

DL9120 DL9130EV

Multifunction installation tester

Operating Instructions

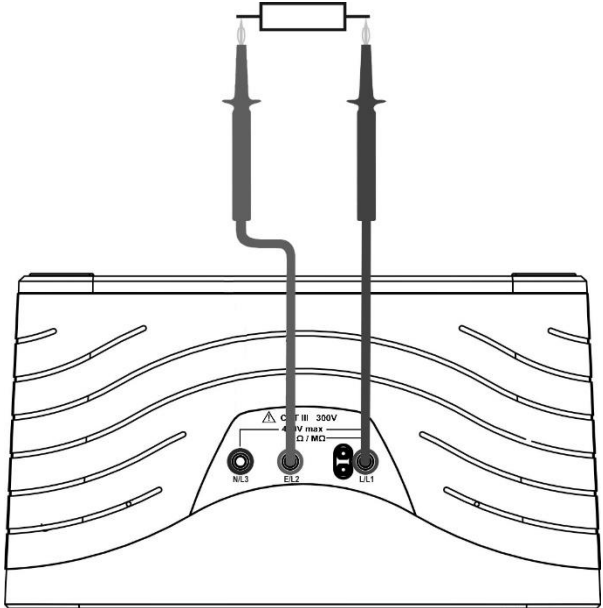


Figure 2 Earth Continuity/Insulation Measurement

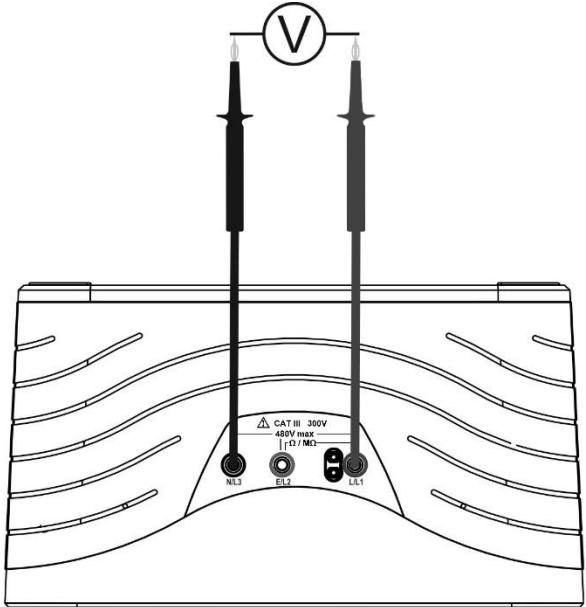


Figure 3 Voltage measurement using test probes

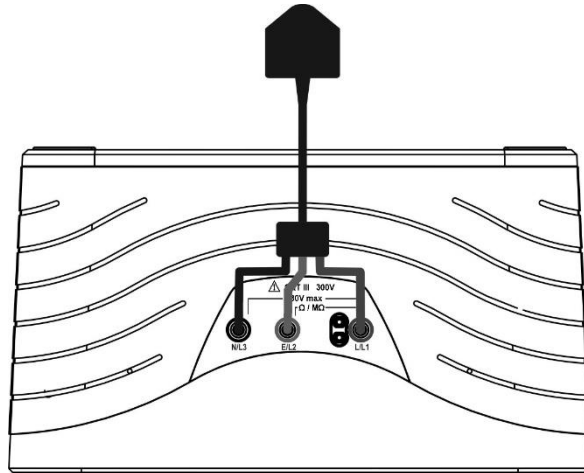


Figure 4 Voltage, RCD, Z_s and line impedance measurement at a mains outlet

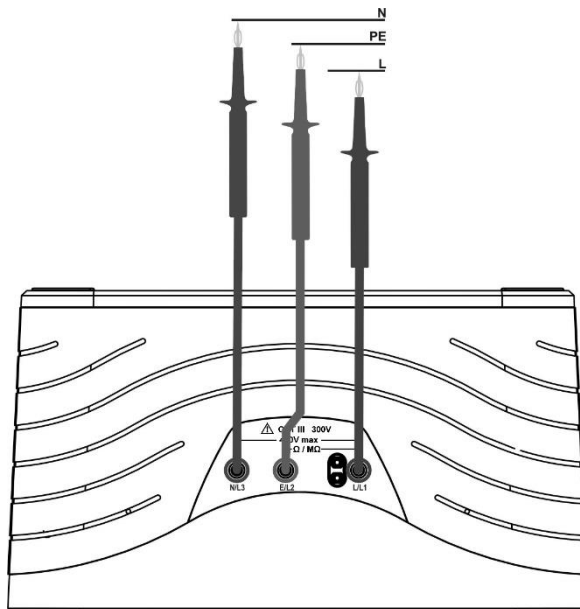


Figure 5 Voltage, RCD, Z_s , Z_e and line impedance measurement at a distribution board

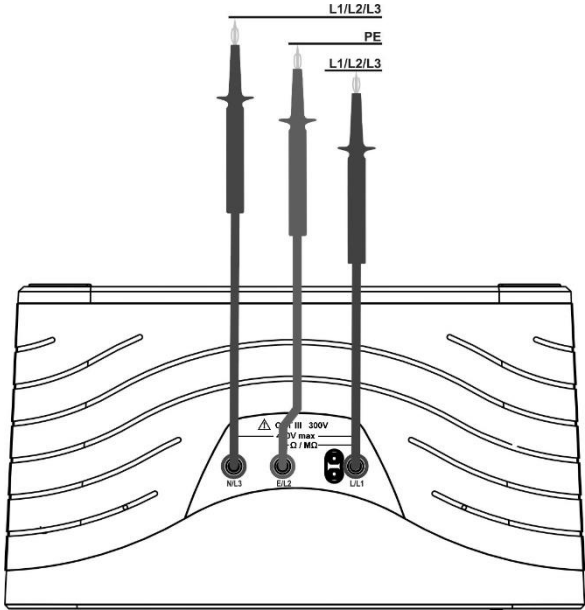


Figure 6 Phase to phase impedance/PSC measurement (DL9130EV only)

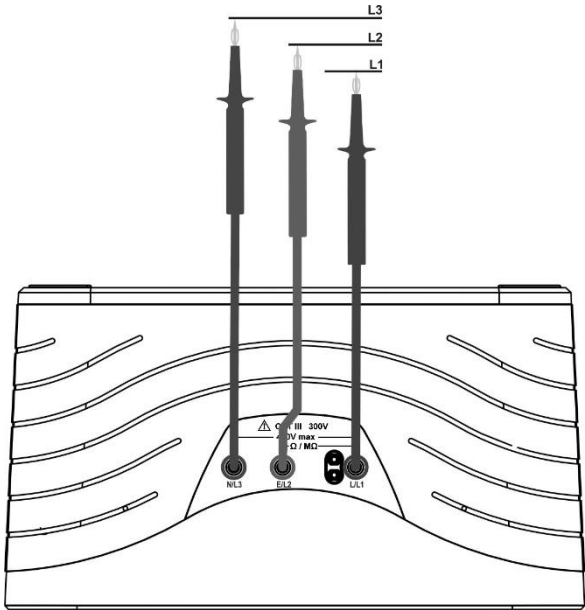


Figure 7 Phase rotation (DL9130EV only)

Limited Warranty & Limitation of Liability

DI-LOG Test Equipment guarantees this product to be free from defects in material and workmanship under normal use and service for a period of 2 years. The period of warranty will be effective from the date of purchase.

