

HPAT600/2 HANDYPAT

INSTRUCTION MANUAL



MARTINDALE
● ● ● ELECTRIC



GENERAL SAFETY INFORMATION: Always read before proceeding.

Warning

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

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.


This product must only be used by a competent person capable of interpreting the results under the conditions and for the purposes for which it has been constructed. Particular attention should be paid to the Warnings, Precautions and Technical Specifications. Always check the unit is in good working order before use and that there are no signs of damage to it. Do not use if damaged.

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


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

REMEMBER: SAFETY IS NO ACCIDENT


MEANING OF SYMBOLS:

 Equipment complies with relevant EU Directives

 AC (Alternating Current)

 Caution - refer to accompanying documents

 Caution - risk of electric shock

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

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

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TECHNICAL SPECIFICATION

1. INTRODUCTION

1.1 Inspection

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

Unpack the HPAT600 and check that you have the following accessories:

Instructions

Mains Charger Unit

Car Charger

Test Probe with crocodile clip (TL67)

6 x AA NiMH rechargeable batteries

Adaptor Lead (EX332)

Null Pin on keyfob

Inspect the unit and its accessories for any damage. If any item is missing or there is damage to any item, consult your distributor immediately.

Refer to section 4.1 for installation of batteries.

1.2 Description

The battery powered HPAT600 HANDYPAT is a Portable Appliance Tester with the following features:

Dual Insulation Test Voltage

The insulation measurement test voltage can be set to either 500V or 250V.

User Selectable Pass Levels

Appliance and lead test pass levels may be set to other than default values.

Auto or Manual Test Modes

The HPAT600 can be operated in either of two test modes. In the Manual test mode, aimed at the newcomer to PAT testing, a connection diagram for the selected test type is shown on the display. Each step of a test type requires confirmation by a press of the OK button. In the Auto test mode, for the experienced operator, the HPAT600 will automatically run through a selected test type without any further user interaction unless a failure is encountered.

IEC Lead Test

The HPAT600 can also be used to check IEC leads and extension leads for earth continuity, insulation, and correct polarity, (Martindale EX332 IEC lead required for extension lead testing).

Test Data Memory Storage

The HPAT600 is able to store in memory the test data for up to 200 appliance tests.

Test Probe Null Function

A null function is incorporated in the HPAT600 to compensate for the test probe lead resistance when used for Class I earth continuity measurements. This allows for alternative test probes to be used if desired.

The HPAT600 will perform the following test types:

IEC Lead test sequence

Class I test sequence

Class II test sequence

Simulated Load test

Class I Earth Continuity single test

Class I Insulation single test

Class II Insulation single test

2. GENERAL OPERATION & FUNCTIONS

2.1 Precautions

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

Warning

Before use check the unit for cracks or any other damage. Make sure the unit is free from dust, grease and moisture. Also check any associated leads and accessories for damage. Do not use if damaged. Be sure the HPAT600 is in good working order before use.

Warning

The HPAT600 and this Instruction Manual are intended for use by personnel who are adequately trained and familiar with the 'IEE Code of Practice for In-service Inspection and Testing of Electrical Equipment'.

Warning

Do not use the HPAT600 if the battery cover is not fitted.

Warning

Do not connect the HPAT600 to the mains supply via the IEC inlet.

Warning

Use batteries of the specified type in the HPAT600.

Warning

Do not touch the appliance being tested or the test probe tip when the HPAT600 is performing an electrical test. Where possible, use the crocodile clip provided to attach the probe to the appliance.

Caution

Avoid severe mechanical shock or vibration and extreme temperature.

Caution

Remove the batteries from the HPAT600 when not in use for an extended period, to avoid risk of corrosion from leaking batteries. (Refer to 4.1 Fitting Batteries).



2.2 Power On/Off

Hold down the green power button for at least 1 second to power on the HPAT600. The HPAT600 will power on at the last settings used and will display the SELECT TEST screen.

If the HPAT600 was previously Auto powered down the screen present at auto power down will be displayed. Refer to 2.23 (Auto Power Down).

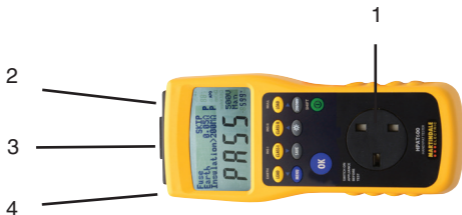
To power off the HPAT600 hold down the green power button for at least 1 second. Present settings will be stored.

