IN2101 / IN2102
INSULATION TESTER

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 a 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: Always read before proceeding.

⚠ **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)**

⚠ >500V **Do not use in distribution systems with voltages higher than 500V.**

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 visit www.martindale-electric.co.uk/measurement_categories.php

CE **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 tester 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 tester 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 tester 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.

The insulation tester must only be used on CAT III and 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 or crocodile clips, **always** keep your fingers behind the finger guard on the test lead probe or crocodile clip.

⚠ 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 possible corrosion from leaking batteries, remove the batteries 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 IN2101 and IN2102 digital insulation and continuity testers have been designed to perform testing in accordance with international standards and BS7671.

The IN2101 and IN2102 have the following measurement functions:

- Insulation resistance to 1000 MΩ with test voltage of 500V (IN2101 only)
- Insulation resistance to 5000 MΩ with test voltages of 250, 500 and 1000V (IN2102 only)
- Continuity range to 40 Ω conforming to BS EN 61557-4
- Resistance range to 1999kΩ
- Resistance range to 999.9Ω with audible indication at <30Ω
- Live circuit voltage test with audible warning >30V

Further functions are:

- Display auto hold
- Auto power off
- Buzzer disable
- Display backlight

2.3 Accessories

The IN2101 and IN2102 come with the following accessories:

- Carrying case with strap
- Set of TL47 test leads
- 6 x 1.5V AA batteries
- Spare fuse (located in battery compartment)
- Instructions

2.4 Battery Installation

Refer to Section 4.1 (Battery Replacement).

3. OPERATION

3.1 General

If the insulation tester displays **OL** then the measurement limits of the range have been exceeded.

3.2 Low Battery Indication

If the [+ −] symbol is displayed, the batteries are lower than 6.6V and the batteries need replacing as measurement accuracy can no longer be guaranteed (See section 4.1 Battery Replacement).

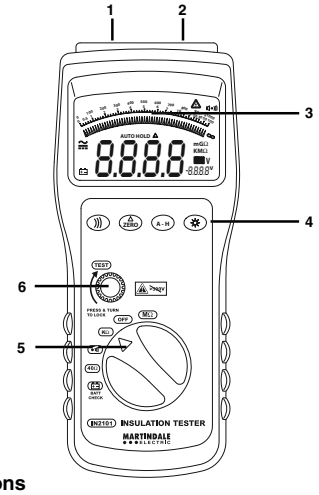
3.3 Defective Fuse Indication

The IN2101/IN2102 is fitted with a fuse to protect against inadvertently pressing the test button when the unit is connected to a live circuit.

A **FUSE**$_{Err}$ display when pressing the test button to make a measurement, indicates the fuse is defective (See section 4.2 Fuse Replacement).

3.4 Description of Insulation Tester Elements

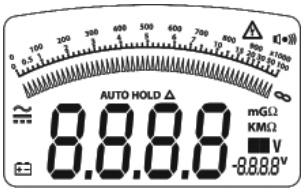
1	VΩ - input terminal
2	COM - Common terminal
3	Display
4	Soft keys
5	Rotary function switch
6	Test button



3.5 Description of Press Buttons

)))	Enables / disables the buzzer
ZERO	Zero's 40Ω and •))) ranges to compensate for lead resistance
A-H	Selects auto hold function
☼	Turns on/off backlight
TEST	Press to perform all tests except the voltage test

3.6 Description of LCD Symbols



⚠	Indicates voltage >30 V at terminals
•))	Indicates buzzer is activated
AUTO HOLD	Display auto hold is activated
△	Indicates zero function is activated
Ω, kΩ, MΩ, V	Units of measurement being displayed
~	Indicates AC voltage measurement
⎓	Indicates DC voltage measurement
+ −	Indicates low battery

3.7 Battery Check

Set the rotary function switch to + − and press the TEST button.

The battery voltage as a % and as a voltage will be displayed.

3.8 Auto Power Off

The unit will automatically power off after 5 minutes.

To disable/enable the auto power off function hold down))) for >2 seconds.

3.9 Display Auto Hold

To activate auto hold press A-H. The LCD will display **AUTO HOLD** with **HOLD** blinking.

HOLD will stop blinking and the buzzer will sound when a stable measurement occurs.

After the TEST button is released the measured value is displayed and **HOLD** will resume blinking.

Press A-H to delete the value held on the display.

3.10 Display Backlight

Press ☼ to turn on the backlight. Press again to turn the backlight off.

3.11 Turning the Buzzer Off

Press))) to turn the buzzer off. The LCD no longer displays •))

Press again to turn the buzzer back on.

3.12 Zero Function

The zero function is used to compensate for test lead resistance when using the 40Ω and •)) low resistance ranges.

Set the rotary function switch to the desired low resistance range.

Short the test leads or crocodile clips.

Press the TEST button to display the resistance of the leads.

