MARTINDALE ELECTRIC

ELECTRICIAN'S TESTER VR2230

INSTALLATION TESTER VR2240

MULTIFUNCTION TEST INSTRUMENTS

USER INSTRUCTION MANUAL

Index:

1. SAFETY PRECAUTIONS AND PROCEDURES

This tester conforms with safety standards BSEN61557 and BSEN 61010-1 relating to electronic measuring instruments.

WARNING

For your own safety as well as that of the apparatus you are recommended to follow the procedures described in this instruction manual and carefully read all the notes preceded by the symbol ⚠.

Adhere strictly to the following instructions before and during measurements:

- ☞ Do not take measurements in wet environments.
- ☞ Do not perform measurements in environments with explosive gas, fuels or dust.
- ☞ Do not touch the object under test whilst taking measurements.
- ☞ Avoid any contact with exposed metal parts, ends of test leads not in use, circuits, etc.
- ☞ Do not perform any measurements if the instrument is damaged eg: cracked case, leakage of batteries, absence of display reading etc.
- ☞ Pay careful attention when using test voltages exceeding 25V in places such as building sites, swimming pools, and damp environments etc. and 50V elsewhere due to the risk of electric shock.

The following symbols are used in this manual:


Caution: refer to the instructions in this manual; improper use may damage the tester or its components.


AC Voltage or Current.


Unidirectional pulsating Voltage or Current.


Rotary switch of the instrument.

1.1. PRELIMINARY INSTRUCTIONS

- ☞ This instrument has been designed for use in environments with pollution degree 2.
- ☞ It can be used for tests on electrical installations with over-voltage category III up to 265V (to Earth).
- ☞ You are recommended to comply with the standard safety practices aimed at:
  - ✓ Protecting you against dangerous currents.
  - ✓ Protecting the instrument against improper use.
- ☞ Only the leads supplied with the instrument guarantee compliance with safety standards. They must be in good condition and must be replaced if necessary, with identical models.
- ☞ Do not perform measurements on circuits exceeding the specified voltage limits.
- ☞ Do not perform any measurement under environmental conditions beyond the limits specified in this manual.
- ☞ Check that batteries have been inserted correctly.
- ☞ Before connecting test leads to the circuit under test, check that rotary switch position is correct.
- ☞ Check that LCD and rotary switch indicate the same function.

1.2. DURING USE

Read carefully the following recommendations and instructions:

WARNING

Non-compliance with the Warnings and/or Instructions may damage the apparatus and/or its components or seriously injure the operator.

- ☞ Before selecting any function disconnect the test leads from the circuit under test.
- ☞ When the instrument is connected to a circuit, do not touch any test lead which is not being used.
- ☞ Do not carry out resistance measurements in the presence of external voltages: even though the instrument is protected, too high a voltage may cause damage.

WARNING

If the symbol  is displayed during use, stop testing and replace batteries **The instrument remembers stored data even when batteries are not installed.**

1.3. AFTER USE

- ☞ When the measurements are completed disconnect the test leads from the circuit under test and switch OFF the instrument.
- ☞ Remove batteries when the instrument is to be unused for long periods.

2. GENERAL DESCRIPTION

This all-in-one tester incorporates continuity, insulation resistance, RCD, earth loop impedance, phase loop impedances, earth resistance and phase rotation tests.

This unit is smaller and more compact than other machines on the market, which makes them very comfortable to use in confined and hazardous areas.

The unit can be held comfortably in one hand.

*****The Veritest VR2240 can store test results in its internal memory and then download them to a P.C. via optional software and accessories.

The Veritest is supplied complete with test leads, a protective carry case and user guide as standard.

Your new instrument will give you accurate and reliable measurements provided that it is used properly.

These instruments have been designed to give the user the highest level of safety possible thanks to their innovative design assuring double insulation and over voltage category III.

- **LOWΩ**: Continuity test of earth, protective and equalizing potential conductors with test current higher than 200mA and open circuit voltage ranging from 4V to 24V.

- **R_{ISO}**: Measurement of insulation resistance with DC test voltage at 50V*****, 100V*****, 250V, 500V or 1000V.

- **RCD∿**: Measurement on general and/or selective RCDs AC type (∿) of the following parameters:
  - ✓ Tripping time.
  - ✓ Tripping current.
  - ✓ Contact voltage (U_t).
  - ✓ Overall earth resistance (R_a).

  In this mode the instrument can measure the overall earth resistance without causing RCD's to trip

*** VR2240 only**

- **RCD**∿: Measurement on general and/or selective RCDs A type (∿) of the following parameters:
  - ✓ Tripping time.
  - ✓ Tripping current.
  - ✓ Contact voltage (U_t).
  - ✓ Overall earth resistance (R_a).

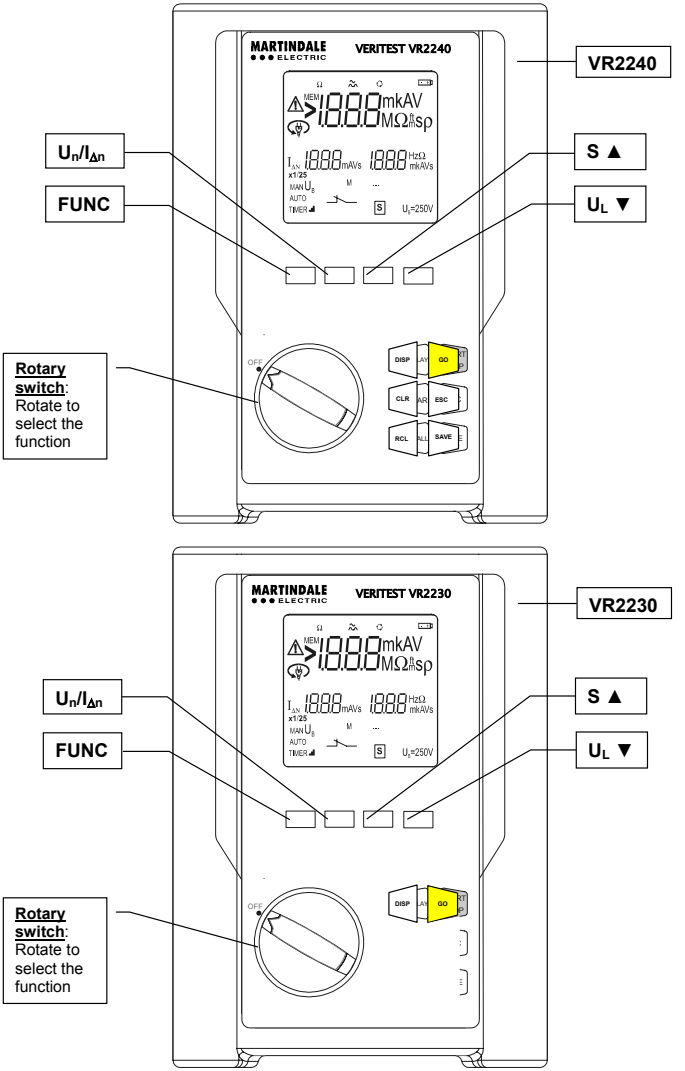
  In this mode the instrument can measure the overall earth resistance without causing RCD's to trip.

- **LOOP Z_S/I_K**: Measurement of line and fault loop impedance with calculation of prospective short circuit current.

- **R_{a15mA}**⏚: Measurement of fault loop impedance between earth and phase conductors with current of 15mA and calculation of prospective short circuit current.

- : Indication of phase rotation sequence.

2.1. INSTRUMENT DESCRIPTION



Description of controls

FUNC ☞ Multifunction key to select measuring modes.

$U_n/I_{\Delta n}$ ☞ Key for selection of differential currents during tests of RCDs or rated voltages during tests of insulation resistance (depends on the selected measurement) with the rotary switch.

S ▲ ☞ Key for selection of RCD type (General or Selective) or to increase the test duration interval or to scroll through the results of the stored tests.

U_L ▼ ☞ Key for selection of contact voltage limit or to decrease the test duration interval or to scroll through the results of the stored tests.

GO ☞ Key to start or to stop tests.

* **ESC** ☞ *Key to quit the function of selected mode

* **SAVE** ☞ *Key to save tests

* **RCL** ☞ *Key to recall stored tests

DISP ☞ Key to scroll between single and multiple test results (Eg: RCD auto) which have been stored.

* **CLR** ☞ *Key to delete the stored tests

*** VR2240 only**

3. PREPARATION FOR USE

3.1. INITIAL QUALITY CHECKS

This instrument has been checked mechanically and electrically prior to shipment. Every care has been taken to ensure that the instrument reaches you in perfect condition.

In the unlikely event that you have to send the instrument back to us, please follow the instructions detailed in section 11.

3.2. POWER SUPPLY

This instrument is supplied with six batteries model 1.5V – LR6 – AA – AM3 – MN 1500 included as standard

3.3. BATTERY REPLACEMENT

When the symbol is displayed the batteries should be replaced.

WARNING

Before replacing batteries make sure that all test leads have been disconnected from input terminals. **The VR2240 is capable of storing data when batteries are removed**

1. Switch OFF the instrument.
2. Remove all of the test leads from the input terminals.
3. Unscrew the fixing screws from the battery compartment cover and remove it.
4. Remove all batteries replacing them with 6x of the same type (1.5V – LR6 – AA – AM3 – MN 1500) observing correct polarity.
5. Fix the screws on the battery compartment cover.

3.4. CALIBRATION

This Instrument is shipped to you manufactured within the specification shown in section 10 of this manual. Performance within the specification is guaranteed for one year. Annual re-calibration is recommended. A Calibration certificate for this instrument is available as a chargeable extra and is not supplied as standard. Please contact us on 01923 441717 for more details.

3.5. STORAGE

In order to ensure the accuracy of measurements, after a period of storage in extreme environmental conditions, wait for the instrument to acclimatize back to normal measuring conditions (see environmental specifications listed in paragraph 10.2.1).

4. DESCRIPTION OF THE ROTARY SWITCH FUNCTIONS

4.1. LOWΩ: CONTINUITY TEST OF EARTH, PROTECTIVE AND EQUALIZING POTENTIAL CONDUCTORS

The measurement is performed with a test current higher than 200mA and open circuit voltage ranging from 4 to 24V DC according to BSEN 61557-4 and VDE 0413 part 4.

WARNING

Before carrying out the continuity test make sure that there is no voltage at the ends of the conductors under test.

Turn the **switch** to the **LOWΩ** position.

FUNC

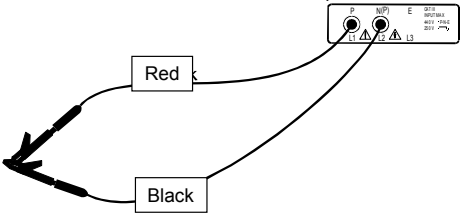
FUNC key is used to select one of the following measuring modes (which can be shown in rotation when pressing the key):

- **AUTO** Mode (the instrument carries out two measurements one with positive polarity R+ and one with negative polarity R-, and displays their average value R_{avg}). This mode is recommended for the continuity test.
- **R +** Mode (measurement with positive polarity, red cable will be positive polarity and black cable will be negative polarity).
- **R -** Mode (measurement with negative polarity, black cable will be positive polarity and red cable will be negative polarity).
- **R + TIMER** Mode (measurement with positive polarity with adjustable test duration). The operator can set a measuring time long enough to permit them to move the conductors while the instrument is carrying out the test so detecting bad connections.
- **R - TIMER** Mode (measurement with negative polarity with adjustable test duration). In this case the operator can set a measuring time long enough to permit them to move the protective conductors while the instrument is carrying out the test so detecting bad connections.
- **CAL** Mode (compensation for the resistance of the test leads).

Note: If the resistance is lower than 16Ω (including the resistance of the leads) the continuity test is performed with a current higher than 200mA. If the resistance is higher than 16Ω the continuity test is performed with a current of 40mA.

