CMi210 CLAMP METER

Instruction Manual

MARTINDALE ELECTRIC

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ALWAYS READ THESE INSTRUCTIONS BEFORE PROCEEDING

Thank you for buying one of our products. For safety and full understanding of its benefits please read this manual before use. Technical support is available from 01923 441717 and support@martindale-electric.co.uk.

CONTENTS

1 SAFETY INFORMATION:

⚠ **REMEMBER: SAFETY IS NO ACCIDENT**

These instructions contain both information and warnings that are necessary for the safe operation and maintenance of this product. It is recommended that you read the instructions carefully and ensure that the contents are fully understood. Failure to understand and to comply with the warnings and instructions can result in serious injury, damage or even death.

Particular attention should be paid to the Warnings, Precautions and Technical Specifications.

Please keep these instructions for future reference. Updated instructions and product information are available at: www.martindale-electric.co.uk

1.1 Meaning of Symbols and Markings

⚠ **Caution - risk of danger & refer to instructions**

⚠ **Caution - risk of electric shock**

Equipment protected by double or reinforced insulation (Class II)

Application around and removal from hazardous live conductors is permitted.

>680V ⚠ **Do not use in distribution systems with voltages higher than 680V.** Refers to the insulation resistance function.

CAT II **(Measurement Category II)** is applicable to test and measuring equipment connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation.

CAT III **(Measurement Category III)** is applicable to test and measuring equipment connected to the distribution part of the building's low-voltage MAINS installation.

CAT IV **(Measurement Category IV)** is applicable to test and measuring equipment connected at the source of the building's low-voltage MAINS installation.

For further information on measurement categories refer to page 23 or visit www.martindale-electric.co.uk/measurement_categories.php

Equipment complies with relevant EU Directives

End of life disposal of this equipment should be in accordance with relevant EU Directives

1.2 Precautions

This product has been designed with your safety in mind, but please pay attention to the following warnings and cautions before use.

⚠ Warnings

In order to avoid the danger of electrical shock, it is important that proper safety measures are taken when working with voltages exceeding 30V AC rms, 42V AC peak or 60V DC.

Where applicable other safety measures such as the use of protective gloves, goggles etc. should be employed.

The insulation clamp meter must only be used by a skilled and competent person who is familiar with the relevant regulations, the safety risks involved and the consequent normal safe working practices, and under the conditions and for the purposes for which it has been constructed and specified.

Before each use the insulation clamp meter and any associated test leads and accessories should be examined for damage, cracks, cuts or scratches. **Do not use** if damaged in any way.

Make sure the insulation clamp meter and test leads are dry, clean and free from dust, grease and moisture while in use to avoid the danger from electric shock due to surface leakage.

Always test this unit on an appropriate proving device or a known good voltage source before and after using it to determine if a hazardous

voltage exists in a circuit to be tested. **Do not use** the unit if it does not function correctly during proving.

Measuring/testing for a voltage/current that exceeds the specified limits of the unit may damage the unit and may expose the operator to a shock hazard. Always check the unit's specified limits before use.

As a clamp meter or multimeter the unit must only be used on CAT IV installations up to 600V to earth, CAT III and CAT II installations up to 1000V to earth, and within the operating temperature and humidity range specified.

The CAT III 1000V marking does not mean the clamp meter can be used to 1000V AC rms, but that it will be safe to the user if inadvertently connected across a voltage up to 1000V AC rms to earth.

As an insulation resistance meter the unit must only be used on CAT II installations up to 600V to earth, and within the operating temperature and humidity range specified.

If the removable probe tip caps are not fitted to the probes of the test leads, their measurement category becomes CAT II 1000V, and they **must not be used** on CAT III or CAT IV installations to avoid the risk of shorting high energy circuits and arc flash.

When this unit is used in combination with test leads, the measurement category of the combination is the lower measurement category of either this unit or the test leads used. Likewise if test lead accessories such as crocodile clips are also used, the measurement category will be the lowest measurement category in that combination.

Do not use if the battery compartment cover is not fitted.

When using test leads, **always** keep your fingers behind the finger guard on the test lead probe.

When positioning the clamp jaws around a hazardous live conductor **always** keep your fingers behind the clamp finger guard.
To avoid electrical shock, and damage to the insulation clamp meter, do not use the insulation clamp meter and the associated temperature probe when voltages at the measurement surface exceed 30V AC rms or 60V DC.

⚠ Cautions

Avoid severe mechanical shock or vibration and extreme temperature.

