MS2003/MS2103 Series Mini Digital Clamp Meter
User Manual

Introduction

This series of digital clamp meters has been designed and manufactured in accordance with international electrotechnical safety standard IEC-61010-2-032, which specifies safety requirements for electronic measuring instruments and handheld current clamp meters. The series complies with the IEC-61010-2-032 standard for 600V CAT III.

Before using this instrument, please read this user manual thoroughly and pay attention to the relevant safety guidelines.

Overview

This digital clamp meter offers stable performance and a well-designed structure, with a device design centered around a high-precision A/D converter. The instrument can measure various electrical parameters, including DC voltage, AC voltage, DC current, AC current, resistance, capacitance, frequency, duty cycle, diodes, continuity, and temperature. It also functions as a diode and continuity tester, live wire detector, and non-contact voltage (NCV) tester. Its high reliability brings efficiency and convenience to your work, making it an ideal tool for fieldwork, laboratories, factories, radio enthusiasts, and home applications.

Safety Information

Operating Precautions

- The instrument must be warmed up for 30 seconds before taking measurements.
- Do not use the instrument or the test leads if they are visibly damaged.
- To comply with safety standards, the instrument must be used with the provided test leads only. If the test leads are damaged, they must be replaced with the same model or with leads that have the same electrical specifications.
- If the instrument is placed in a noisy environment or an environment with high interference, the readings may become unstable or show large errors.
- Ensure that the test leads are not connected to any circuit before adjusting the range setting.
- When the magnitude of the measured signal is uncertain, set the range dial to the highest range.
- Ensure that the test leads and function dial are in the correct positions when taking measurements.
- When using the test leads, keep your fingers behind the protective guard on the test leads.
- Exercise caution when measuring voltages exceeding 60V DC or 30V AC RMS to avoid electric shock.
- Do not exceed the input limit specified for each range to avoid damaging the instrument.
- When measuring current, the test leads should not be inserted into the input jacks.
- When holding the clamp meter during measurement, your fingers should remain behind the safety guard on the body of the meter.
- Before measuring resistance in a live circuit, ensure that all power sources are turned off and all capacitors are discharged.
- When the symbol appears, replace the battery promptly to avoid inaccurate readings.

Safety Symbols

Safety symbols on the instrument and in the user manual:

⚠ Important safety information, refer to the user manual before use.

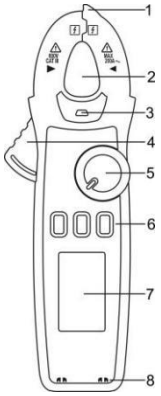
⏚ Grounding symbol

Double insulation protection symbol

Presence of high voltage symbol

Instrument Panel Description

1. NCV Sensing Area
2. Clamp Head
3. NCV Indicator Light
4. Clamp Trigger Position
5. Range Selector Dial
6. Function Button Area
7. LCD Screen
8. Instrument Input Terminals



Function Button Descriptions

Data Hold Button (H)

■ Description: When this button is pressed, the instrument will freeze the data displayed as of that moment, and will not update with further measurements.

Function Button (SELECT)

■ Description: Press this button to switch between functions such as °C and °F, /Ω/F, NCV/Live, DCV/ACV/Hz, and DCA/ACA.

Backlight Button

■ Description: Hold down the button to turn on the backlight; hold down the button again to turn off the backlight.

MAX/MIN Button

■ Description: Button for toggling between maximum and minimum values; hold down the button to exit.

REL Button

■ Description: Hold down this button to enter relative value measurement mode. The current displayed value will be set as the reference value for relative measurements, and subsequent displayed values will be the actual measurement minus this reference value. To exit relative measurement mode, press and hold this button for more than one second to return to normal measurement mode.

V.F.C Button

■ Description: When in the LOWZ V̄/Ṽ range, press this button to enter V.F.C measurement mode.

