

User Manual



Compact Autoranging Clamp Meters

with NIST-Traceable Calibration

**Models 20250-55 (400 A AC),
20250-56 (400 A AC/DC)**



THE STANDARD IN PRECISION MEASUREMENT

Introduction

The Digi-Sense Compact Autoranging Clamp Meters (400 A AC Model 20250-55; 400 A AC/DC Model 20250-56) offer all the basic features needed for measurement. The double-molded plastic housing and jaw are designed for use in tight places. A large backlit display provides easy-to-read measurements. The instruments are fully tested and calibrated to NIST-traceable standards. Careful use of the meter will provide years of reliable service.

Safety

International Safety Symbols



This symbol, adjacent to another symbol or terminal, indicates the user must refer to the manual for further information.



This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present



Double insulation

SAFETY NOTES

- Do not exceed the maximum allowable input range of any function.
- Do not apply voltage to meter when resistance function is selected.
- Set the function switch OFF when the meter is not in use.

WARNINGS

- Set rotary function switch to the appropriate position before measuring.
- When measuring volts, do not switch to current/resistance modes.
- When changing ranges using the rotary function switch, always disconnect the test leads from the circuit under test.
- Do not exceed the maximum rated input limits:

| Input Limits | | |
|--|----------------------------------|----------------------------------|
| Function | Maximum Input, Model 20250-55 | Maximum Input, Model 20250-56 |
| A | 400 A AC | 400 A AC/DC |
| V | 600 V AC/DC | 600 V AC/DC |
| Frequency, Duty cycle, Resistance, Diode, Continuity, Capacitance Test | 250 V AC/DC | 250 V AC/DC |
| Temperature (°C/°F) | 250 V AC/DC | 250 V AC/DC |

CAUTIONS

- Improper use of this meter can cause damage, shock, injury or death. Read and understand this user manual before operating the meter.
- Always remove the test leads before replacing the battery.
- Inspect the condition of the test leads and the meter itself for any damage before operating the meter. Repair or replace any damage before use.
- Use great care when making measurements if the voltages are greater than 25 VAC rms or 35 VDC. These voltages are considered a shock hazard.
- Remove the battery if the meter is to be stored for long periods.
- Always discharge capacitors and remove power from the device under test before performing Diode, Resistance, or Continuity tests.
- Voltage checks on electrical outlets can be difficult and misleading because of the uncertainty of connection to the recessed electrical contacts. Other means should be used to ensure that the terminals are not "live".
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Unpacking

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

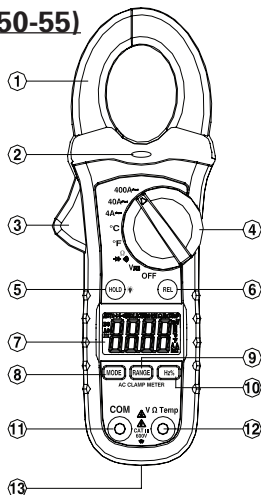
1. Meter
2. Test leads
3. Temperature probe
4. Carrying case
5. 9 V battery
6. User manual
7. NIST-traceable calibration report with data

Key Features

- Built-in noncontact AC voltage detector
- Durable double-molded housing
- 1 $\frac{3}{16}$ " (30 mm) jaw opening
- CAT III 1000 V safety rating
- Electronic overload protection
- Autoranging with auto power-off
- Peak Hold function that captures the peak AC current or voltage reading (model 20250-56 only)

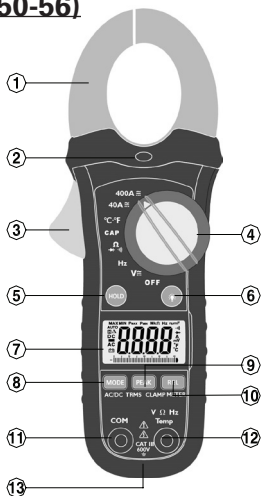
Meter Description (Model 20250-55)

1. Current clamp
2. Noncontact AC voltage indicator light
3. Clamp trigger
4. Rotary function switch
5. Data HOLD / Backlight button
6. Relative button
7. 4000-count LCD
8. MODE select button
9. Range button
10. Hz% button
11. COM input jack
12. V Ω CAP TEMP Hz jack
13. Battery cover