4.1.1. "CAL" MODE

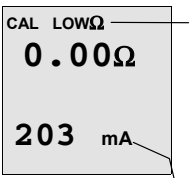
1. Select **CAL** mode with the **FUNC** key.
2. Connect the Red and Black cables to the instrument input terminals **P** and **N** respectively:



Linking of instrument terminals during calibration procedure.

3. Connect the crocodile clips to the cable terminals.
4. Short-circuit the measuring cable ends making sure that the conductive parts of the crocodile clips make good contact with each other (see picture).
5. **GO** Press the **GO** key. The instrument carries out the calibration.

☞ At the end of the test the result is stored and used as an **OFFSET (it is subtracted from any continuity test carried out)** for all subsequent measurements until a new calibration is carried out.
This screen is displayed **for only 2 seconds** then the instrument **beeps twice** (indicating that the calibration is completed) and displays the default screen for the LOWΩ test under AUTO mode.



CAL: indicates that the instrument has a stored value for the resistance of the test leads; this symbol **remains on the display for any further measurements** even when the unit is switched off and on again.

Current supplied by the instrument during the calibration procedure.

Note: The instrument compensates for leads with resistance below 5Ω.

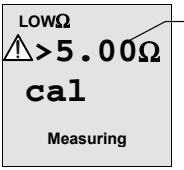
LEADS USED FOR THE TEST

Before any measurement always make sure that the unit has been calibrated with the test leads in use. During a continuity test, if the resistance value measured is less the calibration offset value stored, the symbol ⚠ is displayed as well as blinking "CAL" (see 4th screen in paragraph 4.1.3). This indicates that the calibration stored in the instrument memory may be for leads other than those in use, so a new calibration is required.

⚠ Never disconnect the test leads while **"Measuring"** is displayed.

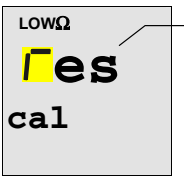
4.1.1.1. Procedure to remove stored calibration and cal symbol

To remove a stored calibration (and the symbol CAL) you need to perform a **calibration procedure with a resistance higher than 5Ω** (for Example with disconnected test leads). When this procedure is carried out **the screen opposite** is displayed first**,** followed by the screen below:



>5Ω: Indicates that the instrument measured a resistance higher than 5Ω so it will proceed with reset procedure.

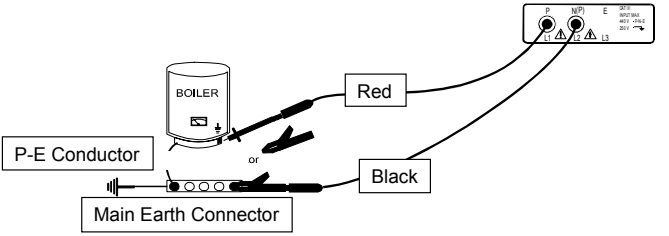
The screen opposite is displayed for 2 seconds, after which the instrument **emits a long sound signal** and then displays the default screen for the LOWΩ test under AUTO mode without displaying the symbol CAL.



rES: Indicates that the instrument removed (RESET) the stored calibration & cal symbol

4.1.2. Procedure to measure the continuity of conductors "AUTO", "R+", "R-", "R+TIMER" and "R-TIMER"

1. Select the desired mode with the **FUNC** key.
2. Connect the Red and Black cables to the instrument input terminals **P** and **N** respectively.



Connections during LOWΩ test.

3. Connect the two crocodile clips to the test lead terminals.
4. Short-circuit the measuring lead ends making sure that the conducting parts of the crocodile clips make good contact with each other. Press the GO key. **If the instrument displays a resistance value other than 0.00 repeat the instrument calibration** (see paragraph 4.1.1).
6. Connect the crocodile clips to the conductors on which the continuity test is to be carried out (see previous picture).
7. **If "R+TIMER" or "R-TIMER" mode is selected** use the following keys to select the duration of the test:

S ▲ Press this key to increase the duration of the test (**Tmax=15 seconds**).

U_L ▲ Press this key to decrease the duration of the test (**Tmin=3 seconds**).

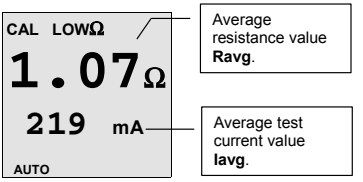
8. **GO** Press the **GO** key. The instrument performs the measurement. In R+/R- Timer mode press GO key again if the test is to be stopped.

WARNING

Never disconnect the test leads while **"Measuring"** is displayed.

4.1.2.1. "AUTO" Mode

☞ At the end of the test, if the **average resistance value Ravg** is **lower than 5Ω** the instrument emits a **double sound signal** indicating the **positive outcome of the test** and displays a screen similar to this.

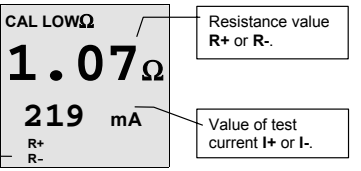


* **SAVE**

*The test can be stored by pressing the **SAVE** key **twice**

4.1.2.2. "R+" or "R-" Mode

☞ At the end of the **R+ or R-** test if a **resistance value lower than 5Ω** was detected, the instrument emits **a double sound signal** indicating **a successful outcome** of the test and displays a screen similar to this.



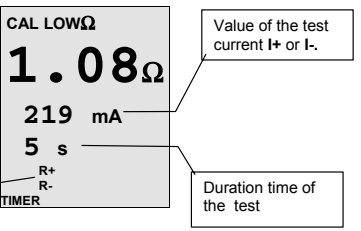
The symbols **R+** or **R-** are displayed.

* **SAVE**

*The test can be stored pressing the **SAVE** key **twice**

4.1.2.3. "R+TIMER" or "R-TIMER" Mode

☞ If during the **R+Timer or R-Timer** test a **resistance value lower than 5Ω** is detected, the instrument (after the set time has elapsed) emits a **double sound signal indicating the positive outcome** of the test and displays a screen similar to this.



The symbols **R+** or **R-** are displayed.

* **SAVE**

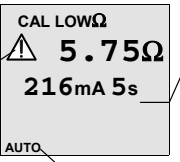
*The test can be stored pressing the **SAVE** key **twice**

*** VR2240 only**

4.1.3. Error screens which may occur during "AUTO", "R+", "R-", "R+TIMER", "R-TIMER" tests

☞ If a value of **Ravg or R+ or R- higher than or equal to 5Ω but lower than 99.9Ω (9.99Ω in R+TIMER and R-TIMER)** was detected, at the end of the test the instrument emits a long sound signal and displays a screen similar to this.

WARNING: value of R_{avg} **higher than 5Ω**

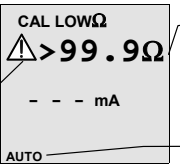


Only if mode R+TIMER or R-TIMER was selected.

AUTO mode.

☞ If in modes AUTO, R+, R- and a **Ravg or R+ or R- higher than 99.9Ω** was detected, at the end of the test the instrument emits **a** long sound signal and displays a screen similar to this.

WARNING: value of R_{avg} or R+ or R- **is too high**.

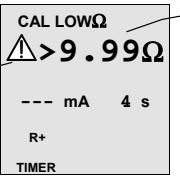


99.9Ω is the maximum value which can be measured in the **LOWΩ AUTO or R+ or R-mode**.

AUTO mode.

☞ If R+TIMER or R-TIMER Mode was selected and a **R+ or R- higher than 9.99Ω** was detected, the instrument emits **an intermittent sound signal during the test, a long sound signal at the end of the test** and displays a screen similar to this.

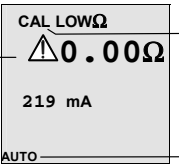
WARNING: value of R+ or R- **is too high**.



9.99Ω is the maximum value which can be measured in **LOWΩ, R+TIMER or R-TIMER mode.**

☞ If the **$R_{MEASURED}$** (measured resistance) **-$R_{CALIBRATION}$** (minus test lead resistance) is less than **0Ω** the instrument displays a screen similar to this.

WARNING: $R_{MEASURED}$-$R_{CALIBRATION}$**< 0**



Blinking **CAL**.

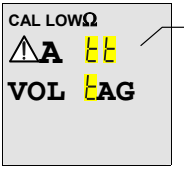
AUTO mode.

* **SAVE**

*****The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

☞ If a voltage higher than 10V is detected at the test leads, the instrument does not carry out the test and displays the screen alongside for 5 seconds. Then the instrument displays the screen for the previously selected test mode LOWΩ under AUTO mode.



WARNING: the test was not performed because of excessive voltage at the terminal ends.

* SAVE **THIS RESULT CANNOT BE SAVED**.

*** VR2240 only**

4.2. MΩ: INSULATION RESISTANCE MEASUREMENT WITH TEST VOLTAGE OF 50V*, 100V*, 250V, 500V OR 1000V ⎓

The measurement is carried out in accordance with BSEN 61557-2 and VDE 0413 part 1.

Before carrying out the insulation test make sure that the circuit under test is not energized and all the loads are disconnected.

Turn the **switch** to **MΩ** position.

FUNC

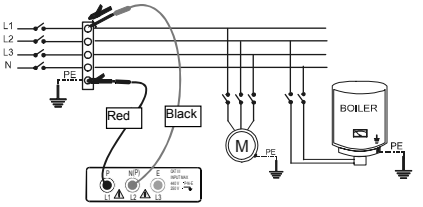
The **FUNC key** is used to select one of the following measuring modes (which can be shown in rotation when pressing the key):

- ☞ **MAN** Mode (minimum test time of 10 seconds, or for as long as the GO key is held). Recommended test.
- ☞ **AUTO** Mode (the test ends when the measured value becomes stable). This test can be used if the installation has capacitance which must be charged to evaluate the real insulation resistance.
- ☞ **TIMER** Mode (test duration depending on the selected interval (from 10 to 999 seconds). This test can be used if a minimum measuring time is required.

*** VR2240 only**

4.2.1. Procedure to measure insulation resistance

1. Select the desired mode using the **FUNC** key.
2. Connect the Red and Black test leads to the instrument input terminals **P** and **N** respectively,



Example insulation test between phase (#1) and earth in a 3 phase electrical installation using test leads.

3. Connect the instrument terminals to the circuit which is to be subjected to the insulation test **after disconnecting the circuit under test from the supply and all relevant loads** (see previous picture).

4. **$U_n/I_{\Delta n}$** Using the **$U_n/I_{\Delta n}$** Key, select the test voltage suitable for the type of test being carried out (see table).
5. The values available are:
   - 50V***** (test on telecommunication systems)
   - 100V*****
   - 250V
   - 500V
   - 1000V

If **"Measuring"** is displayed the instrument is carrying out the measurement. During this stage do not disconnect the test leads as the circuit under test may remain charged at a dangerous voltage due to the capacitance of the installation. The instrument discharges any stored energy after each test.

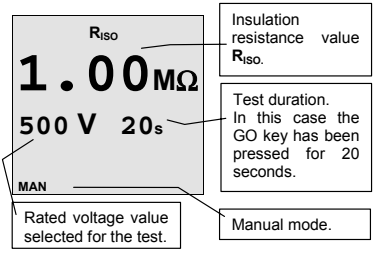
*** VR2240 only**

4.2.1.1. "MAN" Mode

6. **GO** Press the **GO** key.

The instrument performs the test lasting for:
- ✓ Minimum 10 seconds if the key is pressed and released within 5 seconds.
- ✓ Or until the key is released.

☞ At the end of the test, if the **resistance value R_{ISO} detected is lower than R_{MAX}** (see table below), the instrument beeps twice **indicating the positive outcome of the test and** displays a screen similar to this.