When using test leads avoid excessive stresses to the cable entry points at the probe and 4mm plug connector.

To avoid burns or damage to equipment, do not take temperature measurements inside microwave ovens.

To avoid possible corrosion from a leaking battery, remove the battery when the unit is not in use for an extended period.

2. INTRODUCTION

2.1 Inspection

Examine the shipping carton for any sign of damage. Inspect the unit and any accessories for damage. If there is any damage then consult your distributor immediately.

2.2 Description

The Martindale CMi210 is a combined clamp meter and insulation tester with the following measurement functions:

- True RMS AC current to 1500A
- DC current to 2000A
- Inrush current
- True RMS AC voltage to 750V
- DC voltage to 1000V
- Insulation resistance to 6GΩ with test voltages to 1000V
- Resistance to 60MΩ
- Capacitance to 6mF
- Frequency to 10MHz
- Duty cycle
- Temperature (Type K thermocouple)
- Continuity with audible indication
- Diode testing

Further functions are:

- Display hold
- Max/Min indication
- DC current clamp zeroing
- Selectable high frequency rejection
- Live circuit detection for insulation resistance
- Measurement lock for insulation resistance
- Display backlight
- Auto or manual ranging
- Auto power off

2.3 Accessories

The CMi210 comes with the following accessories:

- Carrying case
- Set of TL45 test leads
- Type K thermocouple
- 5 x 1.5V AA batteries (Installed)
- Instructions

Accessories not included:

- TL180 insulation resistance test probe (incorporating test switch for ease of insulation tests)

3. OPERATION

3.1 General

If the magnitude of a parameter to be measured is uncertain, but known to be within the maximum safe limits of the electrical tester, manually set the range to maximum. For example, if measuring AC voltage and the voltage magnitude is unknown, set the range to 750V, then if required, select the correct range for a satisfactory reading.

If the insulation clamp meter displays **OL** or **-OL** then the measurement limits of the range have been exceeded.

3.2 Low Battery Indication

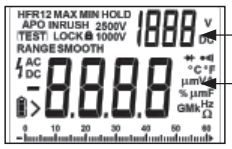
The battery capacity is shown by the symbols on the LCD.

If the symbol is displayed followed by a **bAtt** display, the battery needs replacing as measurement accuracy can no longer be guaranteed (see section 4.1 Battery Replacement).

3.3 Description of Press Buttons

INRUSH	Selects inrush current measurement function
HFR >2sec	Selects high frequency rejection -3db point Turns backlight on/off
INSULATION TEST	Press to perform insulation measurement
SEL ZERO	Selects alternate functions for a rotary switch setting Zero's DC clamp current ranges
MAX MIN	Selects max/min function
LOCK HOLD	Locks the insulation test to continual measurement Selects display hold on other measurement functions
RANGE 50V~1KV	Selects manual ranging Selects test voltage for insulation resistance

3.4 Description of LCD Symbols



HFR1	High frequency reject > 1 kHz selected
HFR 2	High frequency reject > 10 kHz selected
MAX	Maximum indication is displayed
MIN	Minimum indication is displayed
HOLD	Display hold is activated
APO	Auto power off is activated
INRUSH	Inrush current measurement is selected
50V, 100V, 250V, 500V, 1000V	Selected insulation resistance test voltage
TEST	Indicates insulation test active
LOCK	Insulation test voltage output is locked to on
RANGE	Manual ranging is selected
SMOOTH	Insulation resistance smoothing is selected
	Diode testing function is selected
	Continuity function is selected
mV, V, µA, mA, A, µF, mF, Ω, kΩ, MΩ, GΩ, Hz, kHz, MHz, %, °C, °F	Units of measurement being displayed
	Indicates battery level.
DC	Indicates DC measurement
AC	Indicates AC measurement
	Indicates insulation resistance test voltage or external voltage is present at the insulation terminals

3.5 Description of Terminals

VΩHz		Input terminal for AC and DC voltage, resistance, capacitance continuity, diode test , frequency and duty cycle
COM		Common terminal
µA mA		Input terminal for AC & DC current measurements to 400 mA
K-TYPE		Input terminals for temperature probes
Insulation	⊖	Input terminal for negative insulation test lead
	⊕	Input terminal for positive insulation test lead/probe

3.6 Auto Power Off

If the clamp meter is inactive for a period of 30 minutes it will automatically power off.

If any button is pressed after the clamp meter has automatically powered off, the clamp meter will turn back on.

