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## EASYPAT 2100 PAT TESTER

**MARTINDALE**  
● ● ● **ELECTRIC**

Trusted by professionals

## INSTRUCTIONS



**SAFETY INFORMATION: Always read before proceeding.**

## **WARNING**

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

**In order to avoid the danger of electrical shock, it is important that proper safety measures are taken when working with voltages exceeding 30V AC rms, 42V AC peak or 60V DC. Never exceed the maximum allowable input level for each function and range. Refer to the specifications for maximum inputs. Never touch exposed wiring, connections or live circuits.**

**The EasyPat must only be used in conditions and for the purpose which it has been constructed. Attention should be paid to safety instructions, technical specifications and use of the EastPat in dry surroundings.**

**Always inspect your meter, test leads and accessories for any sign of damage before use. If any abnormal conditions exist (e.g: broken test leads, cracked case, display not reading, etc.), do not attempt to use it. Do not expose it to direct sunlight, excessive temperature or moisture.**

**Keep these instructions for future reference. Updated instructions and product information are available at: [www.martindale-electric.co.uk](http://www.martindale-electric.co.uk).**

## **SYMBOLS:**

-  **Equipment complies with relevant EU Directives**
-  **AC (Alternating Current)**
-  **Ground**
-  **Direct Current**
-  **Equipment protected by Double Insulation (Class II)**
-  **Caution - refer to accompanying documents**
-  **Caution - risk of electric shock**

Perform earth continuity and insulation tests as 3.1 & 3.3.

If earth and insulation tests have successfully passed, perform a run current test and check the illumination of Lamp 1 & Lamp 2 against the table printed on the EasyPat front panel.

The Run Leakage test would not normally be carried out on extension leads etc, however if the button is pressed then the display will indicate a value of approx 1.3mA while under test - this is not indicating a fault in the lead but is simply a product of the test current drawn.

## **4. MAINTENANCE**

### **4.1 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.

### **4.2 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.

### **4.3 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.

### **4.4 Storage Conditions**

The EasyPat 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.

### **4.5 Warranty**

Faults in manufacture and materials are fully guaranteed for 12 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.

**NOTE:** With Class I appliances it is important to test the earth continuity prior to flash testing otherwise the test may not be valid.

### **DO NOT TOUCH THE TEST APPLIANCE DURING TEST.**

With Class II appliances, the flash gun should be plugged into the safety test socket. The flash gun is operated by pulling its trigger to expose its probe tip which should be held firmly against any exposed metal surfaces on the appliance during the flash test.

With Class II appliances the flash gun should be held firmly against any exposed metal surfaces on the appliance for the duration of the flash test.

If there is not exposed metalwork on the appliance, metal foil should be wrapped around the appliance and the Flash gun held in contact with the foil.

With sub assemblies attach the Wander earth clip to any metal which would normally be connected to earth. Link together all connections which would normally be connected to mains phase or neutral. Hold the flash gun firmly against a mains connection for the duration of the test.

Press and hold the 'FLASH' key. The orange flash indicator will illuminate and the flash leakage current will be measured and shown on the display for as long as the key is held down.

If the leakage current exceeds the preset limit the EasyPAT will automatically switch off the high voltage.

### **3.6 Lead Test**

**DO NOT PERFORM FLASH TEST while lead is connected to EasyPat IEC connector.**

Ensure the earth wander lead is connected to the EasyPat. The crocodile clip however should not be used and must not be connected to the lead under test nor any earth path.

#### **For IEC Leads**

Plug the lead into the appropriate EasyPat mains socket. Plug the IEC connector into the EasyPat IEC socket.

#### **For Extension Leads**

Plug the lead into the appropriate EasyPat mains socket. Use the short 230V IEC lead EX-332 (or optional 110V LEAD EX-331) to connect the extension lead outlet to the EasyPat IEC socket.