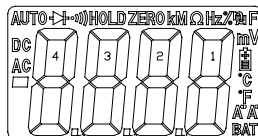
Meter Description (Model 20250-56)

1. Current clamp
2. Noncontact AC voltage indicator light
3. Clamp trigger
4. Rotary function switch
5. Data HOLD button
6. Backlight button
7. 4000-count LCD
8. MODE select button
9. PEAK button
10. Relative button
11. COM input jack
12. V Ω CAP TEMP Hz jack
13. Battery cover



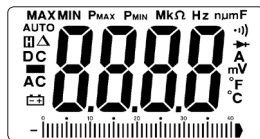
Display Layout (Model 20250-55)

1. **AC DC** AC (alternating current) and DC (direct current)
2. **—** Minus sign
3. **8.8.8.8** 4000 count (0 to 3999) measurement reading
4. **AUTO** Autorange mode
5. **REL (Δ)** Relative mode
6. **→|** Diode test mode
7. **•|)** Audible continuity
8. **HOLD** Data HOLD mode
9. **°C, °F, μm, V, A, K, M, Ω** Units of measure list
10. **Hz %** Frequency/duty cycle test mode



Display Layout (Model 20250-56)

1. **AC DC** AC (alternating current) and DC (direct current)
2. **—** Minus sign
3. **8.8.8.8** 4000 count (0 to 3999) measurement reading with analog bar graph
4. **HOLD** Data HOLD mode
5. **REL (Δ)** Relative mode
6. **AUTO** Autorange mode
7. **MAX MIN** Max/Min Hold mode
8. **Pmax Pmin** Pmax Pmin Hold mode
9. **•|)** Audible continuity
10. **→|** Diode test mode
11. **Hz %** Frequency/duty cycle test mode
12. **Ω, F, A, V, °C, °F** Units of measure list



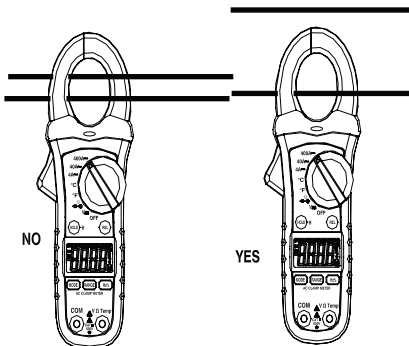
Setup and Operation

Note: Read and understand all warning and precaution statements listed in the safety section of this operation manual prior to using this meter. Set the rotary function switch to the OFF position when the meter is not in use.

AC and AC/DC Current Measurements

WARNING: Ensure that the test leads are disconnected from the meter before making current clamp measurements.

1. Set the rotary function switch to the **400A** or **40A** or **4A** range.
2. For model 20250-56 only, select **AC** or **DC** by pressing the **MODE** button.
3. If the measuring range is unknown, select the higher range first then move to the lower range as necessary.
4. Press the trigger to open jaw. Fully enclose one conductor to be measured (see diagram). The LCD will display the reading.
5. In DCA mode, to ensure the reading is correct, press the **REL** button to clear the reading on the LCD before measurement. The LCD will display the reading (model 20250-56 only).



AC/DC Voltage Measurements

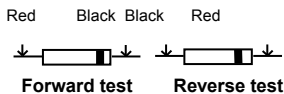
1. Insert the black test lead into the negative COM terminal and the red test lead into the positive V terminal.
2. Set the rotary function switch to the **V** position.
3. Select **AC** or **DC** with the **MODE** button.
4. Connect the test leads in parallel to the circuit under test.
5. Read the voltage measurement in the display.

Resistance and Continuity Measurements

1. Insert the black test lead into the negative COM terminal and the red test lead into the positive terminal.
2. Set the rotary function switch to the $\Omega \rightarrow \text{diode symbol}$ position.
3. Touch the test probe tips across the circuit or component under test. It is best to disconnect one side of the device under test so the rest of the circuit will not interfere with the resistance reading.
4. For Resistance tests, read the resistance value in the display.