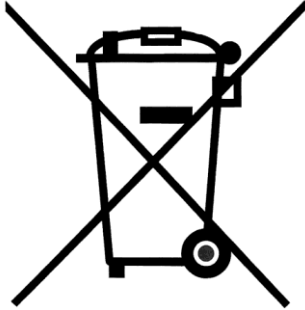
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Due to a policy of continuous development, DI-LOG reserves the right to alter the equipment specification and description outlined in this publication without prior notice. No part of this publication shall be deemed to be part of any contract for the equipment unless specifically referred to as an inclusion within such contract.

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Disposal of Old Product

This product has been designed and manufactured with high quality materials and components that can be recycled and reused.

Please familiarise yourself with the appropriate local separate collection system for electrical and electronic products.

Please dispose of this product according to local regulations. Do not dispose of this product along with normal waste material. The correct disposal of this product will help prevent potential negative consequences for the environment and human health.

Introduction

The DL9120 / DL9130EV is a handheld, battery powered, multi-function electrical installation test instrument capable of performing a comprehensive range of tests, including:

Earth Continuity @ 200mA

Earth Continuity @ 15mA (DL9130EV only)

Insulation Resistance at 250V, 500V and 1000V

Voltage

Frequency

Phase rotation

RCD Trip Time at $\frac{1}{2}I_{\Delta n}$, $I_{\Delta n}$ and $5 \times I_{\Delta n}$

RCD Trip current

RCD Type A, AC and B

RDC-DD testing (DL9130EV only)

Variable RCD test currents

Non trip Zs and PFC measurement on RCD protected circuits

High current Ze and PFC on non RCD protected circuits

Phase to neutral impedance and PSC

Phase to phase impedance and PSC

Power socket wiring polarity

1 User Notes

This instrument and its operating instructions are intended for use by trained personnel.

The following symbols are used in these operating instructions and on the DL9120 / DL9130EV.



Warning of electrical danger!

Indicates instructions must be followed to avoid danger to persons.



Important, follow the documentation! This symbol indicates that the operating instructions must be consulted and adhered to in order to avoid danger.

2 Safety Notes

This DL9120 / DL9130EV is fully compliant with the requirements of:

BS EN 61010-1

BS EN 61010-2-30

BS EN 61557 part 1, 2, 3, 4, 6, 7 and 10.

In order to ensure safe operation of this instrument, all notes and warnings in these instructions must be observed at all times.



The DL9120 / DL9130EV has been designed to make measurements in a dry environment.



The DL9120 / DL9130EV may be used to test circuits with a maximum over-voltage Category III, 300 V AC/DC with reference to earth.



When making connections using the test probes always hold test probes above the hand guards.



The DL9120 / DL9130EV and all associated cables and leads must be checked for signs of damage before equipment is operated.



Prior to any resistance measurement, always ensure that the circuit under test is electrically isolated.

Where safe operation of the DL9120 / DL9130EV is no longer possible it should be immediately shut down and secured to prevent accidental operation.

It must be assumed that safe operation is no longer possible:

- if the instrument or leads show visible signs of damage or
- the instrument does not function or
- after long periods of storage under adverse environmental conditions.



If the DL9120 / DL9130EV is used in a manner not specified by this document, then the protection provided by the equipment may be impaired.

3 Accessories

3.1 Standard Accessories

The DL9120 / DL9130EV is supplied with the following items:

- DL9120 or DL9130EV unit
- Padded neck strap
- Professional carry case
- DI-LOG mains lead
- 1.2 M blue test lead
- 1.2 M red test lead
- 1.2 M green test lead
- Blue crocodile clip
- Red crocodile clip
- Green crocodile clip
- Remote probe with test button (DL9130EV only)
- MN1500 (AA) 1.5v Batteries x 6
- Spare 500mA 1000V HRC FF Fuse
- Operating Instruction Manual
- Calibration certificate



Do not open unit, no other serviceable parts.

4 Unit Description

The DL9120 / DL9130EV is a handheld, multi-function electrical installation test instrument, capable of performing all of the required electrical tests. Tests are selected using the colour coded rotary switch.

4.1 Identifying parts of the DL9120/DL9130EV

The numbering below refers to figure. 1

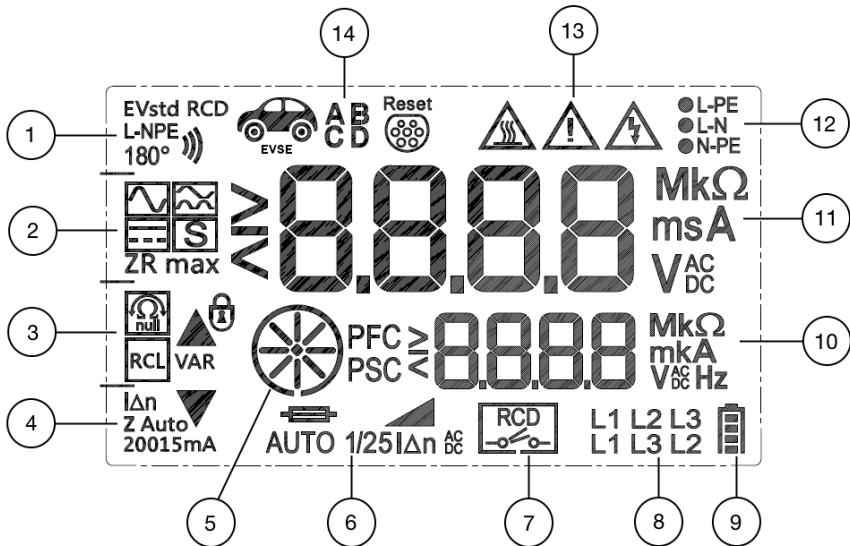
1. Rotary Switch
 - a. Voltage, Frequency and Phase Rotation
 - b. Insulation resistance @ 1000V
 - c. Insulation resistance @ 500V
 - d. Insulation resistance @ 250V
 - e. Continuity @ 200mA or 15mA
 - f. Off
 - g. High current Ze/Zs and PSC/PFC
 - h. Non-trip Zs and PFC
 - i. Auto RCD sequence (EV only on DL9130EV)
 - j. RCD trip time @ $\frac{1}{2} I\Delta N$
 - k. RCD trip time @ $I\Delta N$
 - l. RCD trip time @ $5I\Delta N$
 - m. Variable RCD
 - n. RCD trip current (ramp test)
2. LCD Display
3. Function keys F1, F2, F3 and F4
4. TEST key
5. Test lead input (RED) – Mains Live, Continuity/Insulation +
6. Test lead input (GREEN) – Mains Earth, Continuity/Insulation -
7. Test lead input (BLUE) – Mains Neutral