To disable the auto power off function hold the MAX MIN button at the same time as turning the rotary switch from **OFF** to any position. The **APO** symbol will no longer be displayed on the LCD.

3.7 Backlight

To switch on the backlight press the HFR >2sec button for > 2 seconds. Press again for > 2 seconds to turn the backlight off.

3.8 Auto/Manual Ranging

To select manual ranging, press the RANGE 50V~1KV button. The **RANGE** symbol will be displayed on the LCD to signify manual ranging is selected.

To manually select a range when in manual mode press the RANGE 50V~1KV button until the required range is selected.

To exit manual ranging, hold down the RANGE 50V~1KV button for > 2 seconds. The **RANGE** symbol will no longer be displayed.

3.9 Display Hold
To hold a displayed value, press the LOCK HOLD button. The LCD will display **HOLD**.

Press again to exit display hold.

3.10 Max/Min
To activate the Max/Min function, press the MAX MIN button. Press as required to alternate between displaying the maximum and minimum measured values.

Press for >2 seconds to exit the Max/Min function.

3.11 DC Current Zero
When the DC current ranges are selected, pressing the SEL ZERO button will zero the selected range and select manual ranging.

The zero will be removed if the range is changed.

3.12 High Frequency Rejection
If the AC voltage ranges or AC currents ranges using the clamp are selected, there is a choice between two high frequency rejection -3 dB points.

The clamp meter defaults to HFR2 (10 kHz -3dB point). The LCD will display the **HFR2** symbol.

To select HFR1 (1 kHz -3 dB point), press the HFR >2sec button for < 1 second. The LCD will display the **HFR1** symbol.
Press again to return to HFR2.

3.13 Live Circuit Detection
When set to insulation measurement, if a voltage exceeding 30V DC or AC rms is present at the insulation input terminals the LCD will display **>30V** and the ⚡ symbol. The insulation measurement will be inhibited.

3.14 Lock Function
When set to insulation resistance measurement, pressing the LOCK HOLD button will active the lock function. The LCD will display the **LOCK** 🔒 symbol.

This function will set the insulation resistance test to be continuously active after a single press of the INSULATION TEST button. Press again to exit the lock function and to stop the test.

3.15 Use of the TL45 Test Leads
When crocodile clips are to be fitted, or where access to test points may require extended probe tips, the probe tip caps may be removed by gently pulling them forward until they unclip from the probe body.

CAT III 1000V
CAT IV 600V

CAT II 1000V **ONLY DO NOT USE ON CAT III or CAT IV** installations

3.16 AC Current Measurements using Clamp
Set the rotary switch to the **A~** position.

Set the high frequency rejection as required (see section 3.12). Taking all necessary safety precautions, press the clamp meter trigger to open the clamp jaws, position the jaws around the

conductor to be measured, and release the trigger to close the jaws. Position the clamp meter so the conductor is central within the clamp jaws.

Read the measured ac current from the display.

To display the frequency of the measured ac current press the SEL ZERO button.

Press again to revert back to measured ac current.

Note: To avoid the possibility of an incorrect measurement, only clamp around the conductor being measured.

3.17 DC Current Measurements using Clamp
Set the rotary switch to the **A⎓** position.

If required, with the clamp meter positioned away from any live conductors, zero the selected dc current range by pressing the SEL ZERO button.

Taking all necessary safety precautions, press the clamp meter trigger to open the clamp jaws, position the jaws around the conductor to be measured, and release the trigger to close the jaws.

Position the clamp meter so the conductor is central within the clamp jaws.

Read the measured dc current from the display.

Note: To avoid the possibility of an incorrect measurement, only clamp around the conductor being measured.

3.18 Inrush Current Measurements
Set the rotary switch to the **A~** position.

Set the high frequency rejection as required (see section 3.12).

To select the inrush current measurement function, press the INRUSH button. The LCD will display the **INRUSH** symbol.

Taking all necessary safety precautions, press the clamp meter trigger to open the clamp jaws, position the jaws around the conductor to be measured, and release the trigger to close the jaws.

Position the clamp meter so the conductor is central within the clamp jaws.

The clamp meter will display "- - - -" until the device being measured has powered up and the clamp meter has detected and measured the inrush current.

A single measurement is made and the measured inrush current is held on the display.

To exit the inrush current measurement function, press the INRUSH button for > 2 seconds.

Note 1: To avoid the possibility of an incorrect measurement, only clamp around the conductor being measured.

Note 2: The clamp meter will not respond to an inrush current of less than 10 A on the 660A range and 100A on the 1500A range.