* **SAVE** *The test can be stored by pressing the **SAVE** key **twice**

Test Voltage	R_{MAX} = Maximum resistance value
50VDC*	99.9MΩ
100VDC*	199.9MΩ
250VDC	499MΩ
500VDC	999MΩ
1000VDC	1999MΩ

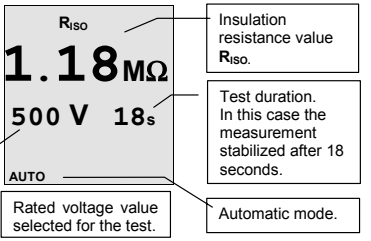
*** VR2240 only**

4.2.1.2. "AUTO" Auto

6. GO — Press the **GO** key. The instrument performs the measurement ending when the measured value stabilizes.

Note: Press the **GO** key again to stop the test

☞ At the end of the test, if the **resistance value R_{ISO} detected is lower than R_{MAX}** (see following table) the instrument beeps twice **indicating the positive outcome of the test and** displays a screen similar to this.



*SAVE — ***The test can be stored pressing the **SAVE** key **twice**

Test Voltage	R_{MAX} = Maximum resistance value
50VDC*	99.9MΩ
100VDC*	199.9MΩ
250VDC	499MΩ
500VDC	999MΩ
1000VDC	1999MΩ

*** VR2240 only**

4.2.1.3. "TIMER" Mode

6. **When using "TIMER" mode,** use the following keys to set the duration time of the test:

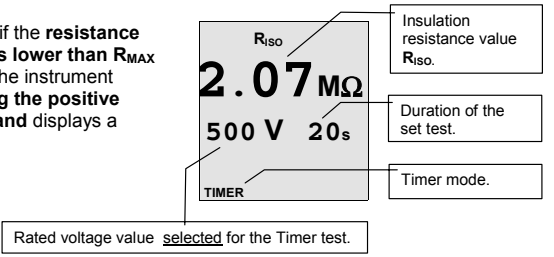
S ▲	press this key to increase the duration of the test (**Tmax=999 seconds**).
U_L ▼	press this key to decrease the duration of the test (**Tmin=10 seconds**).

7. **GO** Press the **GO** key.

The instrument performs the test which will end when the set time has elapsed.
999 seconds → Maximum value of the test duration.
10 seconds → Minimum value of the test duration.

Note: Pressing the **GO** key again immediately stops the test.

☞ At the end of the test, if the **resistance value R_{ISO} detected is lower than R_{MAX}** (see following table), the instrument beeps twice **indicating the positive outcome of the test and** displays a screen similar to this.



* **SAVE** **SAVING**: *The test can be stored pressing the **SAVE** key **twice**

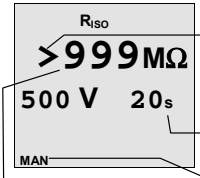
Note: The maximum resistance value **R_{MAX}** which can be measured in mode MΩ depends on the rated voltage selected for the test:

Test Voltage	R_{MAX} = Maximum resistance value
50VDC*	99.9MΩ
100VDC*	199.9MΩ
250VDC	499MΩ
500VDC	999MΩ
1000VDC	1999MΩ

*** VR2240 only**

4.2.2. Other screens which may appear during "MAN", "AUTO" & "TIMER" tests

☞ If a value of **R_{ISO} higher than R_{MAX}** was detected (depending on the selected voltage, the instrument emits a **double beep** at the end of the test **indicating the positive outcome to the test** and displays a screen similar to this.



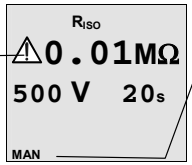
The symbol **">"** means that the resistance value R_{ISO} is higher than R_{MAX}

Test duration

Selected mode MANUAL

Maximum resistance value which can be measured (999MΩ is displayed if a rated voltage of 500V was selected).

☞ If a test is performed at a **voltage lower than the set rated voltage**, at the end of the test the instrument emits a **long single beep** and displays a screen similar to this.

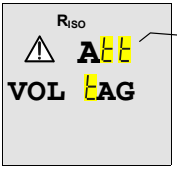


Selected mode MANUAL

WARNING: the insulation resistance test **R_{ISO} was performed at a voltage value lower than the set rated voltage**. This occurs under low insulation* conditions or in the presence of capacitance on the installation. *See technical specification.

* SAVE **SAVING**: *The test can be stored pressing the **SAVE** key **twice**

☞ If the terminal voltage is higher than 30V, the instrument does not perform the test, and displays the screen alongside for 5 seconds. Then it shows the default screen for the R_{ISO} test under AUTO mode.



WARNING: the test was not carried out. Check that the circuit is not energised.

* SAVE **THIS RESULT CANNOT BE SAVED.**

*** VR2240 only**

4.3. RCD ∿ RCD~ : TESTS ON TYPE A OR AC RCD'S

The test is performed according to BSEN 61557-6, BSEN61008, BSEN61009, BSEN60947-2 B 4.2.4 and VDE 0413 part 6.

WARNING

The automatic check of the RCD causes tripping of the RCD itself. Therefore **check that there is no power or load connected downstream which could be affected by the installation switching off.**
It is advisable to disconnect all the loads connected downstream of the RCD as they could add leakage currents so making the test results void.

Turn the **switch** to **RCD ∿ (RCDS type A sensitive to pulsating leakage current DC sensitive) or RCD ~ (RCDS type AC sensitive to sine leakage current)** position:

FUNC

The **FUNC** key is used to select one of the following measuring modes (which can be shown in rotation when pressing the key)

- **MAN x ½** the instrument performs the test with a leakage current at **1/2** the value of the rated current indicated, with a leakage current in phase with the voltage or phase shifted by 180° with respect to the voltage.
- **MAN x 1** the instrument performs the test with a leakage current at **1x** the value of the rated current indicated, with a leakage current in phase with the voltage or phase shifted by 180° with respect to the voltage.
- **MAN x 2** the instrument performs the test with a leakage current at **2x** the value of the rated current indicated, with a leakage current in phase with the voltage or phase shifted by 180° with respect to the voltage.
- **MAN x 5** the instrument performs the test with a leakage current at **5x** the value of the rated current indicated, with a leakage current in phase with the voltage or phase shifted by 180° with respect to the voltage.
- **AUTO** the instrument performs the test automatically with a leakage current at **1/2x**, **1x** & **5x** the value of the rated current indicated with the leakage current in phase with the voltage or phase shifted by 180° with respect to the voltage. Recommended test.
- ***RAMP MODE ⟋ (VR2240 ONLY)** the instrument performs the test with a steadily increasing leakage current, with the leakage current in phase with the voltage or phase shifted by 180° with respect to the voltage. Use this test to measure the tripping current.
- Mode $\mathbf{U_t}$ the instrument performs the test with a leakage current equal to **1/2** the value of the rated current indicated and calculates the contact voltage as well as the R_a earth resistance with a leakage current in phase with the voltage or phase shifted by 180° with respect to the voltage.
- Readings below 1Ω are displayed as 1Ω

Note: According to standard practice it is recommended to perform RCD tests both with phase at 0° and with phase at 180°. Therefore the test must be repeated for both phase values of test current. If the RCD under test is of a type sensitive to both AC and unidirectional pulsing leakage currents, it is advisable to perform the test both with sine wave and unidirectional pulse current with phase 0° and 180°.

$U_n/I_{\Delta n}$

The key **$U_n/I_{\Delta n}$** is used to select one of the following rated tripping currents of the RCD (which can be shown in rotation when pressing the key):

- 10mA.
- 30mA.
- 100mA.
- 300mA.
- 500mA.

S ▲

The key **S▲** is used to activate the test for general or selective RCDs:

- if the test is performed for **selective (time delayed) RCDs** the symbol [S] must be displayed.
- if the test is performed for **general RCDs** the symbol [S] must NOT be displayed.

The option for testing selective RCDs requires an interval between tests of 60 seconds (30 seconds in case of tests at ½ $I_{\Delta n}$). A timer is displayed indicating the waiting time before the instrument performs the test automatically.

Example: Testing a selective RCD with a rated current of $I_{\Delta n}$=30mA

a) the instrument performs the test at ½ $I_{\Delta n}$ 0°. If the RCD passed the test, “OK” is displayed and the RCD does not trip.
b) The instrument performs the test at ½ $I_{\Delta n}$ 180°. If the RCD passed the test, “OK” is displayed and the RCD does not trip. At this stage 30 seconds must elapse before performing the next test.
c) The instrument performs the test at $I_{\Delta n}$ 0°. If the RCD passed the test, “OK” is displayed and the RCD trips and the blinking symbol “rcd” is displayed. The operator should switch on the RCD. After the RCD trips at least 60 seconds must elapse before performing the next test.
d) The instrument performs the test at $I_{\Delta n}$ 180°. Follow the same procedure as described under c).
e) The instrument performs the test at 5x$I_{\Delta n}$ 0°. Follow the same procedure as described under c).
f) The instrument performs the test at 5x$I_{\Delta n}$ 180°. Follow the same procedure as described under c). The test is completed.

In AUTO mode, the operator should switch the RCD on whenever the instrument displays the blinking symbol **“rcd”** signaling the RCD has tripped.

Note: On selective RCDs it is possible to carry out the following tests ”Man ½ $I_{\Delta n}$”, ”Man 1 $I_{\Delta n}$”, ”Man 2 $I_{\Delta n}$”, ”Man 5 $I_{\Delta n}$”, “AUTO”.

U_{L}▼

The key **U_L ▼** is used to select one of the following **limit values for the contact voltage** (which can be shown in rotation when pressing the key):

- ☞ 50V (default)
- ☞ 25V.

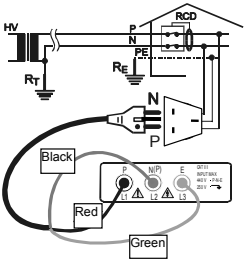
WARNING

Never disconnect the test leads while **“Measuring”** is displayed.

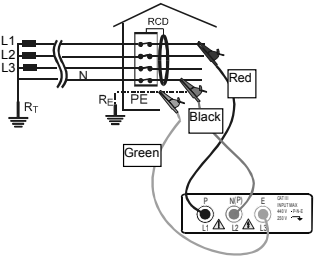
Note: ”Man 5x $I_{\Delta n}$” and “AUTO” test modes are NOT available for RCD type A ⎍ 500mA.

4.3.1. Procedure for RCD testing

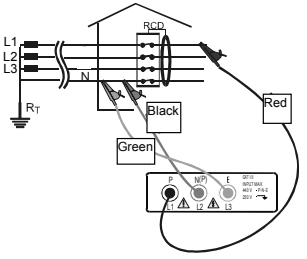
1. Select the desired mode (MAN, x1, x2, x5, AUTO, *RAMP) with the **FUNC** key.
2. Connect the 3 red, black and green connectors of the three-terminal mains cable, or the single test leads, to the corresponding input terminals of the instrument **P**, **N**, **E** (see possible connections in the pictures below). If using un-terminated cables connect the crocodile clips to the free ends of the cables.



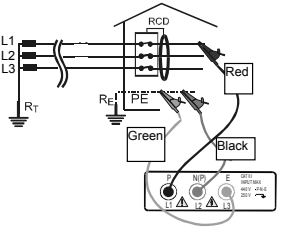
Connection for 230V single-phase RCD check



Connection for 400V + N + PE three-phase RCD check



Connection for 400V + N (no PE) three-phase RCD check



Connection for 400V + PE (no N) three-phase RCD check

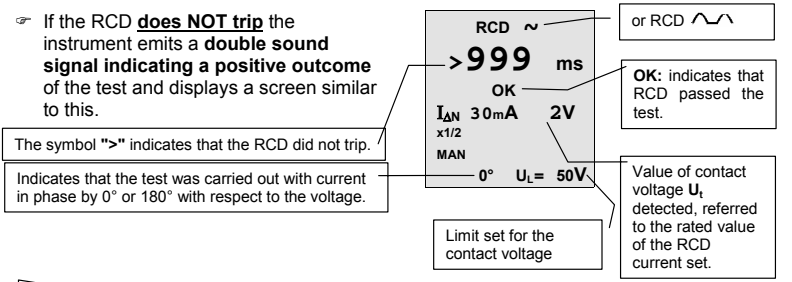
***VR2240 ONLY**

4.3.1.1. "MAN x½" Mode

4. GO

- ☞ Press the **GO** key **once.** The instrument carries out the test injecting a current in phase with positive half wave of the voltage indicated on display by 0°.
- ☞ Press the **GO** key **twice.** The instrument carries out the test injecting a current in phase with negative half wave of the voltage indicated on display by 180°.

