Metrel MD9231

Metrel MD9231 Industrial TRMS AC/DC Current Clamp Meter User Manual

Your guide to safe and effective operation

1. Introduction

Thank you for choosing the Metrel MD9231 Industrial TRMS AC/DC Current Clamp Meter. This instrument is designed for professional use, offering a wide range of measurement capabilities for electrical parameters. It is a true RMS (TRMS) AC and DC current clamp meter capable of measuring currents up to 1000 A, as well as capacitance and frequency. Equipped with a built-in VFD feature, it accurately measures true values in varying frequency environments.

The MD9231 includes features such as peak value, data hold, MAX/MIN hold functions, auto power off, auto-ranging, and a relative zero function. Its robust industrial-grade casing and integrated flashlight make it suitable for demanding work conditions, including dimly lit areas.

Figure 1: Metrel MD9231 Industrial TRMS AC/DC Current Clamp Meter. This image shows the clamp meter from an angled perspective, highlighting its blue and black casing, the clamp jaw, and the display screen.

2. Safety Information

Please read and understand all safety information and operating instructions before using this instrument. Failure to follow these instructions could result in electric shock, fire, or serious injury.

- Always adhere to local and national safety codes.
- Do not use the meter if it appears damaged or if the insulation is compromised.
- Ensure the test leads are in good condition and free from cracks or damage.
- Do not exceed the maximum input limits for any function. The MD9231 is rated for CAT IV 600 V / CAT III 1000 V.
- Exercise extreme caution when working with live circuits.
- Keep fingers behind the finger guards on the test leads during measurements.
- Replace batteries immediately when the low battery indicator appears to ensure accurate readings.
- Avoid using the meter in wet environments or in the presence of explosive gases or dust.

3. Product Overview and Components

Familiarize yourself with the various parts of your MD9231 clamp meter:


METREL® MD 9231
AC+DC TRMS Clamp-on DMM
MAX 1000A
1000V CAT III
600V CAT IV
OFF
HOLD
ZERO
AUTO
P-RMS
MAX MIN AVG
VFD
MkΩHz µFAV
PEAK-RMS
CREST
REC
SELECT
Hz
COM
CAT III
1000V
CAT IV
600V

Figure 2: Front view of the Metrel MD9231 Clamp Meter, showing the display, rotary switch, function buttons, and input terminals.

Key Components:

1. **Clamp Jaw:** Used for non-contact current measurement. Features a 31 mm jaw opening.
2. **Function Rotary Switch:** Selects the desired measurement function (e.g., V, A, Hz, Ohm, Capacitance).
3. **LCD Display:** Digital display with backlight, showing 3-5/6 digits and up to 6000 counts.
4. **Function Buttons:** Includes buttons for PEAK/REC, SELECT, Hz, and other special functions like Data Hold, MIN/MAX/AVG, and Relative Zero.
5. **Input Terminals:** For connecting test leads for voltage, resistance, capacitance, and diode measurements.
6. **Flashlight:** Integrated light for illuminating dark work areas.
7. **Non-Contact Voltage (NCV) Detector:** For automatic detection of electromagnetic fields.

4. Setup

4.1. Battery Installation

The Metrel MD9231 is powered by two 1.5 V AAA batteries. To install or replace batteries:

1. Ensure the meter is turned OFF and disconnect any test leads from the input terminals.
2. Locate the battery compartment cover on the rear of the meter.
3. Use a screwdriver to loosen the screw(s) securing the cover.
4. Remove the cover and insert two new 1.5 V AAA batteries, observing the correct polarity (+/-) as indicated inside the compartment.
5. Replace the battery compartment cover and tighten the screw(s) securely.

Always use fresh batteries of the specified type. Dispose of old batteries responsibly according to local regulations.

5. Operating Instructions

5.1. Power On/Off

To turn the meter ON, rotate the function switch from the 'OFF' position to any desired measurement function. To turn the meter OFF, rotate the function switch back to the 'OFF' position. The meter features an auto power-off function to conserve battery life, which will activate after a period of inactivity.

5.2. Function Selection

Use the rotary switch to select the desired measurement function. The available functions include:

- **AC/DC Voltage (V):** For measuring voltage up to 1000 V.
- **AC/DC Current (A):** For measuring current up to 1000 A using the clamp jaw.