Diode and Continuity Measurements

1. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive diode jack.
2. Set the rotary function switch to the $\Omega \rightarrow \text{diode symbol}$ position.
3. Press the **MODE** button until " $\rightarrow \text{diode symbol}$ " appears in the display.
4. Touch the test probes to the diode under test. Forward voltage will indicate 0.4 V to 0.7 V. Reverse voltage will indicate "OL".. Shorted devices will indicate near 0 mV and an open device will indicate "OL" in both polarities.



5. For Continuity tests, if the resistance is $<150 \Omega$ (20250-55) or $<50 \Omega$ (20250-56), a tone will sound.

Capacitance Measurements (Model 20250-56 Only)

WARNING: To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements. Remove the batteries and unplug the line cords.

1. Set the rotary function switch to the $\rightarrow \text{CAP}$ position.
2. Insert the black test lead banana plug into the negative COM jack and the red test lead banana plug into the positive V jack.
3. Touch the test leads to the capacitor to be tested.
4. Read the capacitance value on the display.

Frequency or % Duty Cycle Measurements

1. For model 20250-55, set the rotary function switch to the **V** position, then press the **Hz%** button to select "**Hz**" or "**% duty**".
2. For model 20250-56, set the rotary function switch to the **Hz** position. (Model 20250-56 does not feature % duty cycle measurement.)
3. Insert the black lead banana plug into the negative COM jack and the red test lead banana plug into the positive V jack.
4. Touch the test probe tips to the circuit under test.
5. Read the frequency value on the display.

Temperature Measurements

WARNING: To avoid electric shock, disconnect both test probes from any source of voltage before making a temperature measurement.

1. Set the rotary function switch to **°C** or **°F** units.
2. For model 20250-56 only, select **°C** or **°F** units by pressing the **MODE** button.
3. Insert the temperature probe into the negative COM and V jacks, making sure to observe the correct polarity.
4. Touch the probe head to the part whose temperature you wish to measure. Keep the probe touching the part under test until reading stabilizes (about 30 seconds).
5. Read the temperature in the display. The digital reading will indicate the proper decimal point and value.

WARNING: To avoid electric shock, be sure the thermocouple has been removed before changing to another measurement function.

Noncontact AC Voltage Measurements

WARNING: Risk of Electrocution. Before use, always test the voltage detector on a known live circuit to verify proper operation

1. Touch the probe tip to the hot conductor or insert into the hot side of the electrical outlet.
2. If AC voltage is present, the indicator light will illuminate.

Note: The conductors in electrical cord sets are often twisted. For best results, rub the probe tip along a length of the cord to assure placing the tip in close proximity to the live conductor.

Note: The detector is designed with high sensitivity. Static electricity or other sources of energy may randomly trip the sensor. This is normal operation.

MODE Button

To select DC/ACV, OHM/ Diode/Continuity (CAP 20250-56 only).

Data HOLD Button

To “freeze” a reading on the screen, press the **HOLD (H)** button. While data HOLD is active, the “HOLD” display icon appears on the LCD. Press the data **HOLD** button again to resume normal operation.

REL Button

For Offset adjustment. (DCA and Capacitance zero on model 20250-56 only.)

RANGE Button (Model 20250-55 only)

When the meter is first turned on, it defaults to autoranging. This automatically selects the best range for the measurements being made and is generally the optimal mode for most measurements. For measurement situations requiring that a range be manually selected, perform the following:

1. Press the **RANGE** button. The “AUTO” display indicator will turn off.
2. Press the **RANGE** button again to step through the available ranges until you select the range you want.
3. Press and hold the **RANGE** button for 2 seconds to exit the manual ranging mode and return to autoranging.

PEAK Hold Button (Model 20250-56 only)

The PEAK Hold function captures the peak AC voltage or current. The meter can capture negative or positive peaks as fast as 1 millisecond in duration.

1. Turn the rotary function switch to an **A** or **V** position.
2. Use the **MODE** button to select AC.
3. Allow time for the display to stabilize.
4. Press and hold the **PEAK** button until “CAL” appears in the display. This procedure will zero the range selected.
5. Press the **PEAK** button, “Pmax” will display. The display will update each time a higher positive peak occurs.

