Digital Multimeter

OPERATING INSTRUCTIONS

Please read and understand instructions 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 operation conditions, the repair will be billed at a nominal cost.

SAFETY INFORMATION

The multimeter has been designed according to IEC 61010 concerning electronic measuring instruments with a measurement category (CAT III 300V) 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.
- Do not use the meter if the meter, a test lead or

your hand is wet.

- 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.
- Turn off the meter and remove the test leads from the meter before you open the back cover or the case.
- Do not operate the meter with the back cover or portions 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.
- To avoid electric shock, do not touch any naked conductor with your hand or skin; and do not ground yourself while using the meter.
- 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.
- Remaining endangerment:
  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 III -** Measurement Category III is for measurements performed in the building

installation. Examples are measurements on distribution boards, circuit breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.
Do not use the meter for measurements within Measurement Categories 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 measuring resistance, diode, temperature, or continuity.
- Use the proper terminals, function and range for your measurements.
- Before measuring current, check the meter's fuses and turn off power to the circuit before connecting the meter to the circuit.
- Before turning the rotary switch to change functions, disconnect the test leads from the circuit under test.

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.

INTRODUCTION

This series meters are compact 3 1/2-digit digital multimeters for measuring DC and AC voltage, DC current, resistance and diode.

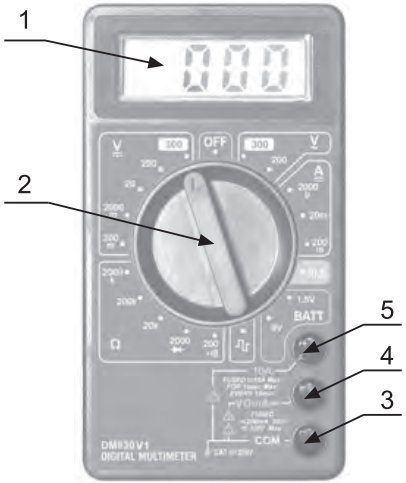
This series meters feature low battery indication and full-range overload protection. They are ideal test tools.

CT1187 has these functions, see the following table:

FUNC / MODEL	DCV	ACV	DCA	Ω	⊣◁	•))	TEMP	⎍	∿	BATT
CT1187	✓	✓	✓	✓	✓	✓		✓		✓

" ⎍ " represents square wave signal output function.
" ∿ " represents sine wave signal output function.

FRONT PANEL



1. **Display**

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

2. **Function/Range Switch**

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

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

3. **" COM " Terminal**

   Plug-in connector for the black test lead for all measurements except temperature measurements.

   For temperature measurements, this " **COM** " terminal is a plug-in connector for the negative plug of the K type thermocouple.

4. **" VΩmA⊣ " Terminal**

   Plug-in connector for the red test lead for all measurements except temperature measurements and the current measurement ≥ 200mA.

   For temperature measurements, this " VΩmA⊣ " terminal is a plug-in connector for the positive plug of the K type thermocouple.

5. **" 10A " Terminal**

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

GENERAL SPECIFICATION

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

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

Sampling Rate: About 2 to 3 times/sec

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

IP Degree: IP20

Low Battery Indication: "  " shown on the display

Operation Environment: Temperature: 0°C to 40°C
Relative Humidity: < 75%

Storage Environment: Temperature: -10°C to 50°C
Relative Humidity: < 85%

Size: 126×70×26mm

SPECIFICATION

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

Accuracy specifications take the form of:

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

DC Voltage

Range	Resolution	Accuracy	Overrange Indication
200mV	100μV	± (0.5% + 5)	" OL " shown on the display
2000mV	1mV	± (0.8% + 5)	
20V	10mV		
200V	100mV		
300V	1V	± (1.0% + 5)	

Input Impedance: 1MΩ
Max. Allowable Input Voltage: 300V

AC Voltage

Range	Resolution	Accuracy	Overrange Indication
200V	100mV	± (1.2% + 10)	" OL " shown on the display
300V	1V		

Input Impedance: About 500kΩ
Frequency Range: 40Hz to 400Hz
Response: Average, calibrated in rms of sine wave
Max. Allowable Input Voltage: 300V

DC Current

Range	Resolution	Accuracy	Overrange Indication
20μA	10nA	± (1.2% + 5)	" OL " shown on the display
200μA	100nA	± (1.0% + 5)	
2000μA	1μA		
20mA	10μA		
200mA	100μA	± (1.2% + 5)	
10A	10mA	± (2.0% + 5)	——— [1]

Overload Protection:

250mA/300V Fast fuse (for protection for the inputs of the " **VΩmA⊣⊢** " terminal)

10A/300V Fast fuse (for protection for the inputs of the " **10A** " terminal)

Max. Allowable Input Current: 10A

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

[1] If the current being measured is > 10A, the display may show the value of the current; but the measurement is dangerous.