☞ If the RCD **does NOT trip** the instrument emits a **double sound signal indicating a positive outcome** of the test and displays a screen similar to this.



* SAVE

*The test can be stored pressing the **SAVE** key **twice**

*** VR2240 only**

4.3.1.2. "MAN x1, x2 & x5" Modes

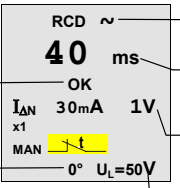
4. GO

☞ Press the **GO** key **once.** The instrument carries out the test injecting a current in phase with positive half wave of the voltage indicated on display by 0°.

☞ Press the **GO** key **twice.** The instrument carries out the test injecting a current in phase with negative half wave of the voltage indicated on display by 180°.

Note: "Man 5x $I_{\Delta n}$" and "AUTO" test modes are not available for 500mA RCD type A ∿.

☞ When the RCD trips, and if the tripping time is within certain limits, the instrument emits a **double sound signal indicating the positive outcome** of the test and displays a screen similar to this.



or RCD ∿

RCD tripping time

Value of contact voltage U_t detected referred to the rated value of the RCD current set.

Limit set for the contact voltage.

OK: The OK symbol relates only to certain trips. It is essential to ensure that the trip is fast enough for the trip rating and application being tested. Please refer to the latest edition of the IEE regs for individual tripping times.

Indicates that the test was carried out with current in phase by 0° or 180° with respect to the voltage

* SAVE **SAVING**: ***The test can be stored pressing the **SAVE** key **twice**

*** VR2240 only**

4.3.1.3. "AUTO" Mode

4. GO

Press the **GO** key: The instrument carries out the following six tests with different values of rated current:

- ☞ 1/2x $I_{\Delta n}$ at 0° (the RCD should not trip).
- ☞ 1/2x $I_{\Delta n}$ at 180° (the RCD should not trip).
- ☞ $I_{\Delta n}$ at 0° (the RCD trips, blinking **rcd,** switch it on again).
- ☞ $I_{\Delta n}$ at 180° (the RCD trips, blinking **rcd,** switch it on again).
- ☞ 5x $I_{\Delta n}$ at 0° (the RCD trips, blinking **rcd,** switch it on again).
- ☞ 5x $I_{\Delta n}$ at 180° (the RCD trips, end of the test).

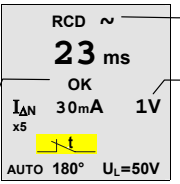
In AUTO mode for each positive result of a single test, the following are displayed:

OK test passed.
Blinking rcd. Switch the RCD on again (if the RCD is not switched on again the instrument does not proceed with the test).

The test ends if all values of test tripping times fall within limits, or at the first value out of limits.

Note: "Man 5x $I_{\Delta n}$" and "AUTO" test modes aren't available for 500mA RCD type A ∿.

☞ At the end of the test if **all six results are positive**, the instrument displays the screen alongside with the last measurement performed.



or RCD ∿

Value of contact voltage U_t detected.

OK: indicates that the RCD passed the test.

5. DISP

Press the **DISP** key to scroll between the results for the six tests performed which can be shown in rotation in the following order: ½$I_{\Delta n}$ at 0°, ½$I_{\Delta n}$ at 180°, $I_{\Delta n}$ at 0°, $I_{\Delta n}$ at 180°, 5$I_{\Delta n}$ at 0°, 5$I_{\Delta n}$ at 180°.

* SAVE

SAVING: *The test can be stored pressing the **SAVE** key **twice**

*** VR2240 only**

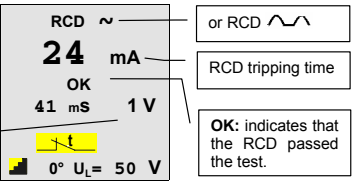
4.3.1.4. * "RAMP ⟋" Mode (VR2240 ONLY)

4. GO

- ☞ Press the **GO** key **once.** The instrument carries out the test injecting a current in phase with positive half wave of the voltage indicated on display by 0°.
- ☞ Press the **GO** key **once.** The instrument carries out the test injecting a current in phase with negative half wave of the voltage indicated on display by 180°.

The instrument generates a leakage current growing step by step in a given time interval.

- ☞ At the end of the test if the RCD tripping current is ≤ $I_{\Delta n}$ (Type AC) or 1.4 $I_{\Delta n}$ (Type A with $I_{\Delta n}$ > 10mA) or 2 $I_{\Delta n}$ (Type A with $I_{\Delta n}$ ≤ 10mA), the instrument emits a double sound signal indicating the positive outcome of the test and displays a screen similar to this.



Value of contact voltage U_t detected referred to the rated value of the RCD current set.

* SAVE **SAVING**: *The test can be stored pressing the **SAVE** key **twice**

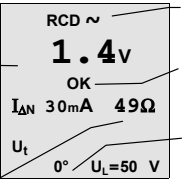
If the parameters set on the instrument are consistent with the RCD under test, the ramp test "⟋" **WILL CAUSE RCD TRIPPING WITH A CURRENT LOWER THAN OR EQUAL TO THE SELECTED RATED DIFFERENTIAL CURRENT**. Do not use this test to compare the trip time with the trip current, as the RCD has to be tested for tripping time with a current equal to and over that of the rated leakage current of the RCD.

*** VR2240 only**

4.3.1.5. Mode "U_t"

4. **GO** Press the **GO** key **once**: the instrument carries out the test.

☞ If the RCD **<u>does NOT trip</u>** the instrument emits a **double sound signal indicating the positive outcome** of the test and displays a screen similar to this.



or RCD ∿

OK: indicates that the RCD passed the test.

Value of contact voltage U_t detected refers to the rated value of the RCD current set.

this indicates that the test was carried out with current in phase (0°) or phase shifted (180°) with respect to the voltage.

Value of earth resistance R_a. is displayed. If "**o.r.**" is displayed, this indicates that the instrument detected a resistance higher than 1999Ω.

* **SAVE** **<u>SAVING</u>**: *****The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

4.3.2. Tripping times for general and selective RCDs

If the parameters set on the instrument are in keeping with the type of RCD under test (and if this works correctly) the test with leakage current $I_{\Delta N}$ x1, $I_{\Delta N}$ x2, $I_{\Delta N}$ x5 **SHOULD** cause RCD tripping within the times set according to the following table:

RCD type	$I_{\Delta N}$ x 1	$I_{\Delta N}$ x 2	$I_{\Delta N}$ x 5	Description
General	0.3s	0.15s	0.04s	**Max** tripping time in seconds
Selective S	0.5s	0.20s	0.15s	**Max** tripping time in seconds
	0.13s	0.05s	0.05s	**Minimum** delay tripping time in seconds

For rated values IΔN ≤ 30mA the test current at five times is 0.25A.
For currents equal to ½ $I_{\Delta N}$ the RCD should not trip in any case.

Tripping times for tests with leakage currents $I_{\Delta N}$ x1, $I_{\Delta N}$ x2, $I_{\Delta N}$ x5 and AUTO.

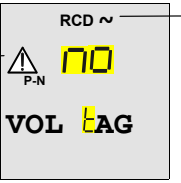
4.3.2.1 Note

The above values apply to RCDs manufactured to comply with BSEN61008. RCDs which are manufactured to comply with BS4293 are required to operate in 0.2s at $I_{\Delta N}$ X1. It is important that the user of this instrument is aware of the applicable tripping time(s) for the RCD being tested.

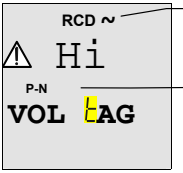
4.3.3. Other situations which may occur during RCD tests in any working mode

☞ Should the instrument detect that the phase and/or neutral cables are not connected to an installation, the screen alongside is displayed when pressing GO.

Message **"no VOL tAGE"**: too low a voltage was detected



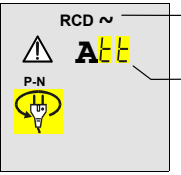
☞ Should the instrument detect a voltage between phase and neutral higher than 265V, for Example if the black cable is connected to an installation phase conductor of a 400V three-phase system, the screen alongside is displayed.



Message **"Hi VOL tAG"**: too high a voltage was detected.

☞ This screen is displayed if the phase conductor is reversed with the neutral.

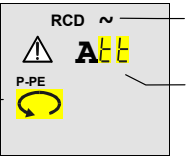
The instrument does not perform the test. Exchange the black cable with the red. Repeat the test.



Message **"Att"**: voltage between phase and earth is too low.

☞ This screen is displayed if the phase conductor is reversed with the earth.

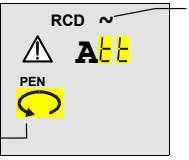
The instrument does not perform the test. Reverse the phase to earth connection in the plug or exchange the red cable with the green.



Message **"Att"**: voltage between phase and earth is too low.

☞ This screen is displayed when in a 2 phase system the black conductor is reversed with the green.

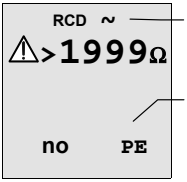
The instrument does not perform the test.



* SAVE **THE PREVIOUS RESULT CANNOT BE SAVED.**

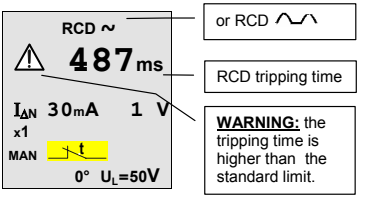
*** VR2240 only**

☞ If the instrument detects that the earth cable (green) is not connected, the screen alongside is displayed for 5 seconds after which time the screen reverts to the initial display. Check the connections of PE conductor under test.

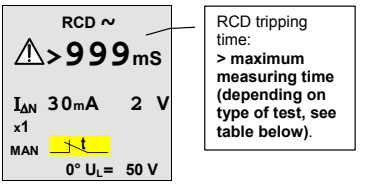


*SAVE **THE PREVIOUS RESULT CANNOT BE SAVED**.

☞ During the tests MAN x1, x2, x5 and AUTO (during x1 and x5 tests), if the RCD trips to break the circuit within a time not complying with the limits in table 4.3.2, the instrument emits **a long sound signal** at the end of the test and displays the values alongside.
*Refer also to note 4.3.2.1



☞ If the RCD trips in a time higher than the instrument's measuring limits, the instrument emits **a long sound signal** at the end of the test and displays the values alongside.



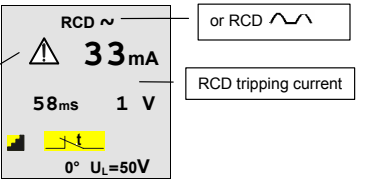
The maximum duration depends on the test type:

Test type	General RCD	Selective RCD
MAN x1 test	999ms	999ms
MAN x2 test	200ms	250ms
MAN x5 test	50ms	160ms
*"▟" test	300ms	

*SAVE **SAVING**: ***The tests can be stored by pressing the **SAVE** key **twice**

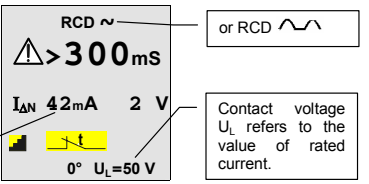
*** VR2240 only**

☞ *During the ramp test, if the RCD trips to break the circuit at a tripping current higher than $I_{\Delta n}$ (Type AC) or 1.4 x $I_{\Delta n}$ (Type A with $I_{\Delta n}$>10mA) or 2 x $I_{\Delta n}$ (Type A with $I_{\Delta n}$≤10mA), the instrument emits **a long sound signal** at the end of the test and displays a screen similar to this.