Technical Specifications

General Specifications

■ Operating Conditions:
Working Temperature (Humidity): 0 to 40 °C（<80%RH）
Storage Temperature (Humidity): -10 to 60 °C（<70%RH, with battery removed）
■ Maximum voltage between any input terminal and ground: 600V RMS
■ Measurement Principle: Dual-slope integrating A/D converter
■ Sampling Rate: Approximately 2 times per second
■ Display: Maximum reading of 4000/6000. The unit symbol is automatically displayed according to the selected measurement function.
■ Range Switching: Automatic.
■ Overload Indicator: The LCD will display "OL".
■ Input Polarity Indication: Automatically displays the "–" symbol for negative polarity
■ Low Battery Indicator: When the battery voltage is below the normal operating voltage, the symbol will appear on the LCD display.
■ Battery: 1.5V AAA ×2
■ Maximum Clamp Opening Size: φ19mm
■ Maximum Measurable Conductor Size: φ19mm
■ Dimensions: 178(L) × 60(W) × 32(H) mm
■ Weight: Approximately 165 g (including batteries)
■ Accessories: 1. User manual, 2. Test leads (1 set),
3. Warranty card, 4. Temperature probe (for MS2003B/MS2003A/MS2103B only)

Accuracy Specifications

Accuracy: ± (percent of reading + number of counts), guaranteed for 1 year
Reference Conditions: Ambient temperature of 18°C to 28°C and relative humidity not exceeding 80%

Note: When measuring current, please place the conductor being tested at the center of the clamp head. If it is not placed at the center, the accuracy of the reading may be affected.

AC Current (ACA) (MS2103A/MS2003B: 6000 count display, MS2003A/MS2103B: 4000 count display)

Range	Resolution	MS2103	MS2003B	MS2003	MS2103B	Accuracy
6mA	0.001mA	√				±(2.5%+10d)
60mA	0.01mA	√				
600mA	0.1mA	√				
4/6A	0.001A		√	√		±(2.5%+10d)
40/60A	0.01A	√	√	√	√	
200A	0.1A	√	√	√	√	

Frequency Response: TRMS 50Hz-60Hz

DC Current (DCA) (MS2103A/MS2003B: 6000 count display, MS2003A/MS2103B: 4000 count display)

Range	Resolution	MS2103A	MS2003B	MS2003A	MS2103B	Accuracy
6mA	0.001mA	√				±(1.5%+10d)
60mA	0.01mA	√				
600mA	0.1mA	√				
40/60A	0.01A	√			√	±(2.5%+10d)
200A	0.1A	√			√	

DC Voltage (DCV) (MS2103A/MS2003B: 6000 count display, MS2003A/MS2103B: 4000 count display)

Range	Resolution	Accuracy
400/600mV	0.1mV	±(0.7%+5d)
4/6V	0.001V	±(0.8%+5d)
40/60V	0.01V	
400/600V	0.1V	
600V	1V	

Input impedance: 10MΩ
Maximum input voltage: 600V DC or 600V AC RMS

AC Voltage (ACV) (MS2103A/MS2003B: 6000 count display, MS2003A/MS2103B: 4000 count display)

Range	Resolution	Accuracy
600mV	0.1mV	±(1.0%+10d) / for MS2003B only
4V/6V	0.001V	±(1.0%+5d)
40V/60V	0.01V	
400/600V	0.1V	
600V	1V	
V.F.C 600V	0.1V	±(4.0%+5d) / for MS2003B only

Input impedance: 10MΩ
Frequency response: TRMS 40 to 1000Hz
Maximum input voltage: 600V DC or 600V AC RMS

Resistance (Ω) (MS2103A/MS2003B: 6000 count display, MS2003A/MS2103B: 4000 count display)

Range	Resolution	Accuracy
400/600Ω	0.1Ω	±(1.0%+10d)

4/6kΩ	0.001KΩ	±(0.8%+5d)
40/60kΩ	0.01KΩ	
400/600kΩ	0.1KΩ	
4/6MΩ	0.001MΩ	
40/60MΩ	0.01MΩ	±(2.0%+10d)

Overload protection: 250V DC or AC RMS

Diode / Continuity Test

Range	Resolution	Description
	0.001V	Displays the forward voltage drop of the diode; for reverse, it shows "1" or "OL".
	0.1Ω	If resistance is less than 50Ω ± 30Ω, the buzzer will sound.