Note: *Rotating the Rotary Switch through the off position without stopping will maintain the power on the DL9120 / DL9130EV.*

Note: *The DL9120 / DL9130EV will power off if it is inactive for a period of time. In order to re-power the DL9120 / DL9130EV you must rotate the Rotary Switch to off then rotate the Rotary Switch to the required test position.*

Note: *The function performed by keys F1 – F4 depends upon the rotary switch position. For each rotary switch position, the left hand side of the LCD display indicates the function of the key above.*

4.2 LCD display



1. Icons for function key F1. These icons are used to display the available options for the selected test. Repeatedly pressing function key F1 cycles through the available options.
2. Icons for function key F2. These icons are used to display the available options for the selected test. Repeatedly pressing function key F2 cycles through the available options.
3. Icons for function key F3. These icons are used to display the available options for the selected test. Repeatedly pressing function key F3 cycles through the available options.
4. Icons for function key F4. These icons are used to display the available options for the selected test. Repeatedly pressing function key F4 cycles through the available options.
5. Zs/Ze progress indicator / Phase sequence indicator
6. RCD test icons. These icons display the selected RCD test function.
7. RCD status. Indicates when the RCD has tripped during an RCD test.
8. Phase sequence indicator
9. Battery status indicator. Shows the amount of charge in the batteries.
10. Secondary display.
11. Primary display
12. Mains supply status icons. These icons indicate the status of the mains supply between line and earth (L-PE), line and neutral (L-N) and neutral and earth (N-PE) during RCD and Loop tests.

Note: Testing is inhibited if the mains supply is incorrect.

13. Warning Icons. These icons are used to inform the user of the potential of any hazard or warning which may restrict the operation of the DL9120 / DL9130EV. Details are provided in the relevant parts of these operating instructions.
14. EVSE status icons.

5 Using the DL9120 / DL9130EV

5.1 Power On

To turn the DL9120 / DL9130EV on, simply rotate the rotary switch to the required test position, the DL9120 / DL9130EV will display the battery voltage for a short period of time.

Backlight Functionality (Power On with F1 pressed)

If F1 is held down when turning on the DL9120 / DL9130EV then the backlight options will be displayed. The DL9120 / DL9130EV will display **bL** and the existing setting, pressing F1 will cycle through the available options;

- OFF - Backlight functionality is disabled
- bLUE - The backlight is always set to blue
- rGb - LCD backlight is set to blue but will change to green for passed measurements and red for failed measurements.

Press the test key to store the displayed option.

Battery Health Check

The DL9120 / DL9130EV will automatically perform battery health checks at power on and periodically while the DL9120 / DL9130EV is being used.

Note: When the battery symbol is flashing all tests will be inhibited and the batteries should be replaced as described in section 8.4.

Note: The battery health check may indicate that the batteries are healthy but stop tests with a flashing battery symbol during testing. This is due to the different levels of current required during different test types. The batteries should be replaced as described in section 8.4.

5.2 Remote probe (only supplied with DL9130EV)

The remote probe can be used in place of the standard 4mm red test lead. When the remote probe is connected, the TEST button on the probe performs the same function as the TEST key on the DL9120 / DL9130EV. Either TEST button/key can be used to initiate a measurement.

5.3 Continuity Tests



Always ensure that the circuit under test is electrically isolated.



Measurements can be adversely affected by impedances of additional operating circuits connected in parallel or by transient currents.





If the test probes are connected across a voltage of >30V ac/dc then the DL9120 / DL9130EV will automatically display the voltage between the probes, the warning buzzer will sound.

Rotate the rotary switch until the Continuity test is selected.

When the continuity test is selected, the DL9120 / DL9130EV will display the user selectable test options for a short period of time; Buzzer, R max, Lead Zero and 15/200mA (15mA DL9130EV only). If the Buzzer or Lead Zero was previously enabled, then the icon will remain on the display when the continuity test is selected. If the Lead Zero is disabled then the icon will flash to indicate that the leads should be zeroed, if the Buzzer or R max are disabled then the icons will not be displayed.

Functions keys F1-F4 have are used to select the options below:

F1	F2 (DL9130EV)	F3	F4
 Buzzer	R max	 Lead Zero	200 / 15mA (DL9130EV)

Buzzer (F1)

When enabled, the Buzzer will sound when the continuity measurement is less than 20 ohms.

R max (F2, DL9130EV only)

When enabled, the DL9130EV will record the highest continuity measurement taken. This will be displayed in the secondary display. When this function is disabled, the maximum recorded value is reset.

Lead Zero (F3)

The instrument can automatically compensate for the resistance of the test leads as follows:

Fit the supplied crocodile clips to the red and green test leads and connect the crocodile clips firmly together using both lower parts of the jaw. Press

and hold the Lead Zero (F3). The measured resistance of the test leads is shown in the primary display until a beep is heard and the Lead Zero icon is shown on the display. All subsequent measurements will automatically include compensation for the test lead resistance. To disable the function, remove the leads from the load to measure open circuit, press and hold F3.

Note: A maximum test lead resistance of 10 ohms can nulled out. If the test lead resistance is greater than 10 ohms an error beep will indicate that the Lead Zero function has failed, and the display icon will not be shown.

Note: For ease of use, the DL9120 / DL9130EV will store the Lead Zero compensation when switched off and recall this value when next switched on. The stored value is only applicable to the test leads used when the compensation measurement was made. If the test leads are replaced the Lead Zero function should be repeated using the replacement test leads.

200mA / 15mA Test Current (F4, DL9130EV only)

The DL9130EV can perform Continuity tests at both 200mA and 15mA. To switch between the currents the test probes must be open circuit. Press F4 until the required test current is displayed.