Press △ ZERO to remove the lead resistance. The LCD will display the △ symbol.

To remove the lead compensation press △ ZERO again. The LCD no longer displays △.

3.13 Locking the Test Button

The TEST button may be locked into the test position by pressing it down and turning it clockwise. Turn anticlockwise to unlock it.

3.14 Use of the TL47 Test Leads

Before use, always check the continuity of the test leads.

When crocodile clips are to be fitted, or where it may be required to plug the probes into 4mm sockets, the probe tip covers may be removed by gently pulling them forward until they unclip from the probe body to reveal 4mm plugs.

CAT III 1000V
CAT IV 600V

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

3.15 Voltage Measurements

DO NOT press the TEST button when testing for voltage on a circuit and ensure it is unlatched and released before proceeding.

Connect the black test lead to the **COM** terminal and the red test lead to the VΩ terminal.

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

Read the measured voltage from the display.

When a voltage > 30V DC or AC rms is detected the buzzer will sound and the ⚠ symbol will flash on the LCD.

⚠ If a voltage test is being made prior to an insulation resistance, continuity or resistance measurement and voltage is present on the circuit under test, **do not proceed**.

In this event, remove the test leads from the circuit under test. A suitably qualified electrician must proceed with caution to investigate and remove the source of the voltage on the circuit under test before proceeding with any other measurement.

3.16 Insulation Resistance Measurements

For safety and to avoid damage to the insulation tester, perform insulation resistance tests in the following order.

Ensure the TEST button is unlatched and released before proceeding.

Set the rotary switch to the MΩ position (IN2101) or 250V, 500V or 1000V (IN2102) depending on the desired test voltage.

Connect the black test lead to the **COM** terminal and the red test lead to the VΩ terminal.

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

⚠ Perform a voltage measurement (see 3.15). **Do not proceed** if voltage is present.

Press the TEST button. The buzzer will sound (unless disabled) and the ⚠ symbol will be displayed on the LCD to indicate the presence of the test voltage at the terminals.

Allow several seconds for the measurement to stabilise and read the measured insulation resistance from the display.

The test voltage is displayed in the lower right corner of the LCD.

The test voltage decreases when measuring low values of resistance. If it drops to <80V, a flashing indication of **0000** will be displayed.

When the TEST button is released following the test, the circuit under test will be discharged. If locked, unlock it before removing the test leads.

⚠ Do not remove the test leads until the displayed voltage has discharged to a safe level.

3.17 Continuity Measurements
Set the rotary switch to the 40Ω position.

Connect the black test lead to the **COM** terminal and the red test lead to the **V**Ω terminal.

If required, compensate for test lead resistance by performing the zero function (see 3.12).

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

⚠ Perform a voltage measurement (see 3.15). **Do not proceed** if voltage is present.

Press the TEST button and read the measured continuity resistance from the display.

3.18 kΩ Resistance Measurements
Set the rotary switch to the KΩ position.

Connect the black test lead to the **COM** terminal and the red test lead to the **V**Ω terminal.

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

⚠ Perform a voltage measurement (see 3.15). **Do not proceed** if voltage is present.

Press the TEST button and read the measured resistance from the display.

3.19 Resistance Measurements with Buzzer
Set the rotary switch to the •)) position.

Connect the black test lead to the **COM** terminal and the red test lead to the **V**Ω terminal. If required, compensate for test lead resistance by performing the zero function (see 3.12).

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

⚠ Perform a voltage measurement (see 3.15). **Do not proceed** if voltage is present.

Press the TEST button and read the measured continuity resistance from the display.

If the resistance <30Ω the buzzer will sound.

4. MAINTENANCE

4.1 Battery Replacement

⚠ To avoid shock or injury, disconnect the insulation tester from any external circuits and remove the test leads before proceeding.

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

Fit 6 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 multimeter, disconnect it from any external circuits or components and remove the test leads and battery before proceeding.

Replace only with the fuses specified.

The fuse is located in the battery compartment underneath the unit and can be accessed by removing the two screws and lifting off the cover.

Replace the fuse only with the original type F 0.5 A/600V 6.3 x 32mm 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 TL47 test 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 for poor connections.

4.7 Storage Conditions

The instrument should be kept in warm dry conditions, away from direct sources of heat or sunlight, with the batteries removed, 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.

MARTINDALE ELECTRIC

Specification
IN2101 & IN2102
Insulation Tester

ELECTRICAL

All specified accuracies are at 23°C ± 5°C, <80% RH for 1 year.