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## 1. INTRODUCTION

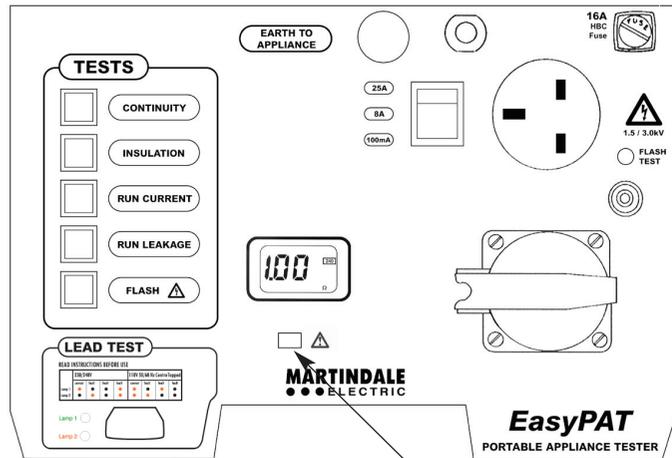


Fig. 1  
Over Temperature Indicator

### 1.1 Description

The Martindale EasyPat is an LCD indicating portable appliance tester, which is housed in a rugged injection moulded case with a removable lid. The base of the case contains the complete power and electronic circuitry. Basic safety instructions are presented on the inside of the lid, and a pannier bag, which provides storage for the flash gun, supply adaptors and comprehensive instruction manual, clips onto the top of the lid.

Operation of the Martindale EasyPat is straightforward. The five main tests, continuity, insulation, run current, run leakage and flash, provided by this instrument are selected by depressing one of five push-button switches on the front panel. A three position rocker switch selects a test current of 100mA DC, 8A AC or 25A AC for the continuity test. While the key is depressed the relevant measurement is displayed on the large, custom LCD Display.

The Martindale EasyPat allows fast, simple testing on all tools, appliances and IT equipment in accordance with the recommendations of the Electricity At Work Act, the Health And Safety Executive and the Electronic And Business Equipment Association. It should be noted that Class I equipment is earthed whereas Class II equipment is not earthed (double-insulated), usually denoted by the symbol

### WARNING

This test can be hazardous if the earth continuity and insulation of the appliance have not been checked prior to performing a run test. Always ensure that any appliance with electrically energised moving parts is securely mounted before performing a test.

**ENSURE THAT THE WANDER EARTH CLIP IS DISCONNECTED.  
DO NOT TOUCH THE APPLIANCE DURING TESTS.  
DO NOT RUN THE APPLIANCE LONGER THAN NECESSARY.  
DO NOT USE THE EASYPAT AS A MAINS POWER OUTLET.**

### Run current

Press and hold the 'RUN CURRENT' key. The display will show the current drawn by the appliance for as long as the button is held depressed.

### Run Leakage Current

Press and hold the 'RUN LEAKAGE' key. The display will show the earth leakage current for the appliance for as long as the button is held depressed. Ideally this should register as 0mA - any higher reading gives an indication of current leakage to earth which can be useful for tracking down appliances that are causing nuisance tripping of RCDs.

### WARNING

If the fuse in the EasyPat ruptures it **must** be replaced with a fuse as specified. Fitting of any other type or rating of fuse is hazardous and may result in damage to the EasyPat.

### 3.5 Flash

**NOTE:** Due to the high voltages present during this test it should only be carried out by suitable trained operators. Always inspect the flash gun for damage before use.

Flash voltage is applied:

- i) Along the mains lead phase/neutral and the earth for a Class I instrument (test voltage 1.5kV).
- ii) Along the mains lead phase/neutral and the flash probe for Class II instruments (test voltage 3kV).
- iii) Along the flash gun and the Wander earth clip for testing Class I sub assemblies not connected to any mains plug (test voltage 1.5kV).

This test severely stresses the insulation of the appliance under test and should not be carried out on a routine maintenance basis. Always check the appliance manufacturers data to ensure that permanent damage will not be done to the appliance if a flash test is carried out.

To establish the maximum cable lengths permissible for other limits of earth continuity divide the new limit by 0.1 and multiply by length for 0.1Ω, e.g.

Maximum cable length for 0.5mm<sup>2</sup> on 0.1. limit = 2 metres

Maximum cable length for 0.5mm<sup>2</sup> on 0.2. limit = (0.2 /0.1) x 2 = 4 metres

**NOTE:** During this test high currents are generated by the EasyPat which will cause a rapid increase in the temperature within the instrument.