The DL9120 can only perform tests at 200mA.

TEST

The Continuity test does respond to the TEST key or Remote probe button, the test will automatically start when a low resistance is detected.

5.4 Insulation Resistance Tests



Always ensure that the circuit under test is electrically isolated.



Should a voltage of >30V be applied to the DL9120 / DL9130EV while in Insulation mode the DL9120 / DL9130EV will enter Voltage mode until the voltage is removed.



If the test probes are connected across a voltage of >30V then the DL9120 / DL9130EV will automatically display the voltage between the probes, the warning buzzer will sound and the TEST key is inhibited.





The DL9120 / DL9130EV will discharge any charged voltage that has been generated due to the insulation test as long as the DL9120 / DL9130EV remains connected to the circuit under test after the test is complete. If the charged voltage is hazardous at the end of the test the DL9120 / DL9130EV will enter voltage mode until the voltage is below 30V.

Should the DL9120 / DL9130EV be removed from the circuit under test during an active Insulation test then any charged voltage CANNOT NOT be discharged by the DL9120 / DL9130EV.

Use the rotary switch to select either the 250V, 500V or 1000V MΩ (DL9130EV only) test.

The DL9120 / DL9130EV will display the Test Lock and battery symbol for 1 second. If the Test Lock feature is required, it should be activated as described below.

Functions keys F1-F4 have are used to select the options below:

F1	F2	F3	F4
 Buzzer	Not Used	 Test Lock	Not used

Buzzer (F1)

When enabled, the Buzzer will sound when the continuity measurement is less than or equal to 1Mohm.

Test Lock (F3)

The Test Lock is used to 'lock' the DL9120 / DL9130EV in a continuous measurement mode, with a single press of the TEST key. When Test Lock is enabled, the LCD shows the padlock icon. When Test Lock is active the TEST key is locked until the option is disabled or the rotary switch is moved to another position.

To enable the Test Lock mode, press the F3 key before the TEST key is pressed or press F3 and the TEST simultaneously.

To disable Test Lock, press F3 or turn the rotary switch to another position.

TEST

To make an insulation resistance measurement, press the TEST key. When a single press is made, the test will start for a duration of 3 seconds. If the TEST key is held down, the test will continue until the TEST button is released. Alternatively, use the Test Lock function to allow

measurements to be started or stopped with a single press of the TEST key.

During a measurement, the measured value is shown in the primary display and the measured test voltage is shown in the secondary display.

5.5 Voltage Measurement and Phase Rotation

F1	F2	F3	F4
Not Used	Not Used	Not Used	Not used

Rotate the rotary switch until the V test is selected. The DL9120 / DL9130EV will automatically measure any voltage present on the test probes. The TEST key is not required.

The function keys do not perform any operations while in Voltage mode.

When an AC voltage is applied to the test probes, the frequency of the measured voltage is shown in the secondary display.

The voltage displayed will be the larger of voltages connected across the RED-BLUE or RED-GREEN test terminals, the connections used to display the voltage will also be indicated on the LCD.

When a 3 phase voltage is connected to the test probes, the voltage between the red and black is displayed in the primary display and the phase sequence icon is shown on the display. When the test probes are connected as follows: RED to L1, GREEN to L2, BLACK to L3 the display icon will show L1 L2 L3.

5.6 Single Phase High Current Earth Loop Impedance / Line Impedance



The DL9120 / DL9130EV will only allow the Earth Loop Impedance test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-neutral (L-N illuminated) and neutral-earth (N-PE **not** illuminated).



When performing 2 wire tests and under certain circumstances, a potential hazardous touch voltage could be determined due to the impedance of the circuit under test, the DL9120/9130 will stop the test immediately indicating "3 LEAd". If this happens, connect all three

connections to the system under test before retrying the test.

If the warning persists in 3 wire mode then there is a potential hazard with the circuit under test.

Rotate the rotary switch until Ze/Zs High is selected. Functions keys F1-F4 have are used to select the options below:

F1	F2	F3	F4
L-PE loop/ L-N loop select	Z Max	Not used	Auto Start

The DL9120 / DL9130EV is capable of performing both 2 wire and 3 wire High Current Loop / Line Impedance tests on single phase installations. In order to perform 2 wire tests the correct connection setting (F1) must match the 2 wire connection being made.

For two wire Line Impedance the connection setting (F1) must be set to L-N and the red and blue must be connected to live and neutral respectively.

For two wire Loop Impedance the connection setting (F1) must be set to L-PE and the red and green must be connected to live and earth respectively.

In 3 wire mode the test will be performed to the L-N / L-PE setting, all three live to red, neutral to blue and earth to green connections must be made.

If the DL9120 / DL9130EV is set to auto-start as soon as the correct connections are made the test will start.

Note: Connections must not be changed (removed or added) when active tests are being run.

Tip: If the DL9120 / DL9130EV is set in Auto mode you can change connection method in between tests. By always connecting the Live (Red) connection last this will stop the test starting while you may still be connecting the earth or neutral connection for a 3 wire test.

Note: When performing 2 wire tests should a potential hazardous touch voltage be determined due to the impedance of the circuit under test, the DL9120 / 9130EV will stop immediately indicating "3 LEAd". If this happens connect all three connections to the system under test before retrying the test.

If the touch voltage warning persists in 3 wire mode, then there is a potential hazard with the circuit under test.

L-PE / L-N (F1)

Press the function key F1 to select either the Earth Loop Impedance test (L-PE) or the Line Impedance test (L-N).

Z Max (F2, DL9130EV only)

When enabled, the DL9130EV will record the highest Loop or Line Impedance measurement taken. This will be displayed in the secondary display. When this function is disabled, the maximum recorded value is reset.

Auto Start (F4)

When Auto start is activated the AUTO icon is shown on the display. Loop measurements will automatically start approximately 3s after the DL9120 / DL9130EV is connected to the correct mains supply via a mains plug or the test probes. The Auto Start function remains enabled if the switch position is changed or the DL9120 / DL9130EV is powered off. To disable the Auto Start function press F4.

Note: If the mains supply is removed within the Auto start countdown period the test will not start.

Note: If the mains power is removed during the loop measurement, or the RCD trips the test will terminate and the display will show "RCD" to indicate that power has been removed.

TEST

To begin the test, press and release the TEST key or select Auto Start using F4.

When the test is complete, the measurement is shown in the primary display and the calculated Prospective Fault Current (PFC for Loop Impedance) or Prospective Short-circuit Current (PSC for Line Impedance) is shown in the secondary display.