- **Resistance (Ω):** For measuring resistance.
- **Continuity ()))):** For checking circuit continuity with an audible indicator.
- **Diode Test (▶|):** For testing diodes.
- **Capacitance (µF):** For measuring capacitance.
- **Frequency (Hz):** For measuring frequency.
- **VFD (Variable Frequency Drive):** For accurate measurements in VFD environments.
- **NCV (Non-Contact Voltage):** For detecting live conductors without physical contact.

5.3. Making Measurements

For Current Measurement (AC/DC A):

1. Rotate the function switch to the AC A or DC A position.
2. Open the clamp jaw by pressing the lever.
3. Encircle only one conductor with the clamp jaw. Ensure the jaw is fully closed.
4. Read the current value on the LCD display.

For Voltage, Resistance, Capacitance, Diode, and Frequency Measurements:

1. Rotate the function switch to the desired V, Ω, µF, or Hz position.
2. Insert the black test lead into the 'COM' terminal and the red test lead into the 'VΩHz' terminal.
3. Connect the test probes to the circuit or component under test.
4. Read the measurement on the LCD display.

5.4. Special Functions

- **SELECT Button:** Toggles between AC/DC modes or different sub-functions within a rotary switch position (e.g., VFD, NCV).
- **PEAK/REC Button:** Activates Peak Hold or Record mode (MIN/MAX/AVG).
- **Data Hold:** Freezes the current reading on the display.
- **MIN/MAX/AVG:** Records the minimum, maximum, and average values over a measurement period.
- **Relative Zero:** Subtracts the current reading from all subsequent readings, useful for nulling out test lead resistance or comparing measurements.
- **Backlight:** Illuminates the LCD display for better visibility in low-light conditions.
- **Flashlight:** Provides illumination for the work area.

6. Maintenance

6.1. Cleaning

To clean the meter, wipe the case with a damp cloth and a mild detergent. Do not use abrasives or solvents. Ensure the meter is completely dry before use.

6.2. Battery Replacement

Refer to Section 4.1 for detailed instructions on battery replacement. Always replace batteries when the low battery indicator appears on the display to maintain measurement accuracy.

6.3. Calibration

For optimal performance and accuracy, it is recommended to have the Metrel MD9231 calibrated periodically by qualified personnel. Refer to Metrel's official website or contact customer support for calibration services and schedules.

7. Troubleshooting

If you encounter issues with your MD9231, refer to the following common problems and solutions:

- **Meter does not power on:**
  Check battery installation and ensure batteries are not depleted. Replace batteries if necessary. Ensure the rotary switch is not in the 'OFF' position.
- **No reading or 'OL' (Overload) displayed:**
  Ensure test leads are properly connected and making good contact with the circuit. Verify the selected function and range are appropriate for the measurement. If measuring current, ensure only one conductor is within the clamp jaw.
- **Inaccurate readings:**
  Check battery level. Ensure test leads are not damaged. Verify the correct function is selected. Environmental factors (e.g., strong electromagnetic fields) can affect readings.
- **Display is dim or flickering:**
  Replace batteries.

If the problem persists after attempting these solutions, contact Metrel customer support for further assistance.

8. Specifications

The following table outlines the technical specifications of the Metrel MD9231 Industrial TRMS AC/DC Current Clamp Meter:

TECHNICAL SPECIFICATION

Function	Range	Accuracy
DC Voltage	600.0 V ... 1000.0 V	±(0.8% of reading + 5 digits)
AC Voltage (50 Hz ... 400 Hz)	600.0 V ... 1000.0 V	From ±(0.8% of reading + 5 digits) to ±(10% of reading + 5 digits)
DC+AC Voltage (DC, 50 Hz ... 400 Hz)	600.0 V ... 1000.0 V	From ±(1.0% of reading + 7 digits) to ±(12% of reading + 7 digits)
PEAK-rms (ACV & ACA)	Response: 80 ms to > 90%.	
CREST (Peak-Hold)	Accuracy: Add 250 digits to specified accuracy for changes > 5ms	
Audible Continuity Tester	Audible Threshold: At between 10 Ω and 250 Ω. Response time: 32 ms approx.	
Ohm	600.0 Ω, 6.000 kΩ, 60.00 kΩ	±(1.0% of reading + 5 digits)
Capacitance	200.0 µF, 2500 µF	±(2.0% of reading + 4 digits)
Diode Tester	2.000 V	±(1.5% of reading + 5 digits)
AmpTipTM clamp-on DCA	00.00 A ... 60.00 A	From ±(1.5% of reading + 5 digits) to ±(3.0% of reading + 5 digits)
AmpTipTM clamp-on ACA (40 Hz ... 400 Hz)	00.00 A ... 60.00 A	From ±(1.5% of reading + 5 digits) to ±(3.0% of reading + 5 digits)
AmpTipTM clamp-on DC+ACA (DC, 40 Hz ... 400 Hz)	00.00 A ... 60,00 A	From ±(2.0% of reading + 7 digits) to ±(3.0% of reading + 7 digits)
Regular Clamp-on DCA	60.00 A ... 1000 A	±(1.8% of reading + 5 digits)
Regular Clamp-on ACA (40 Hz ... 400 Hz)	60.00 A ... 1000 A	From ±(1.8% of reading + 5 digits) to ±(2.2% of reading + 5 digits)
Regular Clamp-on DC+ACA (DC, 40 Hz ... 400 Hz)	60.00 A ... 1000 A	From ±(2.2% of reading + 7 digits) to ±(2.5% of reading + 7 digits)
Hz Line Level Frequency	5.00 Hz ... 999.9 Hz	±(1.0% of reading + 5 digits)
Non-Contact EF-Detection	20 V ... 440 V	Tolerance: 10 V ... 1000 V
Detection Frequency	50/60Hz	
Transient Protection	8.0 kV (1.2/50 µs surge)	
Overload Protections	Current & Hz functions via jaws: 1000 ADC/AAC rms at < 400 Hz Other functions via terminals: 1000 VDC/VAC rms	
Power Supply	1.5 V AAA Size battery X 2	
Power Consumption	Typical 13 mA for Current functions	
Dimension (L x W x H)	258 x 94 x 44 mm	
Weight	392 g	
Jaw opening & Conductor diameter	51 mm max	

ORDERING INFORMATION

Standard set MD 9231
- MD 9231 Current clamp
- Test lead, 2 pcs
- Battery, 2 pcs
- Pouch, 1 pcs
- User manual

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Figure 3: Detailed technical specifications for the Metrel MD9231, including measurement ranges and accuracy.

General Specifications:

- **Brand:** Metrel
- **Model:** MD9231

- **Power Source:** Battery Powered (2 x 1.5 V AAA batteries)
- **Jaw Opening & Conductor Diameter:** 31 mm max
- **Dimensions (L x W x H):** 258 x 94 x 44 mm
- **Weight:** 292 g
- **Overvoltage Category:** CAT IV 600 V / CAT III 1000 V
- **Display:** 3-5/6 digit, 6000 counts, with backlight

Measurement Specifications:

Function	Range	Accuracy
DC Voltage	600.0 V - 1000.0 V	±(0.8% of reading + 5 digits)
AC Voltage (40 Hz - 400 Hz)	600.0 V - 1000.0 V	±(1.0% of reading + 5 digits)
DC Current (Clamp-on DCA)	00.00 A - 60.00 A	±(2.0% of reading + 5 digits)
AC Current (Clamp-on ACA, 40 Hz - 400 Hz)	00.00 A - 60.00 A	±(2.0% of reading + 5 digits)
Resistance	600.0 Ω - 60.00 MΩ	±(1.0% of reading + 5 digits)
Capacitance	600.0 µF - 2500 µF	±(2.0% of reading + 4 digits)
Frequency	5.00 Hz - 999.9 Hz	±(1.0% of reading + 5 digits)
Diode Test	2.0 V	±(1.5% of reading + 5 digits)
Continuity Test	Response time: 32 ms approx.	Audible indication at <30 Ω

9. Warranty and Support

9.1. Warranty Information

Metrel products are manufactured under strict quality control standards. This product is covered by a limited warranty against defects in materials and workmanship. The specific warranty period and terms may vary by region. Please refer to the warranty card included with your product or visit the official Metrel website for detailed warranty information.
The warranty does not cover damage caused by misuse, unauthorized modification, accident, neglect, or improper operation.

9.2. Customer Support

For technical assistance, service, or repair, please contact Metrel customer support. When contacting support, please have your product model number (MD9231) and purchase information ready.

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