Diode Test

Range	Description
⊣▶⊢	The display shows the approx. forward voltage drop of the diode. Open Circuit Voltage: about 2.8V Test Current: about 1mA

Resistance

Range	Resolution	Accuracy	Overrange Indication
200Ω	0.1Ω	± (1.2% + 5)	" OL " shown on the display
2000Ω	1Ω		
20kΩ	10Ω		
200kΩ	100Ω		
2000kΩ	1kΩ		
20MΩ	0.01MΩ		

Max. Open Circuit Voltage: About 3V

Signal Output

Range	Frequency	Output Level
(square wave)	about 50Hz	about 3Vp-p
(sine wave)	about 1kHz	about 2Vp-p

Battery Test

Range	Description	Remark
1.5V	The working voltage of the battery will be shown on the display, so the quality of the battery can be judged.	Test Current: about 20mA
9V		Test Current: about 5mA

Continuity Test

Range	Description
•)))	The built-in buzzer will sound if the resistance is less than about 20Ω. The buzzer will not sound if the resistance is more than about 150Ω. The buzzer may or may not sound if the resistance is between 20Ω and 150Ω.

OPERATING INSTRUCTION

Measuring DC Voltage

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩmA⇥** " 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 300V between the terminals.

Measuring AC Voltage

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩmA⇥** " 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.

Note:

To avoid electric shock to you or damages to the meter, do not apply a voltage higher than 300V between the terminals.

Measuring DC Current

1. Connect the black test lead to the " **COM** " terminal. Connect the red test lead to the " **VΩmA⊣⊢** " terminal if the current to be measured is less than 200mA. If the current is between 200mA and 10A, connect the red test lead to the " **10A** " terminal instead.
2. Set the range switch to **10A⎓** or desired **A⎓** range position.
3. Turn off power to the circuit to be tested. Then discharge all capacitors.

4. Break the circuit path to be tested, then 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 the magnitude of the current to be measured is not known beforehand, set the range switch to the highest range (the 10A range position is the " **10A** " position) 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 " **VΩmA⊣⊢** " terminal.
2. Set the range switch to desired Ω range position.
3. Connect the test leads across the object to be tested.
4. Read the reading on the display.

Note:

1. For measurements > 1MΩ, 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, " OL " will be displayed as an overrange indication.
3. Before measurement, disconnect all power to the circuit to be tested and discharge all capacitors thoroughly.

Diode Test

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩmA⊣◀** " terminal. (**Note:** The polarity of the red lead is positive "**+**".)
2. Set the range switch to ⊣◀ 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, " OL " 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 " **VΩmA⊣◀** " 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 20Ω, the built-in buzzer will sound.

Note:
Before test, disconnect all power to the circuit to be tested and discharge all capacitors thoroughly.

Battery Test

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩmA⊣⊢** " terminal.
2. According to the rated voltage of the battery to be tested, set the range switch to the corresponding **BATT** range position
3. Connect the test leads to the two terminals of the battery to be tested.
4. Read the working voltage of the battery on the display.

Signal Output

1. Connect the black test lead to the " **COM** " terminal and the red test lead to the " **VΩmA⇥** " terminal.
2. Set the range switch to ⎍ position for square wave signal output or to ∿ position for sine wave signal output.
   Tip: Only DM830G1 has sine wave signal output function.
3. An output signal will appear between the two probes.

Note:

1. Don't apply a voltage between the terminals when the range switch is in ⎍ or ∿ position.
2. There is no short circuit protection when the meter is in signal output function.

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 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. Set the range switch to **OFF** position and remove all 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 and replace (as needed) the battery and fuses, and/or review this manual to verify proper use of the meter.

Battery and Fuse Replacement

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 fuses specified.

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

If the symbol " " appears on the display, it indicates that the battery is low and must be replaced immediately. If the error of reading is too large, it also indicates that the battery must be replaced immediately.

To replace battery, remove the screws on the back cover and remove the back cover. Replace the exhausted battery with a new one of the same type (9V battery, 6F22 or equivalent). Reinstall the back cover and the screws.

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

cover and the screws.

This meter uses two fuses:

F1: 250mA/300V Fast fuse, Ø5X20mm
F2: 10A/300V Fast fuse, 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.