5.7 Three Phase Line Impedance



The DL9120 / DL9130EV will only allow Three Phase Line Impedance test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-line (L-N illuminated) and line-earth (N-PE **not** illuminated).



The 2 wire mode is disabled for Three Phase Line Impedance tests.

Rotate the rotary switch until Ze/Zs High is selected. Functions keys F1-F4 have are used to select the options below:

F1	F2	F3	F4
L-PE loop/ L-N loop select	Z Max	Not used	Z Auto Start

Note: When the Ze/Zs High switch position is selected, the DL9130EV will default to the last used setting, even if it has been switched off.

Auto Start (F4)

When Auto start is activated the Z Auto icon is shown on the display. Loop measurements will automatically start approximately 3s after the DL9120 / DL9130EV is connected to correct mains supply via a mains plug or the test probes. The Auto Start function remains enabled if the switch position is changed or the DL9120 / DL9130EV is powered off. To disable the Z Auto Start function press F4.

Note: If the mains supply is removed within the Auto start countdown period the test will not start.

TEST

To begin the test, press and release the TEST key or select Auto Start using F4.

When the test is complete, the measurement is shown in the primary display and the calculated Prospective Short-circuit Current (PSC) is shown in the secondary display.

5.8 Non trip Earth Loop Impedance / Line Impedance



The DL9120 / DL9130EV will only allow the Earth Loop Impedance test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-neutral (L-N illuminated) and neutral-earth (N-PE **not** illuminated).



The DL9120 / DL9130EV can only perform Non trip Earth Loop Impedance tests if the neutral resistance is <10R. Should the neutral resistance be above 10R then the DL9120 / DL9130EV will display the **Hi-N** error.



The 2 wire mode is disabled for Non Trip Loop Impedance tests.

Rotate the rotary switch until Zs Non Trip is selected. Functions keys F1-F4 have are used to select the options below:

F1	F2	F3	F4
L-PE loop/ L-N loop review	Z Max	Not used	Z Auto Start

Note: *When the Zs Non Trip switch position is selected, the DL9130EV will default to the last used setting, even if it has been switched off.*

L-PE / L-N (F1)

F1 can be used to toggle between the L-PE and L-N measurements after the test has been completed.

Z Max (F2, DL9130EV only)

When enabled, the DL9130EV will record the highest Loop or Line Impedance measurement taken. This will be displayed in the secondary display. When switching between the L-PE and L-N functions the relevant Z Max measurement will be displayed.

When this function is disabled or the instrument is turned off, the maximum recorded value is reset.

Auto Start (F4)

When Auto start is activated the Z Auto icon is shown on the display. Loop measurements will automatically start approximately 3s after the DL9120 / DL9130EV is connected to the correct mains supply via a mains plug or the test probes. The Z Auto Start function remains enabled if the switch position is changed or the DL9120 / DL9130EV is powered off. To disable the Z Auto Start function press F4.

Note: *If the mains supply is removed within the Auto start countdown period the test will not start.*

Note: *If the mains power is removed during the loop measurement, the test will terminate and the display will show "RCD" to indicate that power has been removed.*

TEST

To begin the test, press and release the TEST key or select Z Auto Start using F4.

During the test, progress is shown by the rotating progress icon. When the test is complete, the loop measurement is shown in the primary display and the calculated Prospective Fault Current (PFC) or Prospective Short-circuit Current (PSC) is shown in the secondary display.

Tip: *A Line Impedance measurement is automatically made as part of the Earth Loop Impedance test. The Line Impedance measurement (L-N) and Prospective Short-circuit Current (PSC) can be viewed by simply pressing function key F1, without the need to repeat the test.*

5.9 Auto RCD Test Sequence



The DL9120 / DL9130EV will only allow the RCD test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-neutral (L-N illuminated) and neutral-earth (N-PE **not** illuminated).



Potential fields from other earthing installations, large voltages between the protective conductor and earth, large voltage between the neutral and earth or leakage currents in the circuit following the residual current protection device may influence the measurement.





Equipment which is connected downstream of a residual current protective device (RCD) may cause a considerable extension of the operating time.



The DL9120 / DL9130EV will determine the fault voltage that may appear on the protective conductor during the test. If the fault voltage is greater than 25V the DL9120 / DL9130EV will indicate >25V on the LCD, but the user may proceed with the test. If the fault voltage is great than 50V, this is indicated on the LCD and the test is inhibited.

The Auto test is used to automatically perform a sequence of RCD trip time tests with a single press of the TEST key. Each time the RCD trips, the sequence will automatically continue once the RCD is reset.

Functions keys F1-F4 have are used to select the options below:

F1 (DL9130EV)	F2	F3	F4
Std RCD / EV RCD mode	RCD type (not EV mode)	 Recall	 Test current

Switches between Standard RCD and EV RCD mode (F1, DL9103EV only)

This switches the DL9103EV between the standard RCD auto test sequence and the EV auto test sequence.

std RCD
EV RCD

Standard Auto RCD Mode

Auto EV Mode (DL9130EV only)

AC/DC/Selective (F2, not available in EV mode)

Function key F2 is used to select the required RCD type: AC, DC sensitive and pure DC combined with standard or selective RCD types. Each time the F2 key is pressed, the next option is selected



RCD Type AC (Sinusoidal Waveform)



RCD Type AC Selective (Sinusoidal Waveform)



RCD Type A (Pulsating Waveform)



RCD Type A Selective (Pulsating Waveform)



RCD Type B (DC)

During selective tests, the DL9120 / DL9130EV will display a delay timer which counts down from 30s to 0s. Pressing the Test key or turning the rotary switch while the DL9130EV is counting will terminate the count.

Recall (F3)

The RCL (Recall) key is used to recall the results of the last automatic RCD test performed by the DL9120 / DL9130EV. The LCD will update to show all of the relevant parameters for the result displayed. Repeat press the F3 key to cycle through the results.

Pressing any key while displaying a recalled measurement will return the DL9120 / DL9130EV to the normal pre-test screen.

Rated residual operating current $I_{\Delta n}$

The test current can be selected by pressing the F4 key. Repeat press the F4 key until the desired RCD test current is displayed.

TEST

When the required settings have been selected, press the TEST key to begin the sequence. The test sequence will perform the following tests at set test current;

Auto Sequence		Display
$1/2I\Delta n$	0°	Trip Time
$1/2I\Delta n$	180°	Trip Time
$I\Delta n$	0°	Trip Time
$I\Delta n$	180°	Trip Time
$5I\Delta n$	0°	Trip Time
$5I\Delta n$	180°	Trip Time

The Trip Time is shown in the primary display.

During the sequence if any test passes and does not trip the RCD then the DL9120 / DL9130EV will move on to the following test.