A thermal trip has been incorporated into the instrument to protect against over temperature. When triggered it will inhibit all test functions and illuminate the red indicator which is located below the display. When the internal temperature returns within acceptable limits normal operation of the instrument will be restored and the red indicator will extinguish.

### 3.2 Earth Continuity (100mA)

This test is only required for earthed (Class I) appliances whose exposed metal work is solely for screening RF Radiation. Such metalwork could be damaged by the 25A or 8A test currents, and so the test current is limited to 100mA. The method of testing is similar to 3.1 except that the rocker switch is set to its 100mA position.

### 3.3 Insulation

The integrity of the insulation of the appliance is tested by applying 500V DC between phase/neutral linked together and earth. The measured insulation resistance is displayed.

Fit the wander earth clip to any exposed metal on the appliance. If there is no exposed metalwork on the appliance, metal foil should be wrapped around the appliance and the wander lead clip attached to the foil. If there are several separate metal parts which are apparently electrical isolated from a visual inspection, each should be tested.

Press and hold the 'INSULATION' key. The display will show the measured insulation value for as long as the button is held depressed. If filter components are fitted to the appliance being tested these may cause erroneous readings during the first few seconds of the test. To ensure a valid reading allow a few seconds before noting the displayed result.

**NOTE:** It is important to test the earth continuity in a Class I appliance prior to this test. Otherwise, this test may not be valid.

### 3.4 Run

Full mains supply is applied to the appliance. The running current or the earth leakage current, depending on the button pressed, can be measured and displayed.

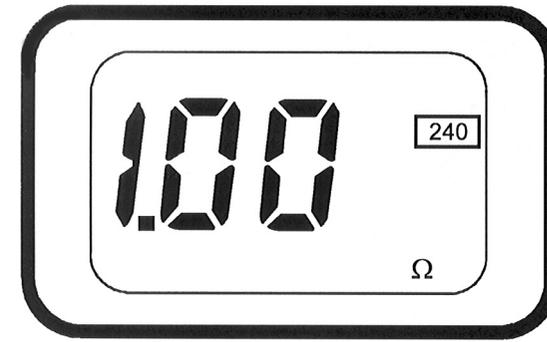


Fig . 2 Display of reading (1.00Ω)

The instrument can be connected directly to a 230V supply using the 13A plug fitted on the supply lead or to a 110V supply, using the adaptor supplied. On power up the EasyPat monitors the supply voltage, adjusts its measurement circuits and selects the correct test socket accordingly. The display indicates the supply voltage on which tests will be carried out.

Appliances to be tested should be connected into the appropriate test socket and should be compatible with the supply voltage to the instrument. If the appliance has an on/off switch, it should be set to the on position to ensure that the appliance is fully tested.

If the value for the measured parameter is outside the range of the EasyPat then the display will show overrange. This is indicated on the display by a single 1. with no following zeros. Fig. 3 shows the earth continuity display if the measured value is greater than 1.99Ω.

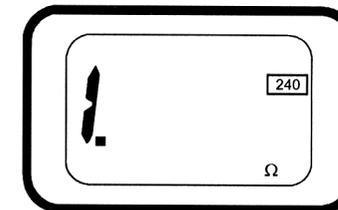


Fig. 3

### NB

**On the earth bond tests, overrange means above 1.99Ω and is a fail.**

**On the insulation test it means above 19.9MΩ and is a pass.**

**The wander earth lead is a three-wire lead that forms part of the measuring circuitry: It is important that the wander earth lead is plugged into the front panel of the EasyPat 2100 whenever the EasyPat is in use.**

A red light which is located below the display illuminates if the instrument overheats during a continuity test sequence. All test functions are disabled for as long as this indicator is illuminated and will only be restored after the instrument has cooled and the red indicator has turned off. See Fig. 2.

### 1.2 Earth / Continuity (8A and 25A)

For this test a voltage of 6V AC is applied between the earth pin of the plug of the appliance being tested and its exposed metal work, via the wander earth lead. The magnitude of the test current is either 8A or 25A selected by the three position rocker switch. The high current applied in this test verifies that the protective earth path will carry the fault current in the event of an insulation breakdown within the appliance.