Overload protection: 250V DC or AC RMS

Temperature (TEMP)

Function	Range	Resolution	Accuracy
°C	-20°C to 0°C	1°C	±4°C
	0°C to 400°C		±(2.0%+3d)
	400°C to 1000°C		±(3.0%+3d)
°F	-4°F to 50°F	1°F	±5°F
	50°F to 750°F		±(2.0%+5d)
	750°F to 1832°F		±(3.0%+5d)

Overload protection: 250V DC or AC RMS

Frequency / Duty Cycle (Hz/%) Measurement

Range	Resolution	Accuracy
10Hz to 1kHz	0.001Hz to 0.001kHz	±(0.5%+2d) / for MS2003B only
10Hz to 10MHz	0.001Hz to 0.01MHz	±(0.5%+2d)
10Hz to 1MHz	0.001Hz to 0.01MHz	±(0.5%+2d) / for MS2103A only
10.0% to 90.0%	0.1%	±(2.5%+3d) / for MS2103A/MS2003B only

Input amplitude: ≥5V (DC level is zero); Overload protection: 250V DC or AC RMS

Capacitance (F)

Range	Resolution	MS2103A	MS2003B	MS2003A	MS2103B
		Accuracy			
60nF	0.01nF	±(3%+5d)			
600nF to 600μF	0.1nF to 0.1μF	±(3%+5d)			
6mF to 60mF	0.001mF to 0.01mF	±(10%+5d)			
10nF	0.01nF		±(4%+5d)		
100nF to 100μF	0.1nF to 0.1μF		±(4%+5d)		
1mF to 60mF	0.001mF to 0.01mF		±(10%+5d)		
40nF	0.01nF			±(4%+5d)	±(3%+5d)
400nF to 400μF	0.1nF to 0.1μF			±(4%+5d)	±(3%+5d)
4mF	0.001mF			±(10%+5d)	±(10%+5d)

Overload protection: 250V DC or AC RMS

Non-Contact AC Voltage Detection (NCV): Measures AC voltage >30V-1000V/50Hz-60Hz.

Live Wire Identification (Live): Measures AC voltage >90V-250V/50Hz-60Hz.

Operating Instructions

High Current Measurement

1. Turn the dial to the desired **Current** range.
2. Select the correct range based on the size of the signal being measured.
3. Press the **SELECT** function button to choose "DCA" or "ACA" measurement mode (for MS2103A, MS2103B).
4. Pull the trigger to open the clamp and place the wire to be measured (a single wire) in the center of the clamp head. Ensure that the clamp is fully closed.
5. Read the current value on the LCD display.
6. If the display shows "OL", it indicates overload, and the dial must immediately be set to a higher range for measurement.

⚠ **Note: Ensure that all test leads are removed from the input sockets. To avoid risk of electric shock, do not attempt to measure the current of high-voltage (>600V) conductors.**

Small Current Measurement (This feature is available on MS2103A)

1. Turn the dial to the desired **Current** range.
2. Select the correct range based on the size of the signal being measured.
3. Press the **SELECT** function button to choose "DCA" or "ACA" measurement mode.
4. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.
5. Use the test leads to measure the current in the circuit being tested (connect the test leads in series with the circuit).
6. Read the current value from the LCD.
7. If the display shows "OL", it indicates overload, and the dial must immediately be set to a higher range for measurement.

⚠ **Note: The instrument has a built-in 0.5A fuse. Do not measure currents greater than 600mA to avoid blowing the fuse.**

Voltage Measurement

1. Turn the dial to the **Voltage** position.
2. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.
3. Press the **SELECT** function button to choose "DCV" or "ACV" measurement mode.
4. Use the test leads to measure the voltage of the circuit being tested (connect the test leads in parallel with the circuit).
5. Read the voltage value from the LCD.

