INPUT** jack.

4.14.2 Set the transform switch at the desired TACH range position according to the measured cylinder of the engine.

4.14.3 Connect the black test lead to the iron or the negative pole of the storage cell, and the red one to the low voltage connection pole of the divider or the negative pole of the ignition winding for measurement.

4.20.4 You can get reading from LCD after the engine is started.

4.16 Testing Diode

4.15.1 Connect the black test lead to the **COM** jack and the red test lead to the **INPUT** jack. (The polarity of red lead is “+”)

4.15.2 Set the transform switch at the ⊣▶⊢ range position.

4.15.3 put down the "**FUNC**." transformed at ⊣▶⊢ test.

4.15.4 Connect the red lead to the anode, the black lead to the cathode of the diode under testing.

4.15.5 You can get reading from LCD.

Note:

- The meter will show the approximate forward voltage drop of the diode. figure‘OL’will be displayed.
- When the input is not connected, i.e. at open circuit, the figure “OL” will be displayed.

4.17 Continuity Test

> ⚠ **WARNING**
>
> **When testing the circuit continuity, be sure that the power of the circuit has been shut down and all capacitors have been discharged fully.**

4.16.1 Connect the black test lead to the **COM** jack and the red test lead to the **INPUT** jack.

4.16.2 Set the transform switch at the ∘•))) range position.

4.16.3 put down the **"FUNC."** transformed at ∘•))) continuity test.

4.16.4 Connect test leads across two points of the circuit under testing.

4.16.5 If continuity exists(i.e., resistance less than about 50Ω±20Ω), built-in buzzer will sound.

Note:

- If the input open circuit (or the circuit resistance measured is higher than 200Ω), then the figure '0L' will be displayed.

5. Maintenance

> ⚠ **WARNING**
>
> **Before attempting open the battery cover or case of the meter, be sure that test leads have been disconnected from measurement circuit to avoid electric shock hazard.**

5.1 Battery Replacement

> ⚠ **WARNING**
>
> **To avoid electric shock, make sure that the test leads have been clearly move away from the circuit under measurement before opening the battery cover of the meter.**

> ⚠ **WARNING**
>
> **Do not mix old and new batteries. Do not mix alkaline, standard (carbon-zinc), or rechargeable (ni-cad, ni-mh, etc) batteries.**

If the sign " [-+] " appears, it means that the batteries should be replaced.
Loosen the fixing screw of the battery cover and remove it.
Replace the exhausted batteries with new ones.
Put the battery cover back and fix it again to its origin form.

Note:

Do not reverse the polarity of the batteries.

5.2 Replace the Probe

If insulation on probe is damaged, replace it.

> ⚠ **WARNING**
>
> **Use meet EN 61010-031 standard, rated CAT III 600V, 10A or better probe.**

6. Accessories

(1) Test Leads: Electric Ratings 1000V 10A one piece
(2) Battery: 1.5V, AAA two pieces
(3) Operating Manual one piece