If any test passes and does trip the RCD then the DL9120 / DL9130EV will move onto the following test as soon as the RCD has been reset.

If any test fails then the sequence is aborted.



Shows the status of the RCD under test.

Once the test sequence is complete the results from the test sequence can be reviewed using F3 (Recall).

5.10 Auto EV Test Sequence (DL9130EV only)



The DL9130EV will only allow the RCD test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-neutral (L-N illuminated) and neutral-earth (N-PE **not** illuminated).



Potential fields from other earthing installations, large voltages between the protective conductor and earth, large voltage between the neutral and earth or leakage currents in the circuit following the residual current protection device may influence the measurement.





Equipment which is connected downstream of a residual current protective device (RCD) may cause a considerable extension of the operating time.



The DL9130EV will determine the fault voltage that may appear on the protective conductor during the test. If the fault voltage is greater than 25V the DL9130EV will indicate >25V on the LCD, but the user may proceed with the test. If the fault voltage is great than 50V, this is indicated on the LCD and the test is inhibited.

The Auto test is used to automatically perform a sequence of RDC-DD & RCD trip time tests with a single press of the TEST key. Each time the RDC-DD or RCD trips, the sequence will automatically continue once the RDC-DD / RCD is reset.

Functions keys F1-F4 have are used to select the options below:

F1	F2	F3	F4
Std RCD / EV RCD mode	Not used	 Recall	 Test current

Switches between RCD and EV mode (F1, DL9103EV only)

This switches the DL9103EV between the standard RCD auto test sequence and the EV auto test sequence.

std RCD
EV RCD

Standard Auto RCD Mode

Auto EV Mode (DL9130EV only)

Recall (F3)

The RCL (Recall) key is used to recall the results of the last automatic RCD test performed by the DL9120 / DL9130EV. The LCD will update to show all of the relevant parameters for the result displayed. Repeat press the F3 key to cycle through the results.

Pressing any key while displaying a recalled measurement will return the DL9120 / DL9130EV to the normal pre-test screen.

Rated residual operating current IΔn

The test current can be selected by pressing the F4 key. Repeat press the F4 key until the desired RCD test current is displayed. The only options available are 6mA for RDC-DD or 30mA for RDC Type B.

TEST

When the required settings have been selected, press the TEST key to begin the sequence. The test sequence will perform the following tests at set test current.

6mA DD Setting		30mA Setting		Display
+6mA	RDC-DD	30mA	Type B	Trip Time
-6mA	RDC-DD	30mA	Type B	Trip Time
30mA 1/2I Δ n	0° AC	30mA 1/2I Δ n	0° AC	Trip Time
30mA 1/2I Δ n	180° AC	30mA 1/2I Δ n	180° AC	Trip Time
30mA I Δ n	0° AC	30mA I Δ n	0° AC	Trip Time
30mA I Δ n	180° AC	30mA I Δ n	180° AC	Trip Time
30mA 5I Δ n	0° AC	30mA 5I Δ n	0° AC	Trip Time
30mA 5I Δ n	180° AC	30mA 5I Δ n	180° AC	Trip Time

The Trip Times are shown in the primary display.

Once the test sequence is complete the results from the sequence can be reviewed using F3 (Recall) or the sequence can be extended by pressing TEST to include;

6mA DD Setting		30mA Setting		Display
+6mA	RDC-DD	30mA	Type B	Trip Current
-6mA	RDC-DD	30mA	Type B	Trip Current
30mA	0° AC	30mA	0° AC	Trip Current
30mA	180° AC	30mA	180° AC	Trip Current

During the sequence if any test passes and does not trip the RCD then the DL9130EV will move on to the following test.

If any test passes and does trip the RCD then the DL9130EV will move onto the following test as soon as the RCD has been reset.

If any test fails then the sequence is aborted.

Once the Trip Current (Ramp) tests have been performed, all of the results from the test sequence can be reviewed using F3 (Recall).

The following icons will indicate the status throughout the test sequence.



Indicates that the DL9130EV is in EV Mode

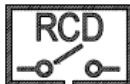


Indicates to the user to select the appropriate Control Pilot (CP) State on the EV adapter.

Reset



Indicates that the EV charger needs to be reset.



Shows the status of the RCD under test.

5.11 RCD Trip Time Tests (x1/2, x1 and x5)



The DL9120 / DL9130EV will only allow the RCD test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-neutral (L-N illuminated) and neutral-earth (N-PE **not** illuminated).



Potential fields from other earthing installations, large voltages between the protective conductor and earth, large voltage between the neutral and earth or leakage currents in the circuit following the residual current protection device may influence the measurement.



Equipment which is connected downstream of a residual current protective device (RCD) may cause a considerable extension of the operating time.



The DL9120 / DL9130EV will determine the fault voltage that may appear on the protective conductor during the test. If the fault voltage is greater than 25V the DL9130EV will indicate >25V on the LCD, but the user may proceed with the test. If the fault voltage is great than 50V, this is indicated on the LCD and the test is inhibited.

Use the rotary switch to select the $\frac{1}{2} I_{\Delta n}$, $I_{\Delta n}$ or $5 I_{\Delta n}$ test position.

The $\frac{1}{2} I_{\Delta n}$ test will perform the RCD test with a current of 50% of that indicated on the LCD.

The $I_{\Delta n}$ test will perform the RCD with the test current indicated on the LCD.

The $5 I_{\Delta n}$ test will perform the RCD with 500% that which is indicated on the LCD.

F1	F2	F3	F4
0° / 180°	RCD type	Variable Test Current	$I_{\Delta n}$ Test current

0° / 180° (F1)

Use the F1 key to alternate between the starting angle of the current. All RCD tests will start on zero crossing. For type B RCDs 0° will perform positive dc tests and for 180° negative dc tests.

RCD Type (F2)

Function key F2 is used to select the required RCD type: AC, DC sensitive and pure DC combined with standard or selective RCD types. Each time the F2 key is pressed the next option is selected



RCD Type AC (Sinusoidal Waveform)



RCD Type AC Selective (Sinusoidal Waveform)



RCD Type A (Pulsating Waveform)



RCD Type A Selective (Pulsating Waveform)



RCD Type B (DC)

During selective tests the DL9120 / DL9130EV will display a delay timer which counts down from 30s to 0s. Pressing the Test key or turning the rotary switch while the DL9120 / DL9130EV is counting will terminate the count.

Variable Current (F3)

Function key F3 is used to select the variable RCD current function. The RCD current is set using the Variable RCD function and cannot be altered in this mode.