WARNING: the RCD tripping current is higher than the rated value of the set differential current ($I_{\Delta N}$=30mA was set in the Example).

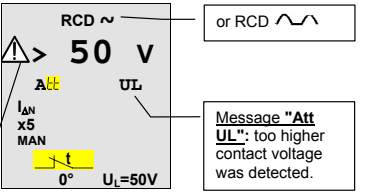
☞ *During the ramp test for general RCDs if the RCD trips to break the circuit, the instrument emits **a long sound signal** at the end of the test and displays a screen similar to this.



Maximum current generated by the instrument during the test for general RCDs (the value indicated refers to an AC type 30mA RCD, in this case the maximum current supplied is equal to 1.4x$I_{\Delta N}$)

*SAVE **SAVING**: *The tests can be stored by pressing the **SAVE** key **twice**

☞ If a contact voltage **U_t higher than the selected limit (U_L)** is detected the instrument stops the test, emits **a long sound signal** and displays a screen similar to this.



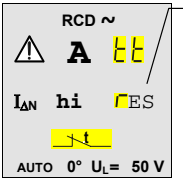
Message **">50V"** o **">25V"**: the instrument detects a contact voltage higher than the selected limit (50V in this case).

*SAVE **THIS RESULT CANNOT BE SAVED**.

In order to store the contact voltage value U_t, perform the test under U_t mode.

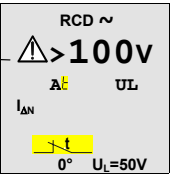
*** VR2240 only**

☞ If the instrument is unable to generate the current because the fault loop presents a too high a resistance, the instrument emits **a long sound signal** at the end of the test and displays a screen similar to this



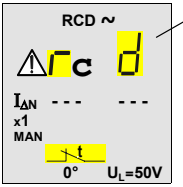
Message "**HI rES**": the instrument detected a excessive resistance therefore it is unable to perform the test.

☞ During the U_t test if the instrument detects a contact voltage U_t higher than the full scale value, a long sound signal is emitted at the end of the test and displays a screen similar to this.



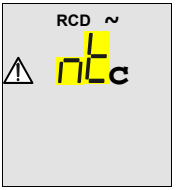
Message **">100V"** or **">50V"**:
the instrument detected a contact voltage higher than the full scale. Under U_t mode the instrument full scale is equal to 100V or 50V depending on the value set for U_L equal to 50V or 25V.

☞ If the RCD trips during the preliminary test at ½ I_{dn} (independently from the working mode) the instrument displays the screen alongside until voltage between phase and earth is detected (RCD reset) after which time the screen reverts to the initial display

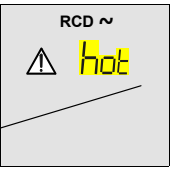


Message **"rcd"**: the RCD trips too early. Some leakage currents may be present in the installation.

☞ If the thermistors of the instrument are damaged, a screen similar to this is displayed.



☞ If the instrument becomes overheated, tests cannot be carried out and the message alongside is displayed. Wait until the screen reverts to the initial display in order to proceed.



Message "hot": the instrument overheated.

* SAVE **THIS RESULT CANNOT BE SAVED**.

*** VR2240 only**

4.4. LOOP Z_S /I_K: MEASUREMENT OF LINE IMPEDANCE, FAULT LOOP IMPEDANCE AND CALCULATION OF PROSPECTIVE SHORT CIRCUIT AND FAULT CURRENT

WARNING

This test is designed for use where there is no RCD in the circuit.
This test will trip the RCDs.

Turn the **switch** to **LOOP Z_S /I_K** position.

FUNC

The **FUNC** key is used to select one of the following measuring modes (which can be shown in rotation when pressing the key):

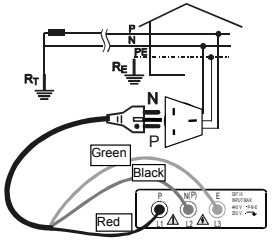
- "**P-N**" Mode (the instrument measures the resistance between the phase and neutral conductors and calculates the phase to neutral prospective short circuit current).
- "**P-P**" Mode (the instrument measures the resistance between two phase conductors and calculates the phase to phase prospective short circuit current).
- "**P-PE**" Mode (the instrument measures the resistance between the phase and protective conductors and calculates the phase to earth prospective fault current).

WARNING

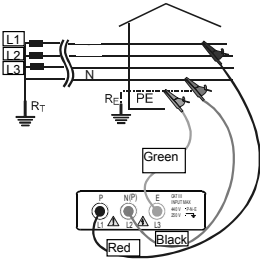
When **"Measuring"** is indicated on the display, the instrument is carrying out a test. Never disconnect test leads while **"Measuring"** is displayed.

4.4.1. "P-N" Mode

1. Select **P-N** mode with the **FUNC** key.
2. If possible disconnect all low impedance loads downstream of the point at which the measurement is to be taken, since such impedances would be in parallel with the line impedance to be measured.
3. Connect the red, black and green connectors of the mains lead (13a plugtop) or of the singular test leads to the corresponding input terminals of the instrument. (see diagrams below). When testing disconnected cables, connect the crocodile clips to the free ends of these.



Instrument connection for 230V single-phase or two-phase line impedance measurement

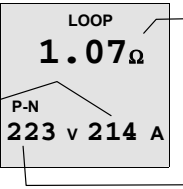


Instrument connection for line impedance measurement in a 400V three-phase system

4. Put the mains plug into a 230V 50Hz socket or connect the crocodile clips to the conductors of the three-phase system (see pictures).

5. **GO** Press the **GO** key. The instrument starts the test.

☞ At the end of the test the instrument emits a **double sound signal indicating that the test completed correctly** and displays a screen similar to this.



Value of phase to neutral line impedance expressed in Ω.

Phase to neutral effective voltage value expressed in Volts.

Effective value of the phase to neutral prospective short circuit current expressed in Ampere calculated according to the formula on the next page.

WARNING

The measurement of Phase-Neutral impedance entails the flow of a current of about 6A between the two conductors. This may cause the tripping of magnetothermal RCDs with nominal value lower than 10A. If necessary perform the test upstream of the RCD itself.

Calculation formula for prospective short circuit current:

$$I_{CC} = \frac{U_N}{Z_{PN}}$$

where U_N= phase to neutral voltage 127V if $V_{meas} \leq 150V$
230V if $150V < V_{meas} \leq 265V$

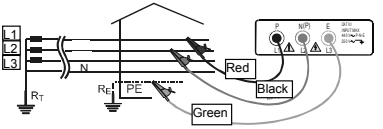
* 

SAVING: ***The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

4.4.2. "P-P" Mode

1. Select **P-P** mode with the **FUNC** key.
2. If possible disconnect all low impedance loads downstream of the point at which the measurement is to be taken, since such an impedance would be in parallel with the line impedance to be measured.
3. Connect the three red, black and green connectors of the test leads to the corresponding input terminals of the instrument **P**, **N**, **E** (see possible connections in the following pictures).

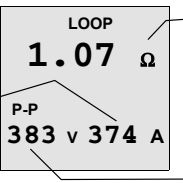


Connections for measurement of phase to phase impedance

4. Connect the crocodile clips to the conductors of the three-phase system (see picture).

5. **GO** Press the **GO** key. The instrument starts the test.

☞ At the end of the test the instrument emits a **double sound signal indicating that the test completed correctly** and displays a screen similar to this.



Value of phase to phase line impedance expressed in Ω.

Effective value of the phase to phase prospective short circuit current expressed in Amperes calculated according to the formula below.

Phase to phase effective voltage value expressed in Volts.

WARNING

The measurement of Phase-Phase impedance entails the flow of a current of about 11.5A between the two conductors. This may cause the tripping of magnetothermal RCDs with nominal value lower than 10A. If necessary perform the test upstream of the RCD itself.

Formula for calculation of prospective short circuit current: $I_{CC} = \frac{U_N}{Z_{PP}}$

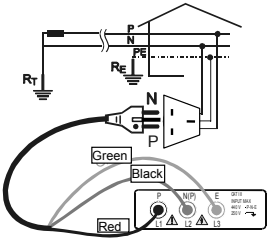
where U_N= phase to phase voltage 127V if $V_{meas} \leq 150V$
230V if $150V < V_{meas} \leq 265V$
400V if $V_{meas} > 265V$

*SAVE **SAVING**: *The tests can be stored by pressing the **SAVE** key **twice**

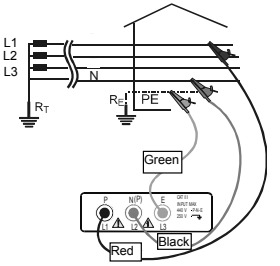
*** VR2240 only**

4.4.3. Mode "P-PE"

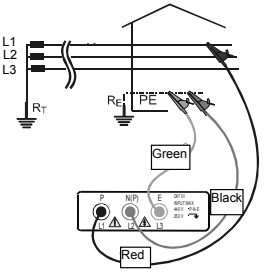
1. Select **P-PE** mode with the **FUNC** key.
2. Connect the three red, black and green connectors of the three-terminal mains test lead or of the single test leads in the corresponding input terminals of the instrument **P**, **N**, **E** (see possible connections in the following pictures).



Connections for loop impedance measurement in a 230V single- or two-phase system



Connections for loop impedance measurement in a 400V three-phase system with neutral



Measurement of loop impedance in a 230 or 400V three-phase system without neutral

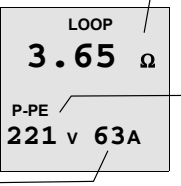
3. Connect the mains plug into a 230V 50Hz socket or the crocodile clips to the conductors of the three-phase system (see pictures).
4. The instrument carries out the test verifying that the contact voltage of the installation is not higher than the limit contact voltage value. The contact voltage limit is that set under one of the following functions: RCD ∿, RCD ∿ or R_{a15mA}.

   Example: if you are carrying out tests in an area where the limit contact voltage is equal to 25V, you will need to select one of the following functions: RCD ∿, RCD ∿ or Ra_{15mA}, and select the limit contact voltage of 25V using U_L▼. At this stage if you turn the selector on LOOP Z_S/I_K under mode P-PE, the instrument will use the limit of 25V during the test.

5. GO

- Press the **GO** key **once.** The instrument carries out the test injecting a current in phase with positive half wave of the voltage indicated on display by 0°.
- Press the **GO** key **twice.** The instrument carries out the test injecting a current in phase with negative half wave of the voltage indicated on display by 180°.

- At the end of the test the instrument emits a **double sound signal indicating that the test completed correctly** and displays a screen similar to this.



Value of phase to earth fault impedance expressed in Ω.

Phase to earth effective voltage value expressed in Volts.

Effective value of the phase to earth prospective short circuit current expressed in Ampere calculated according to the formula below.

WARNING

The measurement of Phase-PE impedance entails the flow of a current of about 11.5A between the two conductors. This may cause the tripping of magnetothermal RCDs with nominal value lower than 10A. If necessary perform the test upstream the RCD itself.

Formula for calculation of prospective fault current:

$$I_{CC} = \frac{U_N}{Z_{PE}}$$

where U_N= phase to earth voltage 127V if 100V < V_{meas} < 150V
230V if 150V < V_{meas} ≤ 265V

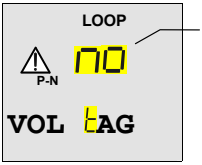
*SAVE

SAVING: ***The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

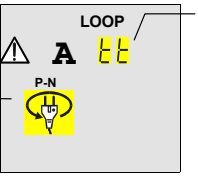
4.4.4. Other situations which may occur during LOOP, Z_S/I_K tests in any working mode

☞ Should the instrument detect that the phase and/or neutral cables are not connected to an installation, the screen alongside is displayed when pressing GO.