### 1.3 Earth / Continuity (100mA)

The test is similar to that described in 1.2 except that a constant current of 100mA DC is applied. This reduced current is required to test IT equipment whose earth path could be damaged by the higher currents.

### 1.4 Insulation

500V DC is applied between the appliance phase and neutral joined together and earth to ensure that this insulation is at an acceptable level.

### 1.5 Run Current

The appliance under test is operated at the nominal supply voltage and the current to it is monitored. Care should be taken to ensure that there is no mechanical hazard with this test and that the wander earth lead is disconnected.

### 1.6 Run Leakage

This test is similar to that described in 1.5 except that the current flow in the earth lead is monitored to check that no potentially hazardous, voltage induced, earth leakage paths are created when the appliance is operating.

### 1.7 Flash

This is an optional test that may be omitted. On Class I appliances 1.5kV AC is applied between the phase and neutral joined together and earth. The flash gun is not required for Class I appliances but on Class II appliances 3kV AC is applied between the phase and neutral joined together and the tip of the flash gun which is touched onto exposed appliance metalwork. This test is a further verification that functional and supplementary insulation levels have not deteriorated.

Though all tests can be performed in any desired sequence, it is recommended that the Continuity test is always carried out first on Class I appliances and if this results in a fail no further tests should be carried out on the appliance until the fault in its protective earthing has been rectified.

## 3. OPERATING INSTRUCTIONS

The appliance under test should have a full visual inspection before any electrical tests are performed.

**NB. The wander earth lead is a three-wire lead that forms part of the measuring circuitry: It is important that the wander earth lead is plugged into the front panel of the EasyPat 2100 whenever the EasyPat is in use.**

Connect the EasyPat 2100 to a suitable supply.

Check that the mains voltage annunciator comes on and that the indicated voltage corresponds to that of the appliances to be tested. Plug the appliance under test into the appropriate socket provided on the EasyPat. Ensure that the appliance is switched on and that it is suitably mounted.

The following tests can be carried out and should be performed in this sequence:

### 3.1 Earth Continuity (8A and 25A)

This test is only required for earthed (Class I) appliances.

The resistance of the earth circuit in the appliance and associated mains wire and plug is displayed.

Select the required test current, 8A or 25A, with the three position rocker switch.

Carefully clip the wander earth lead to any exposed earthed metal on the appliance then press and hold the 'CONTINUITY' key. The display will show the measured continuity value for the appliance for as long as the key is held down. To prevent overheating of the EasyPat and the earth circuit of the appliance this test should be as short as possible.

With 0.5mm<sup>2</sup> this should not be longer than 2-3 seconds and in any case the 'CONTINUITY' button should not be held down for more than 5 seconds for any one reading.

The following table gives a guide to the maximum cable length for a 0.1Ω pass limit.

Cross Section	Max length	Cable rating
0.5 mm <sup>2</sup>	2 metres	3 amp
0.75mm <sup>2</sup>	3 metres	6 amps
1.0 mm <sup>2</sup>	4 metres	10 amps
1.5 mm <sup>2</sup>	6 metres	15 amps
2.5 mm <sup>2</sup>	10metres	20 amps

## 2.2 Mechanical Specification

### CASE

<b>Size:</b>	330x263x144mm (Excluding bag)
<b>Material:</b>	ABS/Polycarbonate
<b>Colour:</b>	Yellow/Clear
<b>Weight:</b>	5.25kg nominal

## 2.3 Environmental Specification

### TEMPERATURE

<b>Operating:</b>	0 °C to 35°C
<b>Storage:</b>	-10 °C to 50°C

This instrument has been designed to be used in a clean dry environment.

**Do not use the instrument outdoors in wet conditions.**

For both Class I and Class II appliances, it is recommended that an Insulation test is successfully carried out before attempting a Run test or a Flash Test.

The results of the tests are displayed on a high contrast 2½ digit LCD which also indicates the parameter being tested ( $\Omega$ , M $\Omega$ , mA, A) and also the current supply voltage which can be either (110 or 230V). See Fig. 2.

### 1.8 Unpacking & Inspection

Before unpacking the EasyPat, examine the shipping carton for any sign of damage. Unpack and inspect the EasyPat for any damage. If there is any damage then consult your distributor immediately.