6. Press the **PEAK** button again, "Pmin" will display. The display will now update and indicate the lowest negative peak.

7. To return to normal operation, press and hold the **PEAK** button until the "Pmin" or "Pmax" indicator switches off.

Note: If the rotary function switch position is changed after a calibration, the PEAK Hold calibration must be repeated for the new function selected.


Automatic Power-Off

To conserve battery life, the meter automatically turns off after 30 minutes of nonuse.

Specifications

| Function | Model 20250-55 | | Model 20250-56 | |
|---|--|---|--|--|
| | Range & Resolution | Accuracy (% of reading) | Range & Resolution | Accuracy (% of reading) |
| AC Current (50/60 Hz) | 4.000 AAC | $\pm(2.5\% + 12 \text{ dgts})$ | — | — |
| | 40.00 AAC | $\pm(2.5\% + 8 \text{ dgts})$ | 40.00 AAC | $\pm(2.5\% + 8 \text{ dgts})$ |
| | 400.0 AAC | $\pm(2.8\% + 8 \text{ dgts})$ | 400.0 AAC | $\pm(2.8\% + 5 \text{ dgts})$ |
| DC Current | — | — | 40.00 ADC | $\pm(2.5\% + 5 \text{ dgts})$ |
| | — | — | 400.0 ADC | $\pm(2.8\% + 5 \text{ dgts})$ |
| DC Voltage | 400.0 mVDC | $\pm(0.8\% + 2 \text{ dgts})$ | 400.0 mVDC | $\pm(0.8\% + 2 \text{ dgts})$ |
| | 4.000 VDC | $\pm(1.5\% + 2 \text{ dgts})$ | 4.000 VDC | $\pm(1.5\% + 2 \text{ dgts})$ |
| | 40.00 VDC | | 40.00 VDC | |
| | 400.0 VDC | | 400.0 VDC | |
| | 600.0 VDC | $\pm(2\% + 2 \text{ dgts})$ | 600.0 VDC | $\pm(2\% + 2 \text{ dgts})$ |
| AC Voltage (50–400 Hz) | — | — | 400.0 mVAC | $\pm(1\% + 10 \text{ dgts})$ |
| | 4.000 VAC | $\pm(1.8\% + 8 \text{ dgts})$ | 4.000 VAC | |
| | 40.00 VAC | | 40.00 VAC | |
| | 400.0 VAC | | 400.0 VAC | $\pm(1.5\% + 5 \text{ dgts})$ |
| | 600.0 VAC | $\pm(2.5\% + 8 \text{ dgts})$ | 600.0 VAC | $\pm(2\% + 5 \text{ dgts})$ |
| Resistance | 400.0 Ω | $\pm(1.0\% + 4 \text{ dgts})$ | 400.0 Ω | $\pm(1.0\% + 4 \text{ dgts})$ |
| | 4.000 K Ω | $\pm(1.5\% + 2 \text{ dgts})$ | 4.000 K Ω | $\pm(1.5\% + 2 \text{ dgts})$ |
| | 40.00 K Ω | | 40.00 K Ω | |
| | 400.0 K Ω | | 400.0 K Ω | |
| | 4.000 M Ω | $\pm(2.5\% + 3 \text{ dgts})$ | 4.000 M Ω | $\pm(2.5\% + 3 \text{ dgts})$ |
| | 40.00 M Ω | $\pm(3.5\% + 5 \text{ dgts})$ | 40.00 M Ω | $\pm(3.5\% + 5 \text{ dgts})$ |
| Capacitance | — | — | 40.00 nF | $\pm(5.0\% \text{ rdg} + 20 \text{ dgts})$ |
| | — | — | 400.0 nF | $\pm(3\% \text{ rdg} + 5 \text{ dgts})$ |
| | — | — | 4.000 μ F | |
| | — | — | 40.00 μ F | |
| | — | — | 400.0 μ F | $\pm(4.0\% \text{ rdg} + 10 \text{ dgts})$ |
| | — | — | 4 mF | $\pm(5\% \text{ rdg} + 10 \text{ dgts})$ |
| Frequency | 10 to 10 kHz Sensitivity: 100 V (<50 Hz); 50 V (50 to 400 Hz); 15 V (401 Hz to 10 kHz) | $\pm(1.5\% \text{ rdg} + 2 \text{ dgts})$ | 10 to 100 kHz Sensitivity: 100 V (<50 Hz); 50 V (50 to 400 Hz); 15 V (401 Hz to 100 kHz) | $\pm(1.5\% \text{ rdg} + 2 \text{ dgts})$ |
| Temperature, type K (probe accuracy not included) | –20.0 to 760.0°C | $\pm(3\% \text{ rdg} + 5^\circ\text{C})$ | –20.0 to 760.0°C | $\pm(3\% \text{ rdg} + 5^\circ\text{C})$ |
| | –4.0 to 1400.0°F | $\pm(3\% \text{ rdg} + 9^\circ\text{F})$ | –4.0 to 1400.0°F | $\pm(3\% \text{ rdg} + 9^\circ\text{F})$ |

