

# User Manual

## DIGI-SENSE™ Insulation Tester

### Model 20250-60



THE STANDARD IN PRECISION MEASUREMENT

## **Introduction**

The Digi-Sense Insulation Tester (Model 20250-60) is versatile and easy to use. The instrument is a must-have on your electrical tool belt. It safely measures insulation resistance of electrical devices such as cables or motor coils up to 4000 M $\Omega$ , as well as providing a means of measuring AC/DC voltages and circuit continuity. Careful use of this meter will provide years of reliable service.

## **Safety Precautions**

- Read the following safety information carefully before attempting to operate or service the meter.
- To avoid damages to the instrument do not apply the signals which exceed the maximum limits shown in the technical specifications tables.
- Do not use the meter or test leads if they look damaged. Use extreme caution when working around bare conductors or bus bars.
- Accidental contact with the conductor could result in electric shock.
- Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.
- Read the operating instructions before use and follow all safety Information.
- Caution when working with voltages above 60 VDC or 30 VAC RMS. Such voltages pose a shock hazard.
- Before taking resistance measurements or testing acoustic continuity, disconnect circuit from main power supply and all loads from the circuit.

## Safety Symbols



Caution refer to this manual before using the meter.



Dangerous voltages.



Meter is protected throughout by double insulation or reinforced insulation.

## CE Compliance with EN-61010-1

**Note:** When servicing, use only specified replacement parts.

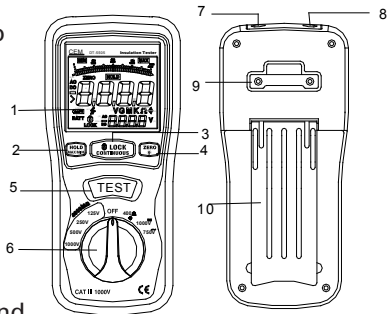
## Unpacking

Check individual parts against the list of items below. If anything is missing or damaged, please contact your instrument supplier immediately.

1. Instrument
2. Test probes
3. Carrying case
4. Six AA batteries
5. User manual

## Meter Description

1. Digital display
2. Data Hold button; Max./Min.
3. Lock button
4. Backlight button; Zero
5. Test button
6. Rotary function switch
7. V $\Omega$  Jack
8. COM input jack
9. Pothook
10. Battery cover / flip stand



## How It Works

### How to Connect Test Leads

When the rotary function switch is on M $\Omega$  range, 400  $\Omega$ /BZ, ACV, or DCV, connect the red test lead into the V $\Omega$  terminal and the black lead into the COM terminal.

### Test Leads Check

Set the range select switch to the 400  $\Omega$  range. With the tip and alligator clip of the test leads connected, the indicator should read 00.0  $\Omega$ . When the leads are not connected, the display will read infinity indicated by "OL". This will ensure that test leads are in good working condition.

## Rotary Function Switch Positions

Turn the tester on by selecting any measurement setting.

### HOLD Max/Min Button

Instant-pressing the **HOLD** button the first time will hold the values at that instant in the primary display. Pressing it a second time will return it to current reading. Pressing and holding the button for 2 seconds will allow reading the **MAX** value, and an additional instant-pressing will switch it to display the **MIN** measured value. These can be toggled by instant-pressing the button. To go back to reading current values, press and hold the button again for 2 seconds.

### Lock Button

Used when testing insulation resistance. Press the **LOCK** button and then push down the **TEST** button. This will apply the high-voltage source and display the test result. Pressing the **TEST** button again will shut off the high-voltage and exit from the insulation resistance testing.

### Test Button

Used when testing insulation resistance. Pressing the **TEST** button will apply the high-voltage source and display the test result. Pressing the **TEST** button again will shut off the high-voltage and exit from the insulation resistance testing.

## Zero/Light Button

Instant-pressing the **ZERO/LIGHT** button will zero the primary display (mainly used for  $400\ \Omega$ , the low resistance testing). Instant-pressing the button a second time will return the display to current reading. Pressing and holding the button for 2 seconds will cause the LCD backlight to turn on. Pressing the button again for 2 seconds will cause the backlight to turn off. The backlight will turn off automatically after 15 seconds.

## Display Descriptions

- Primary display indicates the current function testing values.
- Secondary display shows the output DCV while you test the insulation resistance, and the battery voltage while the ACV.
- Analog bar indicates the current function testing value shown in the primary display.
- ⚡ symbol flashes frequently if the voltage is over 30 V when testing the insulation resistance.
- ))) symbol flashes frequently and the buzzer warns continually if the outside voltage is over 30 V when testing the insulation resistance. This symbol also indicates when resistance measured  $\leq 35\ \Omega$  and the buzzer sounds continuously.
- Lock button is pushed down while testing the insulation resistance and the ⚡ symbol is indicated.
- LOBAT shows when the voltage drops below 7.5 V.

- Max, Min stands for the maximum or the minimum.
- ZERO stands for digital zero adjusting.
- HOLD button is pressed for the primary display.
- AC, DC is the indicator for the voltage property.
- V, M $\Omega$ ,  $\Omega$  are the measured dimension units.