Message **"no VOL tAG":** too low a voltage was detected.

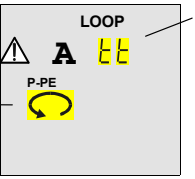
☞ This screen is displayed if the phase conductor is reversed with the neutral.



Message **"Att":** too low a voltage between phase and earth.

The instrument does not perform the test. Exchange the red test lead with the black. Check the earth connection. Repeat the test.

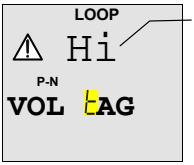
☞ This screen is displayed if the phase conductor is reversed with the earth.



Message **"Att":** too low a voltage between phase and neutral.

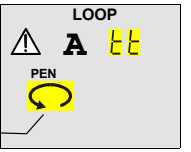
The instrument does not perform the test. Reverse the phase to earth connection under test or exchange the red test lead with the green. Repeat the test.

☞ Should the instrument detect a voltage between phase and neutral higher than 265V, for Example if the black cable is connected to an installation phase conductor of a 400V three-phase system, a screen similar to this is displayed.



Message **"Hi VOL tAG":** a too high a voltage was detected.

☞ This screen is displayed if when testing a 2 phase system, the black conductor is reversed with the green.

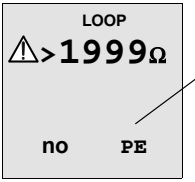


The instrument does not perform the test.

* SAVE **THE PREVIOUS RESULT CANNOT BE SAVED**.

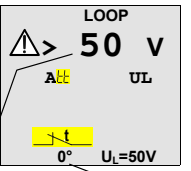
*** VR2240 only**

☞ If the instrument detects that the earth cable (green) is not connected, the screen alongside is displayed for 5 seconds then the screen reverts to the initial display. Check the connections of PE conductor under test.



Message **"no PE"**: the instrument does not detect the protection circuit.

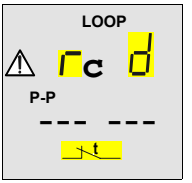
☞ If a contact voltage **U_L higher than the selected limit (U_L)** is detected the instrument stops the test and emits **a long sound signal** at the end of the test. A screen similar to this is displayed.



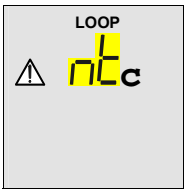
">50" or ">25V": the instrument detects a contact voltage higher than the selected limit (50V in this case).

The instrument displays 0° or 180°

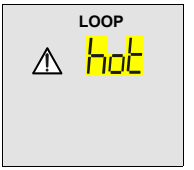
☞ If during the test the instrument does not detect voltage, a screen similar to this is displayed.



☞ If the thermistors of the instrument are damaged, a screen similar to this is displayed.



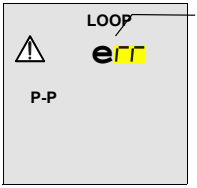
☞ If the instrument becomes overheated, tests cannot be carried out and the message alongside is displayed. Wait until the screen reverts to the initial display in order to proceed.



* SAVE ***THE PREVIOUS RESULT CANNOT BE SAVED**

*** VR2240 only**

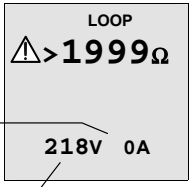
☞ if the instrument detects a **resistance lower than 0,03Ω**, the screen alongside is displayed. Line impedance value is too low and the instrument doesn't perform the measurement



Message **"Err"**: the instrument detects a line loop resistance lower than 0.03Ω.

* SAVE **THE PREVIOUS RESULT CANNOT BE SAVED.**

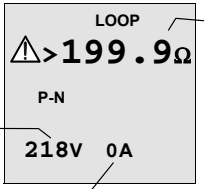
☞ If using **P-PE** mode the instrument carries out the test and detects a **resistance higher than 1999Ω**, a screen similar to this displayed.



Generated current. Resolution 1A.

Value of voltage existing between the phase & earth terminals on the instrument. (P-PE)

☞ Under mode **P-P or P-N** if the instrument detects a **resistance higher than 199.9Ω** a screen similar to this displayed.



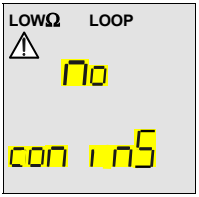
Message **">199.9":** the instrument detects a line loop resistance higher than 199.9Ω.

Value of voltage existing between the phase to phase (if the test is P-P), phase to neutral (if the test is P-N).

Generated current. Resolution 1A.

* SAVE **SAVING:** *The tests can be stored by pressing the **SAVE** key **twice**

☞ *****This screen can be inadvertently displayed if the $U_n/I_{\Delta n}$ button is pressed when in the **LOOP Z_S /I_K** range. This is a function reserved for future use. To return the display back to the default screen, press the $U_n/I_{\Delta n}$ button again.



Note: Unless the $U_n/I_{\Delta n}$ is pressed to return the screen to default, the "no con ins" screen will remain active in the **LOOP Z_S /I_K** range even if the unit is powered down or if the batteries are removed.

*** VR2240 only**

4.5. R_{a15mA} ⏚: MEASUREMENT OF EARTH RESISTANCE WITH 15mA CURRENT AND CALCULATION OF PROSPECTIVE FAULT CURRENT (PFC)

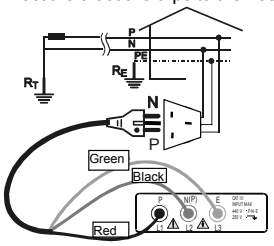
WARNING

This test is designed for circuits where there is an RCD. Provided pre-existing levels of earth leakage are low this test will not trip RCDs. The test results are presented to 1Ω resolution. Where an RCD is available for extra protection, there is no need to specify the loop to 2 decimal places. Records stated for example as "≤1Ω" are acceptable.

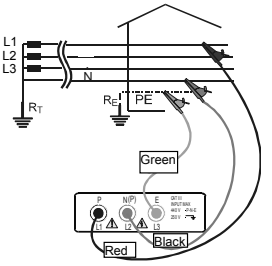
Turn the switch to **R_{a15mA}** position.

☞ The only available mode is **P-PE**.

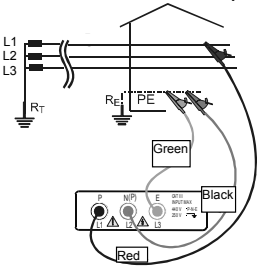
1. Connect the three red, black and green connectors of the three-terminal mains test lead or of the single test leads to the corresponding input terminals of the instrument **P**, **N**, **E** (see possible connections in the following pictures). When testing at loose cables, connect the crocodile clips to the free ends of these



Connection for Earth Resistance in a 230V single- or two-phase system



Connection for Earth Resistance in a 400V three-phase system with neutral



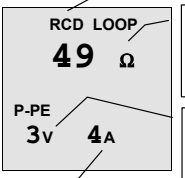
Earth Resistance in a 230V or 400V three-phase system without neutral

2. Connect the mains plug into a 230V 50Hz socket or the crocodile clips to the conductors of the three-phase system (see picture).

3. **U_L▼** The **U_L▼** key is used to select one of the following limit values for the contact voltage (which can be shown in rotation when pressing the key):
   - ☞ 50V (default)
   - ☞ 25V.

4. **GO** Press the **GO** key. The instrument starts the test.

- ☞ At the end of the test the instrument emits a double sound signal indicating that the test completed correctly and displays a screen similar to this



Signifies non- trip low current loop test

Value of Earth Resistance expressed in Ω. Resolution is 1Ω.

Effective value of the phase to earth prospective fault current (PFC) expressed in Amperes calculated according to the formula below. Resolution is 1A.

Value of contact voltage detected during the measurement with leakage current of 15mA. Resolution is 1V.

Note: The test is used to perform the measurement of Earth Resistance without causing the RCD to trip. (RCD rated $I_{\Delta N}$ higher than or equal to 0.03A.)

Formula for the calculation of the prospective short circuit current:

$$I_{CC} = \frac{U_N}{R_A}$$

where U_N= phase to earth voltage 127V if 100V < V_{meas} ≤ 150V
230V if 150V < V_{meas} ≤ 265V

R_A = earth resistance

WARNING

When **"Measuring"** is indicated on the display, the instrument is carrying out a test. Never disconnect test leads while **"Measuring"** is displayed.

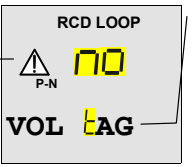
* **SAVE** **SAVING**: ***The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

4.5.1. Other situations which may occur during R_{A15mA} ⏚ tests

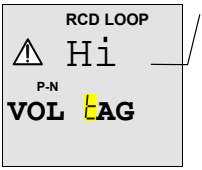
☞ Should the instrument detect that the phase and/or neutral cables are not connected to an installation, a screen similar to this is displayed when pressing GO.

Message **"no"**: the instrument does not perform the test because too low a voltage was detected.



Message **"No VOLTAGE"**: Too low a voltage was detected.

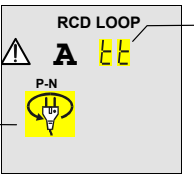
☞ Should the instrument detect a voltage between phase and neutral higher than 265V, for Example if the black cable is connected to an installation phase conductor of a 400V three-phase system, a screen similar to this is displayed.



Message **"Hi VOL tAG"**: Too high a voltage was detected

☞ This screen is displayed if the phase conductor was reversed with respect to the neutral.

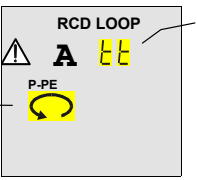
The instrument does not perform the test. Exchange the red test lead with the black. Check the earth connection. Repeat the test.



Message **"ATT"**: voltage between phase and earth is too low.

☞ This screen is displayed if the phase conductor is reversed with the earth.

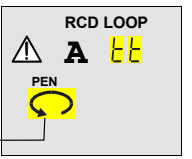
The instrument does not perform the test. Reverse the phase to earth connection under test or exchange the red test lead with the green. Repeat the test.



Message **"Att"**: voltage between phase and neutral is too low.

☞ This screen is displayed if when testing a 2 phase system, the black conductor is reversed with the green.

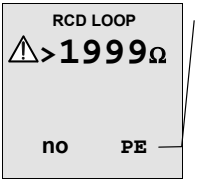
The instrument does not perform the test



* SAVE **THE PREVIOUS RESULT CANNOT BE SAVED**.

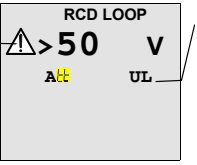
*** VR2240 only**

☞ If the instrument detects that the earth cable (green) is not connected, the screen alongside is displayed for 5 seconds then the screen reverts to the initial display. Check the connections of PE conductor under test.



Message **"no PE"**: the instrument does not detect the protection circuit.

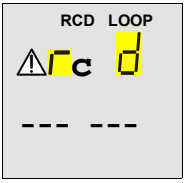
☞ If a contact voltage **U_L higher than the selected limit (U_L)** is detected the instrument stops the test and emits **a long sound signal** at the end of the test. A screen similar to this is displayed.



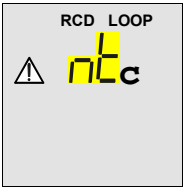
Message **"Att UL"**: Too high a contact voltage was detected

Message **">50" or ">25V":**
The instrument detects a contact voltage higher than the selected limit (50V in this case)

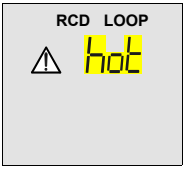
☞ If during the test the instrument does not detect voltage, a screen similar to this is displayed.



☞ If the thermistors of the instrument are damaged, a screen similar to this is displayed.