Specifications (continued)

| | |
|-------------------------------|--|
| Clamp size | Opening $1\frac{3}{16}$ " (30 mm) approximately |
| Diode test | Test current of 0.3 mA typical; Open circuit voltage 1.5 V DC typical (20250-55), <3 V DC typical (20250-56). |
| Continuity check | Threshold <150 Ω (20250-55), <50 Ω (20250-56); Test current <0.5 mA |
| Low-battery indication | "  " is displayed |
| Overrange indication | " OL " is displayed |
| Measurement rate | 2 per second, nominal |
| Input impedance | 10 M Ω (VDC and VAC) |
| Display | 4000 counts LCD |
| AC Current | 50–60 Hz (AAC) (20250-55), 50–60 Hz (AAC TRMS) (20250-56) |
| AC Voltage | 50–400 Hz (VAC) (20250-55), 50–60 Hz (VAC TRMS) (20250-56) |
| Operating temperature | 41 to 104°F (5 to 40°C) |
| Storage temperature | –4 to 140°F (–20 to 60°C) |
| Operating humidity | Max 80% up to 87°F (31°C), decreasing linearly to 50% at 104°F (40°C) |

| | |
|---------------------------|--|
| Storage humidity | <80% |
| Operating altitude | 7000 ft (2000 meters) maximum |
| Overvoltage | Category III 600 V |
| Battery | One 9 V battery |
| Auto power-off | 30 minutes approximately |
| Weight | 6.5 oz (183 g) |
| Dimensions | 7 ³ / ₄ " x 2 ³ / ₄ " x 1 ⁹ / ₁₆ " (19.7 x 7 x 4 cm) |
| Safety | For indoor use and in accordance with Overvoltage Category II, Pollution Degree 2. Category II includes local level, appliance, portable equipment, etc., with transient overvoltages less than Overvoltage Cat. III |

Maintenance, Recalibration, and Repair

Cleaning and Storage

- The meter should be cleaned with a damp cloth and mild detergent when necessary. Do not use solvents or abrasives.
- Store the meter in an area with moderate temperature and humidity.

Battery Replacement

1. Remove the one rear Phillips head screw.
2. Open the battery compartment.
3. Replace the old battery with one 9 V battery.
4. Replace the cover and secure the screw.
5. Dispose of the old battery properly.

WARNING: To avoid electric shock, do not operate your meter until the battery door is in place and fastened securely.

It is recommended that Digi-Sense products are calibrated annually to ensure proper function and accurate measurements; however, your quality system or regulatory body may require more frequent calibrations.

To schedule your recalibration, please contact InnoCal, an ISO 17025 calibration laboratory accredited by A2LA.

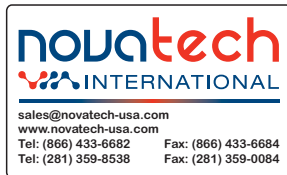


Phone: 1-866-INNOCAL (1-866-466-6225)

Fax: 1-847-327-2993

E-mail: sales@innocalsolutions.com

Web: InnoCalSolutions.com



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



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

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