3.19 AC Voltage Measurements
Connect the black test lead to the COM terminal and the red test lead to the **VΩHz** ⊣⊢ terminal.

Set the rotary switch to the **V~** position.

Set the high frequency rejection as required (see section 3.12).

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured ac voltage from the display.

To display the frequency of the measured ac voltage press the SEL ZERO button.

Press again to revert back to measured ac voltage.

3.20 DC Voltage Measurements
Connect the black test lead to the **COM** terminal and the red test lead to the **VΩHz** ⊣⊢ terminal.

Set the rotary switch to the **V⎓** position.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured dc voltage from the display.

3.21 AC & DC Current Measurements up to 400mA
Connect the black test lead to the **COM** terminal and the red test lead to the **µA mA** terminal.

Set the rotary switch to the **µA≂** or **mA≂** position as required.

The clamp meter defaults to dc current measurement. The LCD will display the **DC** symbol.

To measure ac current press the SEL ZERO button. The LCD will display the **AC** symbol.

Press again to revert back to dc current measurement.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured ac or dc current from the display.

3.22 Resistance Measurements
Connect the black test lead to the **COM** terminal and the red test lead to the **VΩHz** ⊣⊢ terminal.

Set the rotary switch to the ⊣⊢•)))Ω position.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured resistance from the display.

3.23 Capacitance Measurements
⚠ Be sure the capacitor being tested is completely discharged before connecting the test leads.

Connect the black test lead to the **COM** terminal and the red test lead to the **VΩHz** ⊣⊢ terminal.

Set the rotary switch to the ⊣⊢ position.

Taking all necessary safety precautions and observing the correct polarity for electrolytic capacitors, connect the test probes to the capacitor to be measured.

Read the measured capacitance from the display.

3.24 Frequency and Duty Cycle Measurements
Connect the black test lead to the **COM** terminal and the red test lead to the **VΩHz** ⊣⊢ terminal.

Set the rotary switch to the **Hz%** position.

Taking all necessary safety precautions connect the test leads to the circuit being measured and read the measured frequency from the display.

To display the measured duty cycle press the SEL ZERO button.

Press again to revert back to measured frequency.

3.25 Temperature Measurements
Set the rotary switch to the **°C °F** position and set the **TEMP** switch to the **TEMP** position.

The clamp meter defaults to measurement in °C.

For measurement in °F press the SEL ZERO button.

Press again to revert back to °C.

Connect a Type K thermocouple probe, suitable for the type of temperature measurement and temperature range being made, to the **K-TYPE** sockets.

Taking all necessary safety precautions position the thermocouple at the surface or in the medium to be measured and read the measured temperature from the display.

3.26 Continuity Testing
Connect the black test lead to the **COM** terminal and the red test lead to the **VΩHz** ⊣⊢ terminal.

Set the rotary switch to the ⊣⊢•))) Ω position.

Press the SEL ZERO button once. The LCD will display the •))) symbol.

Taking all necessary safety precautions connect the test leads to the circuit being tested.

If the resistance is < 40Ω, the buzzer will sound continuously. The resistance value will be displayed if ≤ 600Ω.

3.27 Diode Testing
If the diode to be tested is in circuit, be sure the circuit power is switched off.

Connect the black test lead to the **COM** terminal and the red test lead to the **VΩHz** ⊣⊢ terminal.

Set the rotary switch to the ⊣⊢•))) Ω position.

Press the SEL ZERO button twice. The LCD will display the ⊣⊢ symbol.

Taking all necessary safety precautions connect the test leads to the diode being tested.

If the diode is good a forward bias will give a display reading of around 0.6 V (silicon diode) and a reverse bias will give a display of **OL**. If the diode is shorted or open circuit the display will indicate approx. 0V or **OL** respectively for both forward and reverse bias.

3.28 Insulation Resistance Measurements
Connect the black TL45 test lead to the **INSULATION** ⊖ terminal.

Connect the red TL45 test lead, or the optional TL180 test probe, to the **INSULATION** ⊕ terminal.

Set the rotary switch to the **INSULATION** position.

Press the RANGE 50V~1KV button to select the required test voltage (50V, 100V, 250V, 500V or 1000V). The selected test voltage will be displayed on the LCD.

Press the SEL ZERO button to activate the smooth function if a noisy measurement requires stabilising. The LCD will display the **SMOOTH** symbol.

Taking all necessary safety precautions connect the TL45 test leads, or if applicable, the TL180 test probe and black TL45 test lead, to the circuit being measured.