2.3 Display Indicators

- ~ Flashes to indicate battery charger is connected to the HPAT600 and powered (Refer to 2.24).
-  When flashing indicates the battery is charging. When continuous indicates the battery is fully charged (Refer to 2.24).
-  Indicates insulation test voltage is present at front panel mains socket.
- S** Indicates that SHIFT state is selected. Press SHIFT again to cancel when required. Note that the SHIFT state will cancel automatically after any shifted button function has been used once.

2.4 Connector Descriptions

- 1) Front panel mains socket - used to connect the appliance under test.
- 2) 4mm socket - used for earth continuity/Class II insulation test probe.
- 3) IEC input socket - used for IEC lead testing.
- 4) Jack socket - used to connect battery charger. 12V DC only, centre is positive.





2.5 Press Button Description

OK Used to select a screen choice or advance when the HPAT600 waits for a prompt. Only active when MENU is selected or a choice during test process is required and the OK symbol is displayed on screen.


Ⓜ Hold for 1 second to power up or power down the HPAT600.

MENU Selects HPAT600 menu.

← Used to exit menu screens. Only active when menu is selected and the ← symbol is displayed on screen.

SAVE Used to save test data. Only active after a test has been performed and becomes inhibited once test data has been saved or test data has been cleared from screen by selection of another function or test.

↓ Used to scroll to screen selections and decrement pass level values, memory locations and contrast. Only active when MENU is selected or a choice during test process is required and ↓↑ symbol is displayed on the screen.

 Turns on the backlight. Alternate pressing turns the backlight on and off. Will not function when OK is active.

↑ Used to scroll to screen selections and increment pass level values, memory locations and contrast. Only active when the MENU is selected or a choice during the test process is required and the ↓↑ symbol is displayed on the screen.

SHIFT

Used to select alternate push button functions (EARTH, INS I, INS II & NULL). Shift is selected by a short press on the green power button. The S symbol is displayed on screen while shift is selected. A second press will cancel SHIFT.

LEAD Selects the lead test.

SHIFT EARTH Selects the Class I Earth Continuity test as a single test.

CLASS I Selects the Class I test sequence.

SHIFT INS I Selects the Class I Insulation test as a single test.

CLASS II Selects the Class II test sequence.

SHIFT INS II Selects the Class II Insulation test as a single test.

LOAD Selects the Simulated Load test.

SHIFT NULL Selects the Class I Earth Continuity null function.

2.6 Contrast Adjustment

If required the display contrast can be adjusted at power up. To enable the contrast adjustment hold down the **250/500V** and **ON/OFF** buttons simultaneously at power-up. The contrast adjustment screen will be displayed. Use the $\downarrow\uparrow$ buttons to adjust the contrast as required. Press the **OK** button to exit the contrast adjustment screen.

2.7 Default Settings and Pass Levels

Note that the HPAT600 will power up at the last settings used. See section 2.20 for returning to default settings.

Default Settings

Insulation voltage	500V
Auto/Manual	Manual
Backlight	Off

Default Pass Levels

Earth Continuity	Class I	0.1 Ω
	IEC Lead	0.1 Ω
Insulation	Class I	1 M Ω
	Class II	2 M Ω
	IEC Lead	1 M Ω

2.8 User Settable Pass Level Range

Earth Continuity	Class I	0.1 Ω to 0.9 Ω in 0.1 Ω steps
	IEC Lead	0.1 Ω to 0.9 Ω in 0.1 Ω steps
Insulation	Class I	0.3M Ω to 1.0M Ω in 0.1M Ω steps and
		1M Ω to 10M Ω in 1M Ω steps
	Class II	0.3M Ω to 1.0M Ω in 0.1M Ω steps and
		1M Ω to 10M Ω in 1M Ω steps

2.9 Menu

Pressing the **MENU** button will display the first page of the MENU screen.

Set Pass Levels	Refer to 2.11
Set Auto/Manual	Refer to 2.13
Recall Memory	Refer to 2.16

Scrolling down with the ↓ button will display the second page of the MENU screen.

Delete All Memory	Refer to 2.19
Reset to Defaults	Refer to 2.20

Use the ← button to exit the MENU screen.