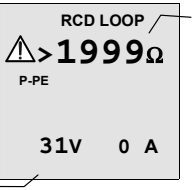
☞ If the instrument becomes overheated, tests cannot be carried out and the message alongside is displayed. Wait until the screen reverts to the initial display in order to proceed.



* SAVE **THE PREVIOUS RESULT CANNOT BE SAVED**

*** VR2240 only**

☞ If, when using the **P-PE** mode the instrument caries out the test and detects an earth resistance **higher than 1999Ω**, a screen similar to this is displayed for 5 seconds after which time the screen reverts to the initial display.



Message **">1999"**: The instrument detects an earth resistance higher than 1999Ω.

Value of contact voltage U_t detected refers to the value of the RCD current set. Resolution 1V.

* **SAVE** **SAVING**: *****The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

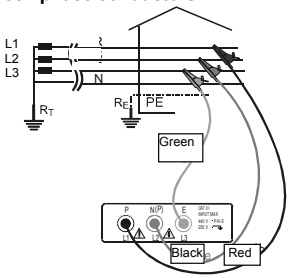
4.6. PHASE SEQUENCE

Turn the **switch** to the position.

4.6.1. Procedure for PHASE SEQUENCE testing

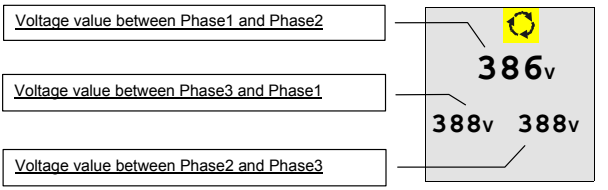
1. Connect the three red, black and green connectors of the single test leads to the corresponding input terminals of the instrument **P**, **N**, **E** (see possible connections in the following picture). When testing at loose cables or busbars, connect the crocodile clips to the free ends of these.

Caution.
High voltage may exist between phase conductors



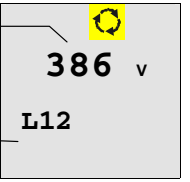
Connections for phase sequence indication
L1=red cable, L2=black cable, L3=green cable

2. Connect the crocodile clips to the three phases of the system under test. The instrument displays the following screen:



3. **FUNC** Press the **FUNC** key to display the three delta voltages L1-2, L2-3, L3-1 in turn. The instrument will display a screen similar to this:

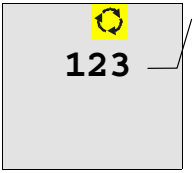
Voltage value between Phase1 and Phase2 sampled when the FUNC key is pressed.



"**L12**": indicates that the value reported is the voltage measured between Phase1 and Phase2.

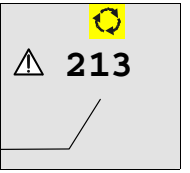
4. **GO** Press the **GO** key to start the phase sequence test. At the end of the test, screens similar to the following will be displayed:

☞ At the end of the test the instrument displays a screen similar to this indicating **correct phase sequence**. I.E. the red lead is connected to the phase1=L1, the black lead to the phase2=L2 and green lead to the phase3=L3.



Message "**123**": indicates that the phase sequence is correct.

☞ At the end of the test the instrument displays a screen similar to this indicating **wrong phase sequence**.



"**213**": indicates that the phase sequence is wrong.

WARNING

When **"Measuring"** is indicated on the display, the instrument is carrying out a test. Never disconnect test leads while **"Measuring"** is displayed.

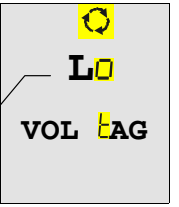
* **ESC** *Press the ESC key again to display the 3 voltage values L12, L23, L31 existing between the phases of the electrical system (see the screen on page.52).

* **SAVE** **SAVING**: *The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

4.6.2. Other situations which may occur during phase sequence tests

☞ if the voltage between each phase is lower than 100V, the instrument **does not perform the test** and displays a screen similar to this.

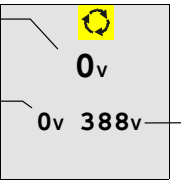


Message **"Lo VOL tAG"**: the instrument detects low voltage between at least 2 phases. The instrument does not perform the test.

* SAVE **THIS RESULT CANNOT BE SAVED**.

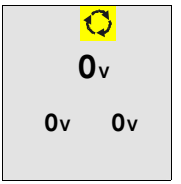
Red cable=L1 is not connected to one phase of the installation. No voltage between phase L1 and phase L2 (L1-L2).

Red cable= L1 is not connected to one phase of the installation. No voltage between phase L3 and phase L1 (L3- L1).



Voltage between phase L2 and phase L3

☞ If two or more cables of the instrument are not connected, a screen similar to this is displayed.



* SAVE **SAVING**: *****The tests can be stored by pressing the **SAVE** key **twice**

*** VR2240 only**

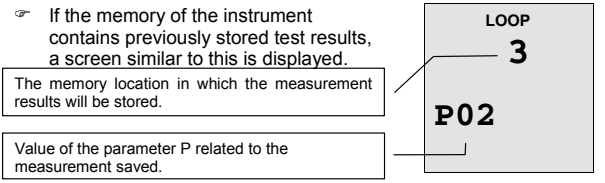
5. *HOW TO SAVE, RECALL AND CLEAR DATA STORED IN MEMORY (VR2240 ONLY)

5.1. SAVE: "SAVE" KEY

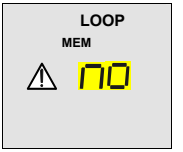
To store the result of any test carried out, proceed as follows:

1. **SAVE** Press the **SAVE** key once.

☞ If the memory of the instrument contains previously stored test results, a screen similar to this is displayed.



☞ If the test cannot be saved the instrument displays a screen similar to this.



2. **U_L▼** **S▲** Use the keys **U_L▼**, **S▲** to increase or decrease the value of the parameter **P** related to the measurement to be saved. This parameter helps the operator to identify the tests performed.

Example: if carrying out tests in different rooms within a building, the operator can associate the measurements performed in a room with a given value of the parameter P. Different values of the parameter P will correspond to different rooms.

3. **SAVE** Press the **SAVE** key again, the instrument **emits two sound signals** confirming that the test results have been stored.

ESC Press the **ESC** key to leave the memory menu and go back to the selected measurement.

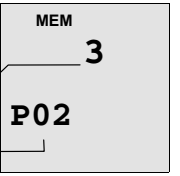
VR2240 only

5.2. *RECALL: "RCL" KEY (VR2240 ONLY)

If you want to recall the stored test results proceed as follows:

1. **RCL** Press the **RCL** key.

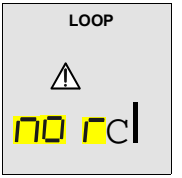
☞ If the memory of the instrument contains previously stored test results, a screen similar to this is displayed.



The memory location in which the measurement result was stored to.

Value of the parameter **P** related to the measurement saved.

☞ If memory of the instrument does not contain any test results, a screen similar to this is displayed.



2. **U_L▼** / **S▲** Use the keys **U_L▼**, **S▲** to select the memory location to be displayed.

3. **DISP** Press the **DISP** key to display the test result stored within the selected memory location.

4. **U_L▼** / **S▲** Use the keys **U_L▼**, **S▲** again to return to the memory locations.

ESC Press the **ESC** key to leave the memory menu and return to the standby screen.

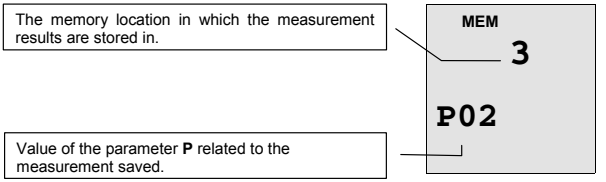
VR2240 only

5.3. *CLEAR: "CLR" KEY (VR2240 ONLY)

If you want to delete the stored tests results, proceed as follows:

1. **RCL**

Press the **RCL** key. The instrument displays a screen similar to this:



2. **U_L▼** / **S▲**

Use the keys **U_L▼**, **S▲** to select the number of the memory location.

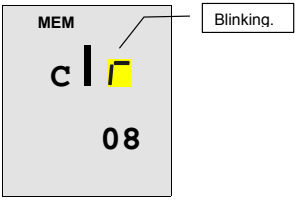
WARNING: the instrument will delete the results stored from the memory location selected to the last full one.

3. **DISP**

Press the **DISP** key to display the test result related to the memory location selected. If more than one result is stored in the memory location (Eg: RCD test under AUTO mode) it is necessary to press **DISP** more than once to display them.

4. **CLR**

Press CLR once. The symbol **"clr"** is blinks. You now have two options:



CLR Press CLR again. **The results selected will be deleted starting from the one selected to the last one saved.**

ESC Press ESC to **cancel deletion**. The blinking symbol "clr" disappears.

VR2240 only

Press the **ESC** key to leave the memory menu and go back to the selected measurement.

Example: 97 tests have been stored in the instrument.
If you want to delete the tests from 43 to 97, proceed as follows:

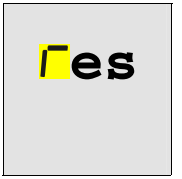
- Press RCL.
- Use the keys **U_L▼, S▲** to select the 43rd memory location.
- Press CLR. “CLR” will blink on the display, 43 is displayed on the left and 97 on the right.
- Press CLR. The tests from 43 to 97 are deleted.

VR2240 only

6. *RESETTING THE INSTRUMENT AND DEFAULT PARAMETERS (VR2240 ONLY)

6.1. RESET PROCEDURE

1. Press the keys DISP, CLR, RCL at the same time and and turn the rotary switch to any test function.
2. **The screen shown here is displayed for approximately 5 seconds**, during which the instrument **emits a sound signal** and then displays the screen relative to the function selected with the rotary switch.



3. **WARNING**: the reset procedure will delete all the stored tests and it will set the default parameters in the instrument.
Before carrying out a reset procedure, download the stored tests.

6.2. DEFAULT PARAMETERS.

Function	Parameter	RESET default parameter
LOWΩ	Mode	AUTO
	Calibration Offset	0
	Mode R+/R- TIMER	TIMER is set at 3s
R_{ISO}	Mode	MAN
	Test voltage	500V
	Mode TIMER	TIMER is set at 60s
RCD type A/AC	Mode	x1
	Test differential current	30mA
	Contact voltage limit	50V
LOOP Z_S/I_K	Mode	P-N
Memory	Parameter P	P = 1
	Memory state	0

VR2240 only

7. *CONNECTION TO A PC (VR2240 ONLY)

The connection from the **VR2240** to a PC is made using the optional infra red data lead **VRTL1** connected to the PC serial port. The optional software package **VRSOFT1** provides the facility to download and print results onto a form (All items sold separately).

Before connecting the VR2240 to a PC, it is necessary to select and configure the COM port on the PC used for data transfer. To set this, start the software and refer to the help provided with the VRSOFT1 download application.

WARNING: The selected port should **NOT** be shared by other devices or applications (eg. mouse, modem, etc.).

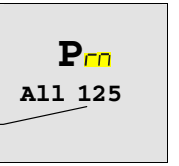
To transfer the stored data from the VR2240 to the PC, follow the directions below.

1. Turn the rotary switch to the **RS232** position (In the case of the VR2230, this position is marked "**CAL**" and is only used at the point of manufacture and is of no use to the end user of the instrument.)

FUNC

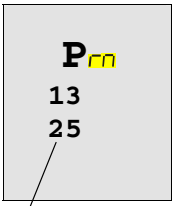
2. Using the **FUNC** key, select the modes "**Prn ALL**" or "**Prn n1 n2**", to display the following screens respectively:

   - ✓ Press **GO** to start printing all of the stored test results.
   - ✓ Press **ESC** to stop printing immediately.



indicates the total number of results stored in memory.