⚠ **Note:**

- **The maximum input voltage for the voltage range is 600V RMS. To avoid risk of electric shock or instrument damage, do not attempt to measure voltage higher than 600V RMS.**
- **In the 200mV and 2V ranges, the instrument may show a reading even without any input or connection to the test leads. This is normal and does not affect the accuracy of the measurements.**

Low Impedance Voltage Measurement (Automatic Detection of AC/DC Voltage), V.F.C Measurement (This feature is available on MS2003B)

1. Turn the dial to the LoWz position.
2. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.
3. Use the test leads to measure the voltage of the circuit being tested (connect the test leads in parallel with the circuit). The instrument will automatically detect whether the signal is DC or AC voltage.
4. Read the voltage value from the LCD.

⚠ **Note:**

- This clamp meter has an automatic AC/DC voltage detection function.
- In the **600mV** and **6V** ranges, the instrument may show a reading even without any input or connection to the test leads. This is normal and does not affect the accuracy of the measurements.
- When the dial is set to the LoWz position, press the **V.F.C** button. The LCD will display the "VFC" symbol, and the instrument will enter V.F.C measurement mode.
- The maximum input voltage for the voltage range is 600V RMS. To avoid risk of electric shock or instrument damage, do not attempt to measure voltage higher than 600V RMS.

Resistance Measurement

1. Turn the dial to the position and press the **SELECT** button to choose the Ω measurement mode.
2. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.
3. Use the test leads to measure the resistance of the resistor being tested.
4. Read the resistance value from the LCD.

⚠ **Note:**

- **Before performing resistance measurements in a live circuit, all power sources in the circuit must be turned off, and all capacitors must be fully discharged.**
- **In the Ω range, when the test leads are shorted, due to the resistance of the test leads, the display may show a small value above zero. Subtract this short-circuit value from the displayed result.**
- **When conducting capacitance testing in a live circuit, other components connected in parallel with the circuit being tested may affect measurement accuracy.**

Diode Test

1. Turn the dial to the position and press the **SELECT** button to choose (diode measurement mode).
2. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.
3. Connect the red test lead to the anode (positive terminal) of the diode and the black test lead to the cathode (negative terminal).
4. Read the forward voltage drop value of the diode from the LCD.

⚠ **Note:**

- **Before performing diode measurements in a live circuit, ensure that all power sources to the circuit are disconnected and all capacitors are discharged.**
- **When measuring diodes in a live circuit, other components connected in parallel with the circuit being tested may affect the accuracy of the measurement.**

Continuity Test

1. Turn the dial to the position and press the **SELECT** button to choose (continuity test mode).
2. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.

3. Use the test leads to test the continuity of the circuit.
4. During the continuity test, if the resistance of the circuit being tested is below approximately 50Ω ± 30Ω, the buzzer will emit a continuous sound.

⚠ **Note: Before performing measurements in a live circuit, ensure that all power sources to the circuit are disconnected and all capacitors are discharged.**

Capacitance Measurement

1. Turn the dial to the position and press the **SELECT** button to choose (capacitance measurement mode).
2. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.
3. Use the test leads to connect to the two terminals of the capacitor being tested.
4. Read the capacitance value from the LCD.

⚠ **Note:**

- **Before performing capacitance measurements in a live circuit, ensure that all power sources in the circuit are turned off and all capacitors are discharged.**
- **It is normal for small capacitance ranges to not return to zero in their default state. During testing, subtract the displayed value accordingly, which will not affect measurement accuracy.**
- **When measuring capacitance in a live circuit, other components connected in parallel with the circuit being tested may affect measurement accuracy.**

Temperature Measurement

1. Turn the dial to the ℃/℉ range.
2. Press the **SELECT** button to select °C or °F mode.
3. The LCD will display the ambient temperature of the instrument.
4. When using a thermocouple for temperature measurement, insert the red plug of the K-type thermocouple into the **VΩ** jack and the black plug into the **COM** jack. Use the thermocouple probe to contact the object or area to be measured.
5. Read the temperature value of the object from the LCD.