Temperature coefficient:

Add 0.1 x (specified accuracy) per °C (0°C to 18°C, 28°C to 40°C)

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

Voltage

Range	Resolution	Accuracy
600V	1V	3% + 5

Voltage warning: >30V

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Specification
IN2101 & IN2102
Insulation Tester

Insulation Resistance

IN2101					
Test voltage	**Test current**	**Range**	**Operating range to BS EN 61557-2** (See note 1)	**Resolution**	**Accuracy**
500V	1mA at 0.5MΩ	4MΩ	0.1MΩ to 1000MΩ	0.001MΩ	3% + 5
		40MΩ		0.01MΩ	
		400MΩ		0.1MΩ	
		1000MΩ		1MΩ	

IN2102					
Test voltage	**Test current**	**Range**	**Operating range to BS EN 61557-2** (See note 1)	**Resolution**	**Accuracy**
250V	1mA at 0.25 MΩ	4MΩ	0.1MΩ to 1000MΩ	0.001MΩ	3% + 5
		40MΩ		0.01MΩ	
		400MΩ		0.1MΩ	
		1000MΩ		1MΩ	
500V	1mA at 0.5MΩ	4MΩ	0.1MΩ to 4000MΩ	0.001MΩ	
		40MΩ		0.01MΩ	
		400MΩ		0.1MΩ	
		4000MΩ		1MΩ	
1000V	1mA at 1MΩ	4MΩ	0.1MΩ to 5000MΩ	0.001MΩ	
		40MΩ		0.01MΩ	
		400MΩ		0.1MΩ	
		5000MΩ		1MΩ	

MARTINDALE ELECTRIC

Specification
IN2101 & IN2102
Insulation Tester

Test voltage accuracy: 0% to +20%
Short circuit test current: <1.5mA
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

Continuity Resistance

Range	Open circuit test voltage	Short circuit test current	Operating range to BS EN 61557-4 (See note 1)	Resolution	Accuracy
40Ω	8V dc typical	≥ 200mA	0.2Ω to 40Ω	0.01Ω	3% + 5

Overload protection: 600V DC or AC rms

kΩ Resistance

Range	Open circuit test voltage	Short circuit test current	Resolution	Accuracy
1999kΩ	1.8V dc typical	0.37mA approx	≤999.9Ω - 0.1Ω ≥1000Ω - 1Ω	3% + 5

Overload protection: 600V DC or AC rms

●))) Resistance

Range	Open circuit test voltage	Short circuit test current	Resolution	Accuracy
999.9Ω	2V dc approx.	0.37mA approx.	0.1Ω	3% + 5

Overload protection: 600V DC or AC rms

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Specification
IN2101 & IN2102
Insulation Tester

Note 1: The operating range where the operating uncertainty does not exceed ±30% in accordance with BS EN 61557-2 and BS EN 61557-4.

Operating uncertainty (B) = $\pm$ ($|A| + 1{,}15 \sqrt{[\ E_2^2 + E_3^2\ ]}$)
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

GENERAL

Display: 5000 count liquid crystal display
Sample rate: 2.5 times/sec
Bar-graph: 51 segments
Overrange: (OL) is displayed
Power: 6 x 1.5V, AA alkaline batteries (IEC LR6, NEDA 15A)
Battery life (alkaline): >3000 measurements typical
Low battery indication: [+ −] symbol is displayed
Auto power off: After 5 minutes
Fuse: F 0.5 A/600 V 6.3x32mm fast blow ceramic
Dimensions: 90 x 210 x 54mm
Weight: Approx. 596g, including batteries
Includes: Carrying case, set of TL47 test leads, 6 x 1.5V AA batteries, instructions

ENVIRONMENTAL

Temperature & Humidity
(Operating): 0°C to 40°C <70% R.H.
(Storage): -20°C to 60°C < 80% R.H., batteries removed
Altitude: up to 2000m
Pollution degree: 2
IP rating: IP44, not for use in wet conditions

MARTINDALE ELECTRIC

Specification
IN2101 & IN2102
Insulation Tester

FUNCTIONALITY
Conforms to BS EN 61557-2 and BS EN 61557-4

SAFETY
Conforms to BS EN 61010-1, CAT III 600V
Class II, double insulation

EMC
Conforms to BS EN 61326-2-2

SPECIFICATION FOR TL47 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 covers fitted)
CAT II 1000V, 10A (Probe tip covers removed)
Class II, double insulation

Check out what else you can get from Martindale:

- 18th Edition Testers
- Accessories
- Calibration Equipment
- Continuity Testers
- Electricians' Kits
- Environmental Products
- Full Calibration & Repair Service
- Fuse Finders
- Digital Clamp Meters
- Digital Multimeters
- Labels
- Microwave Leakage Detectors
- Motor Maintenance Equipment
- Multifunction Testers
- Non-trip Loop Testers
- Pat Testers & Accessories
- Phase Rotation Testers
- Proving Units
- Safe Isolation kits
- Socket Testers
- Thermometers & Probes
- Test Leads
- Voltage Indicators
- Specialist Metrohm Testers (4 & 5kV)
- Specialist Drummond Testers

MARTINDALE ELECTRIC

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