Rated residual operating current $I_{\Delta n}$ (F4)

The test current can be selected by pressing the F4 key. Depending on the RCD Type selected the following options are available

Dial	Type AC Setting	Type A Setting	Type B Setting
x1/2	10, 30, 100, 300, 500mA	10, 30, 100, 300mA	10, 30, 100mA
x1	10, 30, 100, 300, 500mA	10, 30, 100, 300mA	6 (RDC-DD), 10, 30, 100mA
x5	10, 30, 100mA	10, 30, 100, 300mA	10, 30mA

TEST

To start a test press the TEST key, the test will be performed and the trip time of the RCD will be displayed in the primary display.

5.12 RCD Variable Mode



The DL9120 / DL9130EV will only allow the RCD test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-neutral (L-N illuminated) and neutral-earth (N-PE **not** illuminated).



Potential fields from other earthing installations, large voltages between the protective conductor and earth, large voltage between the neutral and earth or leakage currents in the circuit following the residual current protection device may influence the measurement.





Equipment which is connected downstream of a residual current protective device (RCD) may cause a considerable extension of the operating time.



The DL9120 / DL9130EV will determine the fault voltage that may appear on the protective conductor during the test. If the fault voltage is greater than 25V the DL9130EV will indicate >25V on the LCD, but the user may proceed with the test. If the fault voltage is great than 50V, this is indicated on the LCD and the test is inhibited.

Use the rotary dial to select the VAR RCD mode.

F1	F2	F3	F4
0° / 180°	RCD type	 Increase current	 Decrease current

0° / 180° (F1)

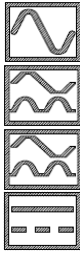
Use the F1 key to alternate between the starting angle of the current. All RCD tests will start on zero crossing. For type B RCDs 0° will perform positive dc tests and for 180° negative dc tests.

AC/DC/Selective (F2)

Function key F2 is used to select the required RCD type: AC, DC sensitive and pure DC combined with standard or selective RCD types. Each time the F2 key is pressed the next option is selected



RCD Type AC (Sinusoidal Waveform)



RCD Type AC Selective (Sinusoidal Waveform)

RCD Type A (Pulsating Waveform)



RCD Type A Selective (Pulsating Waveform)

RCD Type B (DC)

During selective tests, the DL9120 / DL9130EV will display a delay timer which counts down from 30s to 0s. Pressing the Test key or turning the rotary switch while the DL9120 / DL9130EV is counting will terminate the count.

Increase Test Current (F4)

Increases the test current displaying the secondary display.

Decrease Test Current (F4)

Decreases the test current displaying the secondary display.

TEST

To start a test, press the TEST key, the test will be performed and the trip current of the RCD will be displayed in the primary display.

5.13 RCD trip current (Ramp) Tests



The DL9120 / DL9130EV will only allow the RCD test to be performed if the correct voltages are detected between line-earth (L-PE illuminated), line-neutral (L-N illuminated) and neutral-earth (N-PE **not** illuminated).



Potential fields from other earthing installations, large voltages between the protective conductor and earth, large voltage between the neutral and earth or leakage currents in the circuit following the residual current protection device may influence the measurement.



Equipment which is connected downstream of a residual current protective device (RCD) may cause a considerable extension of the operating time.



The DL9120 / DL9130EV will determine the fault voltage that may appear on the protective conductor during the test. If the fault voltage is greater than 25V the DL9130EV will

indicate >25V on the LCD, but the user may proceed with the test. If the fault voltage is great than 50V, this is indicated on the LCD and the test is inhibited.

Use the rotary dial to select the RAMP mode.

F1	F2	F3	F4
0° / 180°	RCD type	Variable Test Current	Test current

0° / 180° (F1)

Use the F1 key to alternate between the starting angle of the current. All RCD tests will start on zero crossing. For type B RCDs 0° will perform positive dc tests and for 180° negative dc tests.

AC/DC/Selective (F2)

Function key F2 is used to select the required RCD type: AC, DC sensitive and pure DC combined with standard or selective RCD types. Each time the F2 key is pressed the next option is selected



RCD Type AC (Sinusoidal Waveform)



RCD Type AC Selective (Sinusoidal Waveform)



RCD Type A (Pulsating Waveform)



RCD Type A Selective (Pulsating Waveform)






RCD Type B (DC)

During selective tests the DL9120 / DL9130EV will display a delay timer which counts down from 30s to 0s. Pressing the Test key or turning the rotary switch while the DL9120 / DL9130EV is counting will terminate the count.

Rated residual operating current IΔn (F4)

The test current can be selected by pressing the F4 key. Depending on the RCD Type selected the following options are available

Type AC Setting 	Type A Setting 	Type B Setting 
10, 30, 100, 300, 500mA	10, 30, 100, 300mA	6 (RDC-DD), 10, 30, 100mA

TEST

To start a test press the TEST key, the test will be performed and the trip current of the RCD will be displayed in the primary display. In variable mode the RCD test current performed meets the current specification for the x1 test.

5.14 Warning / Test Active Indications

The following indications are used across a number of functions in the DL9120 / DL9130EV.



Indicates that the DL9120 / DL9130EV is hot. Please allow to cool before proceeding.



Indicates that a hazardous test is in progress with by the DL9120 / DL9130EV.



Indicates that a hazardous test voltage is being generated by the DL9120 / DL9130EV.



Mains status indications. Static icons indicate that the voltage is present and correct, flashing indicates an incorrect voltage present.



Battery level. Flashing indicates that the battery needs replacing.



This icon may appear during test, this will animate indicating that the test is in progress. Please leave DL9120 / DL9130EV to allow test to complete.

6 Electrical Specifications

6.1 Earth Continuity

Test Voltage Open Circuit	>4V
Test Current	>200mA into 2R >15mA into 2R (DL9130EV only)
Display Range	0.00Ω - 2000Ω @ 200mA 0.00Ω - 200Ω @ 15mA (DL9130EV)
Measuring Range (EN 61557-4)	0.10Ω – 2000Ω @ 200mA 0.10Ω – 200Ω @ 15mA (DL9130EV)
Resolution	0.01Ω maximum
Accuracy	±2% ±5 digits
Number of repeat tests as per EN61557-4	Approx 4000

6.2 Insulation Resistance

Test Voltage	250V / 500V / 1000V
Test Voltage Specification	-0% +20% (open circuit)
Test Voltage @ 1mA	>1mA into $U_N \times (1000\Omega/V)$
Test Current Short Circuit	<2mA
Display Range	0.01MΩ - 200MΩ
Measuring Range (EN 61557-2)	0.05MΩ – 200MΩ
Resolution	0.01MΩ maximum
Accuracy	±5% ±5 digits
Test Voltage Indication	±5%
Accuracy	
Number of repeat tests as per EN61557-2	Approx 3000