⚠ **Note: The instrument uses a cold-junction compensation circuit located inside the front end of the instrument. Due to the instrument's good sealing, it takes time to reach thermal equilibrium with the measuring environment. Therefore, the instrument should be placed in the measuring environment for an extended period to obtain a more accurate reading.**

Frequency/Duty Cycle Measurement

1. Turn the dial to the **Voltage** position.
2. Connect the black test lead to the **COM** input jack. Connect the red test lead to the **VΩ** input jack.
3. Press the **Hz/%** or **SELECT** function button to choose the "Hz" or "%" measurement mode (on the MS2003B, after detecting AC voltage, press the **SELECT** function button to choose the desired measurement mode).
4. Use the test leads to measure the frequency or duty cycle of the circuit being tested (connect the test leads in parallel with the circuit).
5. Read the measured parameters from the LCD.

⚠ **Note: When performing measurements in a live circuit, ensure that the input voltage does not exceed AC 250V.**

Non-Contact Voltage Detection (NCV)

1. Turn the dial to the **NCV Live** position and press the **SELECT** button to choose "NCV" measurement mode.
2. Move the NCV detection area at the top of the clamp meter close to the object. If the instrument detects a live conductor, the front NCV indicator light will flash, and the buzzer will emit a "beep-beep-beep" alarm sound, alerting the user to the presence of voltage. Please proceed with caution.

⚠ **Note:**

- Even if there is no indication, voltage may still be present. Do not rely solely on the NCV detector to determine whether a conductor is live.
- Detection results may be affected by factors such as socket design, insulation thickness, and material type.
- External sources of interference (e.g., flashlights, motors, etc.) may affect the instrument, causing inaccurate detection.

Live Wire Identification (Live)

1. Turn the dial to the **NCV Live** position and press the **SELECT** button to choose "Live" measurement mode.
2. Insert the red test lead into the **VΩ** jack and use the tip of the red test lead to touch the AC voltage. When the instrument emits a "beep-beep-beep" alarm sound and the red LED indicator light turns on, the wire being touched is the live wire.

⚠ **Note:**

- If the circuit has severe leakage, the instrument may also give an audible and visual warning when the red test lead touches the neutral wire.
- Detection results may be affected by factors such as socket design, insulation thickness, and material type.
- External sources of interference (e.g., flashlights, motors, etc.) may affect the instrument, causing inaccurate detection.

Maintenance

This series of digital multimeters are precision instruments. Users should not modify the internal circuits or adjust the internal potentiometer without authorization.

Please pay special attention to the following points:

⚠ Do not measure DC voltages higher than 600V or AC voltages higher than 600V RMS!

⚠ Do not input voltage signals while in the **Resistance**, or modes!

⚠ Do not test voltage signals while in the **Current** measurement mode!

⚠ Do not input voltage signals into the inductance or capacitance test sockets!

⚠ Do not use the instrument for any measurement if the battery is not properly installed or if the back cover is not securely tightened!

⚠ Before replacing the battery or fuse, remove the test leads from the test points and turn off the power switch!

⚠ Note: If using 1.5V batteries, replace the batteries when the instrument displays the symbol. Follow these steps for battery replacement:

1. Unscrew the screws securing the battery compartment cover and remove the cover.
2. Remove the 1.5V batteries and replace them with new ones. Although any standard battery will work, alkaline batteries are recommended due to their longer usage life.
3. Reattach the battery cover and tighten the screws to complete the battery replacement.

⚠ To avoid electric shock, ensure that the instrument is turned off and the test leads are disconnected from the circuit before opening the back cover.

⚠ Regularly clean the instrument with a damp cloth and a small amount of detergent. Do not use chemical solvents to clean the case.

- Repairs and calibrations must be performed by professionals.
- To prevent contamination or damage from static electricity, take appropriate protective measures before opening the instrument case.
- If any abnormalities are observed, immediately discontinue use and send the instrument for repairs.
- Do not use the instrument if the case is not securely closed, or if the screws are not tightened.
- If the instrument will not be used for a long period, remove the battery and avoid storing it in high-temperature or high-humidity environments.

****** The contents of this manual are subject to change with version updates, without further notice****