If there is a live circuit warning (see section 3.13) do not continue with the test and remove all connections from the circuit under test.

Press either the INSULATION TEST button, or if using the TL180 test probe, the test button on the test probe, and hold it down for the duration of the test.

Note: It is not necessary to hold down the test button if the lock function is active (see section 3.14).

Read the measured insulation resistance from the main display and the actual test voltage from the sub-display.

The measured insulation resistance will be held on the display after the test has ended.

Overrange on the insulation resistance measurement function is indicated by a flashing " > " symbol followed by the maximum reading of the selected test voltage. E.g. " > 3GΩ" for a test voltage of 500V.

4. MAINTENANCE
4.1 Battery Replacement
⚠ To avoid shock or injury, disconnect the CMi210 from any external circuits and remove the test leads before proceeding.

The battery compartment is underneath the unit and can be accessed by undoing the 2 screws and lifting off the cover.

Fit 5 new 1.5V, AA alkaline batteries (IEC LR6, NEDA 15A) observing correct polarity.

Replace the battery compartment cover and screws.

Note: Do not mix old and new batteries.

4.2 Fuse Replacement
⚠ To avoid shock, injury or damage to the CMi210, disconnect it from any external circuits and remove the test leads and batteries before proceeding.
Replace only with the fuse specified.

The fuse is inside the battery compartment.

The battery compartment is underneath the unit and can be accessed by undoing the 2 screws and lifting off the cover.

Replace only with the original type 0.5 A/1000V 6.3x32mm fast blow ceramic fuse.

Replace the battery compartment cover and screws.

4.3 Test Lead Replacement
If the test leads become damaged they should be replaced.

⚠ The replacement test leads must have the same (or better) overvoltage category rating as the TL45 leads supplied.

4.4 Calibration
To maintain the integrity of measurements made using your instrument, Martindale Electric recommends that it is returned at least once a year to an approved Calibration Laboratory for recalibration and certification.

Martindale Electric is pleased to offer you this service. Please contact our Service Department for details.
Email: service@martindale-electric.co.uk
Tel: 01923 650660

4.5 Cleaning
⚠ To reduce the risk of surface leakage, this instrument must be kept in a clean condition.

Prior to cleaning, ensure that the instrument is disconnected from any voltage source.

If contamination is found, clean with a damp soft cloth and if necessary a mild detergent or alcohol. Do not use abrasives, abrasive solvents, or detergents which can cause damage to the unit. If a mild detergent is used, the unit should subsequently

be thoroughly cleaned with a water dampened soft cloth. After cleaning, dry and allow to remain in a dry environment for 2 hours before use.

4.6 Repair & Service
There are no user serviceable parts in this unit other than those that may be described in section 4. Return to Martindale Electric if faulty.

Our service department will quote promptly to repair any fault that occurs outside the guarantee period.

Before the unit is returned, please ensure that you have checked the unit, batteries, leads and poor connections.

4.7 Storage Conditions
The instrument should be kept in warm dry conditions away from direct sources of heat or sunlight, and in such a manner as to preserve the working life of the unit. It is strongly advised that the unit is not kept in a tool box where other tools may damage it.

5. WARRANTY AND LIMITATION OF LIABILITY

This Martindale product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is 2 years and begins on the date of receipt by the end user. This warranty extends only to the original buyer or end-user customer, and does not apply to fuses, disposable batteries, test leads or to any product which, in Martindale's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation, handling or storage.

Martindale authorised resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Martindale.

Martindale's warranty obligation is limited, at Martindale's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to Martindale within the warranty period.

This warranty is the buyer's sole and exclusive remedy and is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. Martindale shall not be liable for any special, indirect, incidental or consequential damages or losses, including loss of data, arising from any cause or theory.

Since some jurisdictions do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any part of any provision of this warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision or other part of that provision.

Nothing in this statement reduces your statutory rights.

Measurement Categories

Measurement categories are determined by the potential for dangerous transient impulses on the mains supply system, the magnitude of which depends on the amount of damping of the transient energy due to the location within the system and the system voltage. Short-circuit current levels are also a factor.

Test equipment used for measuring mains circuits will be marked with one or more of three measurement categories, **CAT II, CAT III** or **CAT IV**, to identify on which installations of a mains supply system it can safely be used.