### 1.9 Spares & Accessories

Mains Adaptor - 110V plug to 230V Socket MARTL150 \*

Wander Earth Lead TL66 \*

Flash Gun MARTL166 \*

16Amp, FF, 11/4", HBC Ceramic fuse (Front panel) FUS-FF16 \*

IEC Adaptor 230V: 230V 13A plug to IEC320 connector MAREX332 \*

Accessory bag, clips to lid of EasyPat and holds earth lead, flash gun etc MARTC151 \*

Full range of appliance labels

3 Phase Adaptors	16A, 4 pin	MARTL151
	16A, 5 pin	MARTL152
	32A, 4 pin	MARTL153
	32A, 5 pin	MARTL154

IEC Adaptor 110V: 110V BS4343 plug (yellow) to IEC320 connector MAREX331

\* Included with EasyPat

## 2. SPECIFICATIONS

### 2.1 Electrical Specification

**Supply Voltage:** 110V/230V±10% 50/60Hz

**Power Consumption:** 10/220VA (excluding run)

#### EARTH CONTINUITY TEST (8A & 25A)

**Test Voltage:** 6V AC nominal with no load

**Test Current:** 25A AC nom @ 0.1Ω (25A)

8A AC nom @ 0.1Ω (8A)

**Display Range:** 0 - 1.99Ω

**Accuracy of Indication:** ±10% of reading ±2 digits

#### EARTH CONTINUITY TEST (100mA)

**Test Voltage:** 130mV DC nominal open circuit

**Test Current:** 100mA DC nominal constant current

**Range:** 0 - 1.99Ω

**Accuracy of Indication:** ±10% of reading ±2 digit

#### INSULATION TEST

**Test Voltage:** 500V DC -0% +20% at 0.5MΩ

**Short Circuit Current:** 1.5mA DC nominal

**Display Range:** 0 - 19.9MΩ

**Accuracy Of Indication:** ±5% ±1 digit of reading

#### RUN CURRENT TEST

**Display Range:** 0 - 19.9A

**Usable Range:** 0 - 13.0A (Dependent on mains plug fuse)

**Accuracy of Indication:** ±10% of reading ±1 digit

#### RUN LEAKAGE TEST

**Display Range:** 0 - 19.9mA AC

**Accuracy of Indication:** ±10% of reading ±1 digit

#### FLASH TEST

**Test voltage:** 1.5kV AC nominal - Class I

3.0kV AC nominal - Class II

**Range:** 0 - 3.5mA AC nominal

Current trip @ 4mA nominal

Short circuit current 5mA nominal

**Accuracy of Indication:** ±5% of reading ±1 digit

#### LEADS

**Mains:** 1.7 fixed lead, with a 13A moulded plug

**Earth Continuity:** 3m long, detachable lead, heavy duty crocodile/alligator clip.

**Flash Test:** 1.3m long, detachable, with flash gun at one end and a shrouded 4mm safety plug at the other.

**110/230V Adaptor:** 110V 16A plug (BS 4343) to 230V 13A free socket (BS1363).

**230V IEC Adaptor:** 13A BS1363 plug to IEC320 connector, 230mm long.

#### SOCKETS

**Mains:** 230V 13A to BS 1363

110V 16A to BS4343

**Flash:** 4mm safety type

**Leadtest:** IEC320

#### LAMPS

**Flash:** Neon lamp which illuminates when a flash test is active.

**Over Temperature:** Red light emitting diode which illuminates when the temperature limit for the instruments has been exceeded.

**Lamp 1/ Lamp 2:** Red LED's which illuminate to indicate lead 'polarity'

#### FUSES

**Front Panel:** 16A (FF) 1¼" HBC (Ceramic)

**Plug:** 13A 1" HBC (Ceramic)

**Internal:** 3.15A (F) 5x20mm, HBC (Ceramic)

Internal fuse is not user replaceable.

**NOTE:** The front panel fuse protects the 230V test socket only. The 110V socket is wired direct to the mains input plug fuse. Exact replacements must always be used.

#### SAFETY

**EMC:** Meets BS EN 50081-1

BS EN 50082-1

**LVD:** Meets BS EN 61010-1