## **Setup and Operation**

### **Insulation Resistance Measurements**

1. Turn the function switch from the **OFF** position to the left (4000 M $\Omega$ /1000 V, 4000 M $\Omega$ /500 V, 4000 M $\Omega$ /250 V, or 1000 M $\Omega$ /125 V) and chose one of the voltage blocks. There are 4 ranges: 4 M $\Omega$ , 40 M $\Omega$ , 400 M $\Omega$ , and 4000 M $\Omega$  that can be switched automatically for every voltage block.
2. Connect the test leads to the line to be tested.
3. Push down and hold the **TEST** button, or press the **LOCK** keystroke first and then the **TEST** button. If there is a voltage on the circuit already that is over 30 VAC/DC, the instrument will not apply a source voltage and instead display >30 V on the LCD, the symbol ⚡ flashes, and the buzzer will sound. If the circuit under test does not have a voltage over 30 V on it, the source voltage will be applied and the insulation resistance in M $\Omega$  indicated in the primary display and on the analog bar. On the secondary display, the tested insulation voltage in V (DC) is indicated, the symbol ⚡ flashes, and the buzzer will sound.

4. The test is completed by letting go of the **TEST** button or pushing down the **TEST** button if in the LOCK mode. This will shut off the high-voltage. The test resistance value will be shown in the primary display and held. The secondary display will show the insulation voltage remaining in the circuit.
5. The instrument will discharge the balance of the test voltage automatically through the inner switch of the meter.
6. Turning the rotary function switch will automatically exit from a testing status.

### **Low Resistance (Continuity) Measurements**

1. Set the range switch to 400  $\Omega$ /BZ position.
2. Connect the red test lead to the  $V\Omega$  terminal and black to the COM terminal.
3. Connect the tips of the test leads to both ends of the circuit under test. Read the resistance in  $\Omega$  on the LCD. The two ranges (40.00 M $\Omega$ /400.0 M $\Omega$ ) can be switched automatically; the resistance in  $\Omega$  flashes in the primary display and also shows on the analog bar.
4. An impedance on circuit below approximately  $\leq 35 \Omega$ , will be indicated by a continuous beep.
5. The test current of a test resistance at 0 $\Omega$  is 200 to 220 mA.
6. The high voltage symbol  $\text{⚡}$  flashes, the primary display indicates  $>30 \text{ V}$ , and the buzzer sounds if the voltage (AC/DC) is  $<30 \text{ V}$ .



## AC/DC Voltage Measurements

1. Set the range switch to ACV or DCV position.
2. Connect red test lead to  $V\Omega$  terminal and black test lead to terminal COM.
3. Connect test leads IN PARALLEL to the circuit being measured.
4. Read the voltage value on LCD.

## Battery Saver (Sleep Mode)

The meter will automatically enter the sleep mode if there is no function change or button press for 10 minutes, but exits sleep mode as soon as you turn the rotary function switch or push down any button.

## Power Tools and Small Appliances

This test would also apply to other similar equipment that have a line cord. For double insulated power tools, the megohmmeter lead shown connected to the housing would be connected to some metal part of the tool (e.g. chuck, blade).

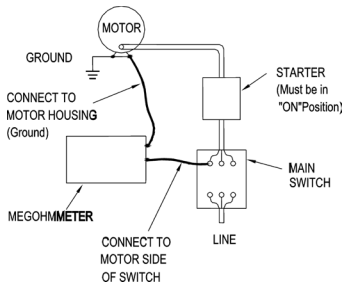
**Note:** The switch of the device under test must be in the **ON** position and the main power should be disconnected.

## Motors

**AC** - Disconnect the motor from the line by disconnecting the wires at the motor terminals or by opening the main switch. If the main switch is used and the motor also has a starter then the starter must be held, by some means, in the **ON** position. In the latter case, the measured resistance will include the resistance of the motor, wire and all other components between the motor and the main switch. If a low insulation resistance reading is indicated, the motor and other components should be checked individually. If the motor is disconnected at the motor terminals, connect one megohmmeter lead to the grounded motor housing and the other lead to one of the motor leads.

**DC** - Disconnect the motor from the line. To test the brush ring field coils and armature, connect one megohmmeter lead to the grounded motor housing and the other lead to the brush on the commutator. If a low insulation resistance reading is indicated, raise the brushes off the commutator and separately test the armature, field coils and brush ring by connecting one megohmmeter lead to each of them individually, leaving the other connected to the grounded motor housing.


**Note:** The above also applies to DC generators.



## Maintenance and Repair

Repairs or servicing not covered in this manual should only be performed by qualified personnel. Periodically wipe the case with a dry cloth. Do not use abrasives or solvents on this instrument.

### Battery Replacement

1. When the battery power is not sufficient for proper operation, the LCD will display  indicating that batteries need to be replaced. The instrument requires six AA alkaline batteries.
2. Remove the four screws from the batter cover to access and replace the batteries.