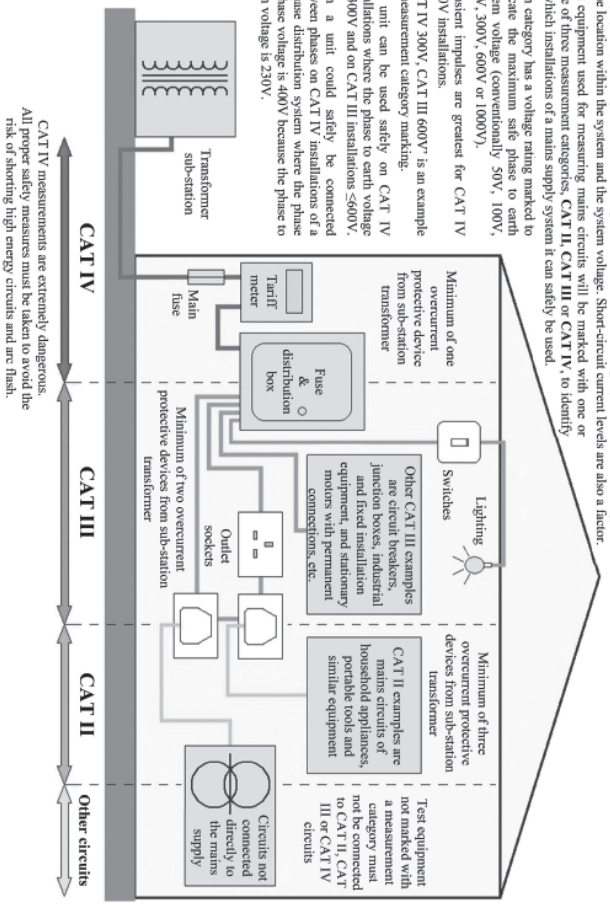
Each category has a voltage rating marked to indicate the maximum safe phase to earth system voltage (conventionally 50V, 100V, 150V, 300V, 600V or 1000V).

Transient impulses are greatest for CAT IV 1000V installations.

'CAT IV 300V, CAT III 600V' is an example of measurement category marking.

The unit can be used safely on CAT IV installations where the phase to earth voltage is ≤300V and on CAT III installations ≤600V.

Such a unit could safely be connected between phases on CAT IV installations of a 3-phase distribution system where the phase to phase voltage is 400V because the phase to earth voltage is 230V.



MARTINDALE ELECTRIC

Specification
CMi210
Insulation Clamp Meter

All specified accuracies are at 23°C ± 5°C, <75% RH for 1 year.
Temperature Coefficient: < 0.1 x (specified accuracy) per °C. (0°C to 18°C, 28°C to 50°C).

All accuracies below are expressed as ± (percentage of reading + digits)

DC Voltage

Range	Resolution	Input Impedance	Accuracy
600mV	0.1mV	>100MΩ	0.5% + 2
6V	0.001V	10MΩ	
60V	0.01V	9.1MΩ	
600V	0.1V		
1000V	1V		

Overload protection: 1000 V DC or 750V AC rms

AC Voltage (true RMS)

Range	Resolution	Input Impe-dance	Accuracy		
			HFR1 selected (50 to 60Hz)	HFR2 selected	
				(50 to 100Hz)	(100 to 400Hz)
600mV	0.1mV	>100MΩ	2.0% + 10	1.5% + 8	Not specified
6V	0.001V	10MΩ			2.0% + 8
60V	0.01V	9.1MΩ			
600V	0.1V				
750V	1V				

MARTINDALE ELECTRIC

Specification
CMi210
Insulation Clamp Meter

True rms AC voltage accuracy is specified from 1% of range to 100% of range.
Crest factor: ≤ 3
Frequency measurement accuracy (50Hz to 1kHz): 0.1% + 5
Frequency sensitivity >500 dgts
Overload protection: 1000V DC or 750V AC rms

AC Current using clamp (true RMS)

Range	Resolution	Accuracy		
		HFR1 selected (50 to 60Hz)	HFR2 selected	
			(50 to 60Hz)	(60 to 400Hz)
600A	0.1A	2.5% + 10	2.0% + 10	3.0% + 10
1500A	1A	2.5% + 10 (≤1000A)	2.5% + 10 (≤1000A)	3.5% + 10 (≤1000A)
		5.0% + 10 (>1000A)	5.0% + 10 (>1000A)	Not specified

True rms AC current accuracy is specified from 1 % of range to 100 % of range.
Crest factor: ≤ 3
Frequency measurement accuracy (50Hz to 1kHz): 0.1% + 5
Frequency sensitivity > 500 dgts
Overload protection: 1500A AC rms for 60 seconds maximum