6.3 Earth Loop Impedance

Supply Voltage	195 – 253V, 45Hz – 65Hz
Nominal Test Current	<15mA (non-trip test) 3A (high current test)
Display Range	0.01Ω - 2000Ω
Measuring Range (EN 61557-3)	0.10Ω - 1999Ω (high current) 1.00Ω – 1999Ω (non-trip)
Resolution	0.01Ω maximum
Accuracy	±5%±5d (high current) ±5%±12d (non-trip, 1.00Ω - 20Ω) ±5%±5d (non-trip, 20Ω - 1999Ω)
PFC Range	0 – 26kA

6.4 Line Impedance

Supply Voltage	195V – 253V, 45Hz – 65Hz 328V - 440V, 45Hz – 65Hz
Nominal Test Current	3A
Display Range	0.01Ω - 2000Ω
Measuring Range	0.1Ω - 1999Ω
Resolution	0.01Ω maximum
Accuracy	±5% ±5 digits
PFC Range	0kA – 26kA

6.5 RCD

Supply Voltage	195V – 253V, 45Hz – 65Hz
Nominal Test Currents	10mA, 30mA, 100mA, 300mA, 500mA and Variable Mode
Test Current Accuracy	-0% +10% at I _{Δn} and 5I _{Δn} -10% +0% at ½ I _{Δn}
Trip Time Ranges	0ms – 2000ms, ½ I _{Δn} 0ms – 300ms, I _{Δn} General 0ms – 500ms, I _{Δn} Selective 0ms – 40ms, 5I _{Δn}
Trip Time Accuracy	±5% ±2 digits
Ramp Current Range	½ I _{Δn} to 1.1 I _{Δn}
Trip Current Measurement Accuracy	10%

6.6 RDC-DD (DL9130EV only)

Supply Voltage	195V – 253V, 45Hz – 65Hz
Nominal Test Currents	6mA
Test Current Accuracy	-0% +10%
Trip Time Ranges	0ms – 10000ms
Trip Time Accuracy	±5% ±2 digits
Ramp Current Range	½ I _{Δn} to 1.1 I _{Δn}
Trip Current Measurement Accuracy	10%

6.7 Voltage/Frequency Measurement

Display Range	0V – 480V
Voltage Measuring Range	0V – 480V
Resolution	1V
Accuracy	±5% ±2 digits
Frequency Range	45Hz – 65Hz
Frequency Accuracy	±1Hz

7 Environmental Conditions

The DL9120 / DL9130EV has been designed to perform tests and measurements in a dry indoor environment.

Operating Altitude 0 to 2000 metres.

Overvoltage category IEC 60664/IEC 61010, 300V Category III.

Pollution degree 2 according to IEC 61010-1.

Protective system IP40 according to IEC 60529.

Electromagnetic compatibility (EMC). Interference immunity and emitted interference conforming to IEC 61326-1.

Operating temperature range of 0°C to 40°C.

Operating humidity up to 75% without condensation.

The DL9120 / DL9130EV can be stored at any temperature in the range -25°C to +65° The batteries should be taken out of the instrument for storage.

8 Maintenance



Before opening the DL9120 / DL9130EV ensure that it is disconnected from all voltage! Electric shock danger!

8.1 Preparing to work on the DL9120 / DL9130EV.

Make the DL9120 / DL9130EV is voltage free as follows, before opening the instrument;

Power the unit off using the rotary switch by selecting the Off position on the rotary switch.

Disconnect all of the test leads from the unit

8.2 Securing the DL9120 / DL9130EV

Under certain conditions safe operation of the DL9120 / DL9130EV can no longer be assumed:

Visible damage of the instrument case.

Incorrect measurement results.

Recognisable abuse to the instrument due to prolonged storage under improper conditions.

Recognisable abuse to the instrument due to extraordinary transportation stress.

Check the battery compartment for signs of battery electrolyte leakage.

In these cases, the DL9120 / DL9130EV should be immediately switched off, disconnected from any test or measurement function and secured to prevent any further use.

8.3 Cleaning

Clean the external case of the DL9130EV with a clean dry cloth.

Avoid using solvents and abrasive scouring agents to clean the external case of the DL9120 / DL9130EV.

Check the battery contacts and compartment are free of electrolytic contamination.

Any contamination of the battery contacts or compartment should be cleaned with a dry cloth.

8.4 Battery Replacement



Before opening the DL9120 / DL9130EV ensure that it is disconnected from all voltage! Electric shock danger!

Power the unit off by selecting the Off position on the rotary switch.

Disconnect all the test leads from the unit

Position the DL9120 / DL9130EV face down and release the 4 captive screws in the battery compartment cover.

Remove the battery compartment cover.

Remove the discharged batteries from the compartment.

Fit a new set of MN1500 (AA) 1.5v batteries.

Relocate the battery cover over the battery compartment and fasten in position with the battery cover captive screws.

8.5 Replacing the Fuse.



Before opening the DL9120 / DL9130EV ensure that it is disconnected from all voltages! Electric shock danger!



All replacement fuse types are specified for ratings and size on the battery compartment cover on the DL9120 / DL9130EV.

Power the unit off by selecting the Off position on the rotary switch.

Disconnect all the test leads from the unit.

Position the DL9120 / DL9130EV face down and release the captive 4 screws in the battery compartment cover.

Remove the battery compartment cover.

Lift one end of the fuse out of the fuse holder with the help of a flat bladed screwdriver.

Lift the defective fuse completely out of the fuse holder.

Insert a new fuse as described and specified by the text on the battery compartment cover.

Ensure that the new fuse is seated and centred in the fuse holder.

Relocate the battery cover over the battery compartment and fasten in position with the battery cover captive screws.

8.6 Service and Calibration.

To maintain the specified accuracy of the measurement results, the instrument must be recalibrated at regular intervals by either the manufacturer or an authorised Service Agent. We recommend a recalibration period of one year.

8.7 Spare Parts.

	Part No.
3 wire lead set c/w croc clips (unfused)	LS3W9100
3 wire lead set c/w croc clips (fused)	FL9100
Mains lead	ML9100
Remote Probe	RP9100
Carrying Case	CCDL9100

For help or advice on Service and Calibration contact:

Service Department
Di-Log Test Equipment
28 Wheel Forge Way
Trafford Park
Manchester
M17 1EH

Sales Tel: 0161 877 0322
Service Tel: 0161 877 3621
Fax: 0161 877 1614
email: support@dilog.co.uk
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