## Specifications

### Environment conditions

- Installation categories III
- Pollution degree 2
- Altitude up to 2000 meters
- Indoor use only
- Relative humidity 80% Max.
- Operation ambient 0 to 40°C

## Specifications (Continued)


**Display:** Large LCD with dual display

**Measurement Range:** 4000 M $\Omega$ /125 V, 4000 M $\Omega$ /250 V, 4000 M $\Omega$ /500 V, 4000 M $\Omega$ /1000 V, 400  $\Omega$ /BZ, 1000 V/DCV, 750 V/ACV

**Sampling Rate:** 2.5 times per second

**Zero Adjustment:** Automatic adjustment

**Overrange Indicator:** "OL" of highest digit is displayed

**Low Battery Indication:** The  is displayed when the battery voltage drops below the operating voltage

**Operating Temperature:** 32 to 104°F (0 to 40°C) and humidity below 80% RH

**Storage Temperature:** 14 to 140°F (-10 to 60°C) and humidity below 70% RH

**Power Source:** DC 9 V (six AA batteries or equivalent)

**Dimensions (L x W x H):** 7 $\frac{7}{8}$ " x 3 $\frac{5}{8}$ " x 2" (20 x 9.2 x 5 cm)

**Weight:** Approx 25 oz (700 g) including battery

**Electrical Specifications:** Accuracies are specified in the way:  $\pm$ (% of reading + digits) at 23°C  $\pm$  5°C, below 80% RH

## OHMS

Range	Resolution	Accuracy	Max. open-circuit voltage	Overload protection
40.00 $\Omega$	0.01 $\Omega$	$\pm(1.2\% +3)$	5.8 V	250 Vrms
400.0 $\Omega$	0.1 $\Omega$		5.8 V	

## Continuity Beeper

Range	Resolution	Operation resistance	Max. open-circuit voltage	Overload protection
•)))	0.01 $\Omega$	Resistance $\leq 35 \Omega$	5.8 V	250 Vrms
Short circuit current	200 mA			

## DC Voltage

Range	Resolution	Accuracy	Input impedance	Overload protection
1000 V	1 V	$\pm(0.8\% +3)$	10 M $\Omega$	1000 Vrms

## AC Voltage (40 Hz to 400 Hz)

Range	Resolution	Accuracy	Input impedance	Overload protection
750 V	1 V	$\pm(1.2\% +10)$	10 M $\Omega$	750 Vrms

## Meg OHMS

Terminal voltage	Range	Resolution	Accuracy	Test current	Short circuit current
125 V (0% to +10%)	0.125 to 4.000 M $\Omega$	0.001 M $\Omega$	$\pm(2\% +10)$	1 mA @ load 125 k $\Omega$	$\leq 1$ mA
	4.001 to 40.00 M $\Omega$	0.01 M $\Omega$	$\pm(2\% +10)$		
	40.01 to 400.0 M $\Omega$	0.1 M $\Omega$	$\pm(4\% +5)$		
	400.1 to 4000 M $\Omega$	1 M $\Omega$	$\pm(5\% +5)$		
250 V (0% to +10%)	0.250 to 4.000 M $\Omega$	0.00 1M $\Omega$	$\pm(2\% +10)$	1 mA @ load 250 k $\Omega$	$\leq 1$ mA
	4.001 to 40.00 M $\Omega$	0.0 1M $\Omega$	$\pm(2\% +10)$		
	40.01 to 400.0 M $\Omega$	0.1 M $\Omega$	$\pm(3\% +5)$		
	400.1 to 4000 M $\Omega$	1 M $\Omega$	$\pm(4\% +5)$		
500 V (0% to +10%)	0.500 to 4.000 M $\Omega$	0.001 M $\Omega$	$\pm(2\% +10)$	1 mA @ load 500 k $\Omega$	$\leq 1$ mA
	4.001 to 40.00 M $\Omega$	0.01 M $\Omega$	$\pm(2\% +10)$		
	40.01 to 400.0 M $\Omega$	0.1 M $\Omega$	$\pm(2\% +5)$		
	400.1 to 4000 M $\Omega$	1 M $\Omega$	$\pm(4\% +5)$		
1000 V (0% to +10%)	1.000 to 4.000 M $\Omega$	0.001 M $\Omega$	$\pm(3\% +10)$	1 mA @ load 1 M $\Omega$	$\leq 1$ mA
	4.001 to 40.00 M $\Omega$	0.01 M $\Omega$	$\pm(2\% +10)$		
	40.01 to 400.0 M $\Omega$	0.1 M $\Omega$	$\pm(2\% +5)$		
	400.1 to 4000 M $\Omega$	1 M $\Omega$	$\pm(4\% +5)$		



## **For Product and Ordering Information, Contact:**



Toll-Free: 1-800-323-4340  
Phone: 1-847-549-7600  
Fax: 1-847-247-2929  
[ColeParmer.com/Digi-Sense](http://ColeParmer.com/Digi-Sense)



Toll-Free: 1-800-358-5525  
Phone: 1-847-327-2000  
Fax: 1-847-327-2700  
[Davis.com/Digi-Sense](http://Davis.com/Digi-Sense)

1065DGMAN\_20250-60

Manual Part No. 00101-95