DC Current using clamp

Range	Resolution	Accuracy
600A	0.1A	2.0% + 5
2000A	1A	3.0% + 5 (≤1000A) 5.0% + 5 (>1000A)

Overload protection: 2000 A DC for 60 seconds maximum

Specification
CMi210
Insulation Clamp Meter

AC Current (True RMS)

Range	Resolution	Voltage burden	Accuracy
600µA	0.1µA	500mV	1.5 % + 10
6000µA	1µA	2V	
60mA	0.01mA	500mV	
400mA	0.1mA	2V	2.0% + 10

Input protection: 0.5 A/1000V fast blow ceramic fuse

DC Current

Range	Resolution	Voltage burden	Accuracy
600µA	0.1µA	500mV	1.0% + 4
6000µA	1µA	2V	
60mA	0.01mA	500mV	
400mA	0.1mA	2V	1.5% + 4

Input protection: 0.5 A/1000V fast blow ceramic fuse

Resistance

Range	Resolution	Open circuit voltage	Accuracy
600Ω	0.1Ω	-3.0Vdc	1.0% + 5
6kΩ	0.001kΩ	-1.2V dc typical	
60kΩ	0.01kΩ		
600kΩ	0.1kΩ		
6MΩ	0.001MΩ		2.0% + 5
60MΩ	0.01MΩ		3.5% + 5

Overload protection: 600V DC or AC rms

Specification
CMi210
Insulation Clamp Meter

Capacitance

Range	Resolution	Accuracy
6µF	0.001µF	3.0% + 10
60µF	0.01µF	
600µF	0.1µF	
6mF	0.001mF	5.0% + 10

Overload Protection: 600V DC or AC rms

Frequency

Range	Resolution	Accuracy
60Hz	0.01Hz	0.1% + 5
600Hz	0.1Hz	
6kHz	0.001kHz	
60kHz	0.01kHz	
600kHz	0.1kHz	
6MHz	0.001MHz	
10MHz	0.01MHz	

Sensitivity (10Hz to 1 MHz): >3.5V AC rms
(1MHz to 10MHz): >3.5V, <5V AC rms
Minimum pulse width: >100 ns.
Duty cycle limits: >30% and <70%
Overload protection: 600V DC or AC rms

Specification
CMi210
Insulation Clamp Meter

Duty Cycle

Range	Frequency range	Resolution	Pulse width	Accuracy (5V logic)
5% to 95%	40Hz to 1kHz	0.1%	> 10µs	2.0% + 10
10% to 90%	1kHz to 10kHz			
20% to 80%	10kHz to 20kHz			

Overload protection: 600V DC or AC rms

Temperature (Type K Thermocouple)

Range	Resolution	Accuracy
0°C to 400°C	1°C	1.0% + 2
-50°C to 0°C, 400°C to 1300°C		2.0% + 3
32°F to 750°F	1°F	1.0% + 4
-58°F to 32°F, 750°F to 2372°F		2.0% + 6

Overload protection: 30V DC or AC rms

Continuity

Range	Resolution	Response time	Open circuit voltage	Audible indication
600Ω	0.1Ω	100ms	-3.0V dc	<40Ω

Overload protection: 600V DC or AC rms

Diode Test

Range	Resolution	Test current	Open circuit voltage	Audible indication	Accuracy
2V	1mV	0.5mA approx.	3.0V dc typical	<0.05V	2.0% + 5

Overload protection: 600V DC or AC rms

Specification
CMi210
Insulation Clamp Meter

Insulation Resistance

Test voltage	Test current	Insulation resistance range	Resolution	Accuracy
50V	1mA at 50 kΩ	50kΩ to 300kΩ	1kΩ	3.0% + 5
		0.3MΩ to 3MΩ	0.01MΩ	
		3MΩ to 30MΩ	0.1MΩ	
		30MΩ to 300MΩ	1MΩ	
100V	1mA at 100 kΩ	100kΩ to 600kΩ	1kΩ	
		0.6MΩ to 6MΩ	0.01MΩ	
		6MΩ to 60MΩ	0.1MΩ	
		60MΩ to 600MΩ	1MΩ	
250V	1mA at 250 kΩ	0.25MΩ to 1.5MΩ	0.01MΩ	1.5% + 5
		1.5MΩ to 15MΩ	0.1MΩ	
		15MΩ to 150MΩ	1MΩ	
		0.15GΩ to 1.5GΩ	0.01GΩ	
500V	1mA at 500 kΩ	0.5MΩ to 3MΩ	0.01MΩ	
		3MΩ to 30MΩ	0.1MΩ	
		30MΩ to 300MΩ	1MΩ	
		0.3GΩ to 3GΩ	0.01GΩ	
1000V	1mA at 1 MΩ	1MΩ to 6MΩ	0.01MΩ	
		6MΩ to 60MΩ	0.1MΩ	
		60MΩ to 600MΩ	1MΩ	
		0.6GΩ to 6GΩ	0.01GΩ	10% + 5