   - ✓ Press **GO** to start printing the test results from memory locations n1 to memory locations n2 inclusive. Note that the printing order is that of the increasing value of the parameter P, **NOT memory location order.** Ensure the range n1 to n2 cover all the results you need.
   - ✓ Press **ESC** to stop printing immediately.



Indicates the memory cell which will be printed as the last one.

Note Transmission speed on the PC is set to **4800 baud** to match the output from VR2240.

VR2240 only

8. *PRINTING WITH AN OPTIONAL SERIAL PRINTER (VR2240 ONLY)

The connection from the **VR2240** to the printer **VRPRINT1** is made using the infra red data **lead VRTL1**, in conjunction with printer adaptor cable **TL130** (all items sold separately).

To transfer the stored data from the VR2240 to the printer, follow the directions below.

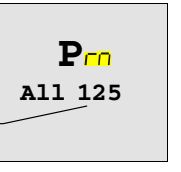
1. Turn the rotary switch to the **RS232** position. (In the case of the VR2230, this position is marked "**CAL**" and is only used at the point of manufacture and is of no use to the end user of the instrument.)

FUNC

3. Using the **FUNC** key, select the modes "**Prn ALL**" or "**Prn n1 n2**", to display the following screens respectively:

   ✓ Press **GO** to start printing all of the stored test results.

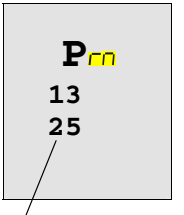
   ✓ Press **ESC** to stop printing immediately.



indicates the total number of results stored in memory.

   ✓ Press **GO** to start printing the test results from memory locations n1 to memory locations n2 inclusive. Note that the printing order is that of the increasing value of the parameter P, **NOT memory location order.** Ensure the range n1 to n2 cover all the results you need.

   ✓ Press **ESC** to stop printing immediately.



Indicates the memory cell which will be printed as the last one.

Note Transmission speed on the printer is set to **4800 baud** to match the output from the **VR2240**.

*** VR2240 only**

9. OPTIONAL ACCESSORIES & MAINTENANCE

Accessories

Infra red data lead	*VRTL1
Download software	*VRSOFT1
Mini printer	*VRPRINT1
Data Lead VRPRINT1 to VR2240	*TL130
Test lead (GB 13A plug)	TL206
Fused test lead set	TL54

Cleaning

Maintenance consists of periodic cleaning.

The exterior of the instrument can be cleaned with a dry clean cloth to remove any oil, grease or grime. Never use liquid solvents or detergents.

Repairs or servicing not covered in this manual should only be performed by qualified personnel.

Calibration

The recommended calibration interval is 12 months.
Martindale Electric will carry out routine calibration (on a chargeable basis) if the instrument is returned, carriage paid, to the address on the final page of this document. Alternatively, a chargeable collection and return service is available. Please call our calibration and service department on **01923 650620** for further details.

Storage Conditions

The Veritest 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 instrument.

Warranty

Faults in manufacture and materials are fully guaranteed for 24 months from date of invoice and will be rectified by us free of charge, provided the unit has not been tampered with and is returned to us with its housing unopened. Damage due to dropping, abuse or misuse is not covered by the guarantee. Nothing in these instructions reduces your statutory rights.

*** VR2240 only**

10. TECHNICAL SPECIFICATIONS

10.1. TECHNICAL FEATURES

Accuracy is indicated as [% of reading + number of digits]. It refers to the atmospheric conditions listed in paragraph 10.2.1.

Continuity (Low Ω)

Test mode	Measuring range (Ω)	Resolution (Ω)	Accuracy
AUTO, R+, R-	0.01 - 19.99	0.01	±(2% rdg + 2 dgt)
	20.0 - 99.9	0.1	
R+TIMER, R-TIMER	0.01 - 9.99	0.01	±(2% rdg + 2 dgt)

Test current >200mA DC up to 16Ω (include the resistance of the calibration)
40mA DC from 16Ω to 99.9Ω
Test current resolution 1mA
Open circuit Test Voltage 9V

Insulation resistance (R_{ISO})

Rated Test voltage (V)	Measurable range (MΩ) at rated test voltage	Resolution (MΩ)	Accuracy
50*	0.05 - 19.99	0.01	±(2% rdg + 2 dgt)
	20.0 - 49.9	0.1	
	50.0 - 99.9	0.1	±(5% rdg + 2 dgt)
100*	0.10 - 19.99	0.01	±(2% rdg + 2 dgt)
	20.0 - 99.9	0.1	
	100.0 - 199.9	0.1	±(5% rdg + 2 dgt)
250	0.23 - 19.99	0.01	±(2% rdg + 2 dgt)
	20.0 - 199.9	0.1	
	200 - 249	1	
	250 - 499	1	±(5% rdg + 2 dgt)
500	0.25 - 19.99	0.01	±(2% rdg + 2 dgt)
	20.0 - 199.9	0.1	
	200 - 499	1	
	500 - 999	1	±(5% rdg + 2 dgt)
1000	0.90 - 19.99	0.01	±(2% rdg + 2 dgt)
	20.0 - 199.9	0.1	
	200 - 999	1	
	1000 - 1999	1	±(5% rdg + 2 dgt)

Automatic selection of the measuring range
Open circuit voltage Rated voltage test –0% +10%
Short circuit current <3,0mA - 500V
<2,0mA - 50V, 100V, 250V, 1000V
Test current on load: >1mA @ V_{Test} across R_{load} =(1000 x V_{Test})Ω
If the instrument measures a voltage higher than 30V, the instrument does not perform the test.

RCD tripping tests

Type of RCD AC, A
Range of phase to earth voltage: (100 - 265) V
Rated tripping currents ($I_{\Delta N}$) 10mA, 30mA, 100mA, 300mA, 500mA
Test frequency 50Hz ± 0.5 Hz

*** VR2240 only**

Tripping time ($t_{\Delta N}$)

Measuring range (ms)			Resolution (ms)	Accuracy
½ $I_{\Delta N}$, $I_{\Delta N}$	0 - 999		1	±(2% rdg + 2 dgt)
2 $I_{\Delta N}$	0 - 200	general		
	0 - 250	selective		
5 $I_{\Delta N}$ RCD	0 - 50	general		
	0 - 160	selective		

NB. For RCD type A 500mA, the MAN x5 and AUTO tests are not available

Contact voltage

Measuring range (V)	Resolution (V)	Accuracy
0 - $2U_{t\,Lim}$	0.1	-0%,+(10%rdg+2dgt)

$U_{t\,Lim}$ (U_L): 25V or 50V

Earth resistance R_A without RCD tripping

Measuring range (Ω)	Resolution (Ω)	Accuracy
1 - 1999	1Ω	±(5% rdg + 2 dgt)

Test current 0.5 $I_{\Delta N}$ of RCD (during RCD U_t test)

Tripping current Ramp Test for RCD type A and AC (VR2240 ONLY)

RCD with $I_{\Delta N} \leq 10$mA

Type RCD	Measuring range $I_{\Delta N}$ (mA)	Resolution (mA)	Accuracy $I_{\Delta N}$
AC	(0.5 - 1.4) $I_{\Delta N}$	0.1 $I_{\Delta N}$	-0%, +10% $I_{\Delta N}$
A	(0.5 - 2.4) $I_{\Delta N}$		

RCD with $I_{\Delta N} > 10$mA

Type RCD	Measuring range $I_{\Delta N}$ (mA)	Resolution (mA)	Accuracy $I_{\Delta N}$
AC	(0.5 - 1.4) $I_{\Delta N}$	0.1 $I_{\Delta N}$	-0%, +10% $I_{\Delta N}$
A	(0.5 - 2) $I_{\Delta N}$		

AC voltage

Electrical System	Measuring range (V)	Resolution (V)	Accuracy
Single-phase system	0 - 265	1	±(2% rdg + 2 dgt)
Two or Three – phase system	0 - 460		±(5% rdg + 2 dgt)

Frequency

Measuring range (Hz)	Resolution (Hz)	Accuracy
15.3 – 99.9	0.1	±(0.1% rdg + 1 dgt)

Phase-Neutral Loop Impedance (LOOP Z_S/I_K phase to phase or phase to neutral)

Test mode	Measuring range (Ω)	Resolution (Ω)	Accuracy
P-P and P-N	0.03 - 19.99	0.01	±(5% rdg + 2 dgt)
	20.0 -199.9	0.1	

Max peak test current
100V 3.17A test duration: 80ms
230V 6.64A test duration: 40ms
400V 11.5A test duration: 40ms

Accuracy current measurement ±10% $I_{max\,Pk}$

Test voltage
V_{PN} 100V - 265V 50Hz + 0.5 Hz
V_{PP} 100V - 460V 50Hz + 0.5 Hz

Phase-Earth Loop Impedance (LOOP Z_S/I_K)

Measuring range (Ω)	Resolution (Ω)	Accuracy
0.03 - 19.99	0.01	±(5% rdg + 2 dgt)
20.0 - 199.9	0.1	
200 - 1999	1	

Max peak test current	100V	3.17A	test duration: 80ms
	230V	6.64A	test duration: 40ms
Accuracy current measurement	±10% $I_{max\ Pk}$		
Test voltage	V_{PE}	100V - 265V 50Hz +0.5 Hz	

Non-Trip Earth Resistance (R_{a15mA})

Range (Ω)	Resolution (Ω)	Accuracy
1 - 1999	1	±(5% rdg + 2 dgt)

Test current 15mA

10.1.1. Safety standards

The instrument complies with:	EN 61010-1 + A2 (1997), EN61557
Insulation:	Class 2, double insulation
Pollution degree:	2
Inside use; max altitude:	2000m
Overvoltage category:	CAT III 460V~ P-N-E / 265V~ to earth

10.1.2. General specifications

Mechanical features

Dimensions:	222(L) x 162(La) x 57(H)mm
Weight (batteries included):	approx. 1000g

Power supply

Battery type:	6 batteries 1.5 V – LR6 – AA – AM3 – MN 1500
Low battery indication:	The symbol is displayed when the battery voltage is too low.
Battery life:	About 40 hours in stand-by or 500 Continuity (LowΩ) tests or 250 Insulation (R_{ISO}) tests 500V/500kΩ or 1000 LOOP or RCD or PHASE SEQUENCE

Display

Features:	LCD custom
***Memory**:	*350 tests
***Interface**	*optical RS232 to print or to download the tests See accessory list for download leads & software

*** VR2240 only**

10.2. ENVIRONMENT

10.2.1. Environmental working conditions

Reference temperature:	23° ± 5°C
Working temperature:	-10°C – 50 °C
Relative humidity allowed:	<80%
Storage temperature:	-20 – 60 °C
Storage humidity:	<80%

10.2.2. EMC

This instrument was designed in compliance with the EMC standards in force and compatibility have been tested for EN61326-1 (1997) + A1 (1998)

This instrument complies with the requirements of the European Low Voltage Directive 72/23/CEE (LVD) and EMC 89/336/CEE, amended with 93/68/CEE.

11. SERVICE

Repair & Service
There are no user serviceable parts in this unit. Return to Martindale Electric Company Ltd if faulty, unless fuse replacement only is necessary. Our service department will promptly quote to repair any faults that occur outside the warranty period. Please call our service and calibration department on **01923 650620** for further details.

Other products available from Martindale Electric

- 16th Edition Testers
- Multifunction Testers
- Calibration Equipment
- Continuity Testers
- Electrician's Kits
- Full Calibration and Repair Service
- Fuse Finders
- Digital Clamp Meters
- Digital Multimeters
- Microwave Leakage Detectors
- Motor Maintenance Equipment
- Non-Trip Loop Testers
- Pat Testers & Accessories
- Phase Rotation
- Proving Units
- Socket Testers
- Thermometers & Probes
- Test Leads
- Voltage Indicators
- Specialist Metrohm Testers (4 & 5kV)
- Specialist Drummond Testers

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