Specification
CMi210
Insulation Clamp Meter

Insulation Resistance Operating Range to BS EN 61557-2

Test voltage	Operating range to BS EN 61557-2 (See note 1)
50V	55kΩ to 300kΩ
	0.55MΩ to 3MΩ
	5.5MΩ to 30MΩ
	55MΩ to 300MΩ
100V	100kΩ to 600kΩ
	0.6MΩ to 6MΩ
	6 MΩ to 60MΩ
	60MΩ to 600MΩ
250V	0.5MΩ to 1.5MΩ
	5MΩ to 15MΩ
	50MΩ to 150MΩ
	0.5GΩ to 1.5GΩ
500V	0.5MΩ to 3 MΩ
	5MΩ to 30MΩ
	50MΩ to 300MΩ
	0.5GΩ to 3GΩ
1000 V	1MΩ to 6MΩ
	6MΩ to 60MΩ
	60MΩ to 600MΩ
	2.5GΩ to 6GΩ

Specification
CMi210
Insulation Clamp Meter

Note 1: The operating range where the operating uncertainty does not exceed ± 30 % in accordance with BS EN 61557-2.
Operating uncertainty (B) = ± (|A| + 1,15 $\sqrt{[E_2^2 + E_3^2]}$)
where, A is the intrinsic uncertainty at reference conditions
E_2 is the variation due to supply voltage change
E_3 is the variation due to temperature change

Test voltage accuracy: 0% to +20%
Short circuit test current: 1mA
Auto discharge: discharge time <1s for C=1µF or less
Maximum capacitive load: operable with up to 1µF load
Live circuit detection: >30V DC or AC rms, test is inhibited
Overload protection: 600V DC or AC rms

GENERAL

Display: liquid crystal display
digital, 6000 counts, updates 2/sec
polarity: Automatic, positive implied, '-' for negative polarity indication
overrange: (OL) or (-OL) is displayed
bar-graph, 60 segments, updates 20/sec
Power: 5 x 1.5V, AA alkaline batteries (IEC LR6, NEDA 15A)
Battery life: 100 hours typical with alkaline
Low battery indication: ▯ symbol and **bAtt** displayed
Auto power off: after 30 minutes
Fuse: 0.5 A/1000V 6.3x32mm fast blow ceramic fuse
Jaw opening capability: conductor diameter 57mm
bus bar 70 x 18mm
Dimensions: 326 x 108 x 53mm
Weight: 720g approx., including batteries
Includes: carrying case, set of TL45 test leads, probe set, Type K thermocouple, 5 x 1.5V AA batteries (installed), instructions

Specification
CMi210
Insulation Clamp Meter

ENVIRONMENTAL

Temperature & Humidity (Operating): 0°C to 50°C <70% R.H.
(Storage): -20°C to 60°C < 80% R.H.
Altitude: up to 2000m
Pollution degree 2, indoor use

SAFETY

Conforms to:
BS EN 61010-1, BS EN 61010-2-032, CAT IV 600V, CAT III 1000V
BS EN 61557-1, BS EN 61557-2, CAT II 600V
Class II, Double insulation

EMC

Conforms to BS EN 61326-1, BS EN 61326-2-2

SPECIFICATION FOR TL45 TEST LEADS

Maximum voltage: 1000V AC/DC
Maximum current: 10A continuous
Connector: 4mm banana plug with fixed shroud

Environmental

Temperature (Operating & Storage): 0°C to 40°C
Altitude: up to 2000m
Pollution degree 2

Safety

Conforms to BS EN 61010-031,
CAT IV 600V, CAT III 1000V, 10A (Probe tip caps fitted)
CAT II 1000V, 10A (Probe tip caps removed)
Class II, Double insulation

Martindale Electric Company Limited
Metrohm House, Penfold Trading Estate, Imperial Way, Watford WD24 4YY, UK
Tel: +44(0)1923 441717 Fax: +44 (0)1923 446900
E-mail: sales@martindale-electric.co.uk
Website: www.martindale-electric.co.uk