2.10 Null of Test Probe Lead Resistance (Class I Earth Continuity only)

The null function is used to compensate for the test probe lead resistance when used for Class I earth continuity measurements. This also allows for the use of alternative test probes.

To null the test probe lead resistance press **SHIFT** and **NULL** (LOAD) to display the NULL screen. Use ↑↓ to select **Null** or **Abort**.

If **Abort** is selected, press **OK** and the HPAT600 will return to the SELECT screen.

If **Null** is selected, connect the test probe from the 4mm socket (2) to the Earth pin of the front panel mains socket (1) (use the brass earth contact pin supplied with the HPAT600). While connected, press **OK**.

If the null is successful, NULL will be displayed on the large 4 digit display and the HPAT600 will return to the SELECT screen.

If the null fails, the NULL FAIL screen will be displayed. Use ↑↓ to select **Repeat** or **Abort**.

If Abort is selected, press OK and the HPAT600 will return to the SELECT screen.

If Repeat is selected, check the test probe connections and press **OK** to repeat the null measurement.

2.11 Setting User Specified Pass Levels

Pass levels other than default (Refer to 2.7 for default values) may be set by the user (Refer to 2.8 for the range of user specified pass level settings).

To set a new pass level enter the MENU screen and with **Pass Levels** selected press **OK** to enter the PASS LEVEL screen. Use ↑↓ to select the pass level to be changed and press **OK**. Use ↑↓ to set the required pass level on the display and press **OK**. Use ← to exit the PASS LEVEL and MENU screens. The new pass level will now be stored.

2.12 Setting Insulation Test Voltage

The insulation measurements can be performed at either 500V DC or 250V DC (default is 500V DC).

To set the insulation test voltage press **250/500V** button. The insulation test voltage is displayed in the bottom right of the display.

2.13 Setting Auto/Manual Test Mode

Tests can be performed in either Auto or Manual test modes (default is Manual).

To set the test mode enter the MENU screen, use ↑↓ to select Auto/Man, and press OK to enter the AUTO/MANUAL screen. Use ↑↓ to select the required test mode and press OK. Use the ← button to exit the MENU screen. The test mode is displayed in the bottom right of the display.

2.14 Saving Test Data to Memory

At the end of an appliance test the data from the test will be displayed on the screen. This data can be saved to memory if required.

To save the test data press **SAVE** and the SAVE screen will be displayed. The SAVE screen will display the memory location into which the test data will be saved as **Save to memory XXX**. Press **OK** to save the data to memory. Make a note of the appliance that relates to that memory location.

Note: The **SAVE** button is only active after a test has been completed and is inhibited once the test data has been saved.

2.15 Memory Full Screen

If the HPAT600 memory is full when attempting to save test data, the MEMORY FULL screen will be displayed. To proceed from this screen press **OK**. It will be necessary to delete some or all of the memory locations in order to save any further test data. (See 2.18 and 2.19).

2.16 Recalling Test Data from Memory

Test data that has previously been saved in the HPAT600 memory can be recalled and displayed on the RECALL MEMORY screen.

To recall test data enter the MENU screen, use ↑↓ to select **Recall Memory** and press **OK** to enter the RECALL MEMORY screen. Mem **XXX** will be displayed. With XXX selected, use ↑↓ to scroll to the required memory location number with the stored test data to be viewed. Use ← to exit the RECALL MEMORY and MENU screens.

Note: The highest memory location with stored data will be displayed on entering the RECALL MEMORY screen. This will normally be the last appliance tested.

However, after individual memory locations have been deleted (see 2.18), the lowest available vacant memory location will be used to store new data, so the user must make appropriate notes of where actual data has been stored for a particular appliance.

2.17 Memory Empty Screen

If no test data has been stored in memory, attempting to enter the RECALL MEMORY screen (Refer to 2.16) will cause the MEMORY EMPTY screen to be displayed. To exit from this screen press OK.

2.18 Deleting Individual Test Data in Memory

When recalling stored test data (Refer to 2.16) the stored test data in any memory location may be deleted individually. The stored test data in other memory locations will **NOT** be deleted.

Navigate through MENU and select Recall Memory. Scroll ↑↓ to required memory location. Use ← to highlight **Mem** then ↓ to navigate to **Delete**.

Note: If the next steps are completed, the chosen individual test data will be deleted from memory and cannot be recovered, so ensure that your records are correct before continuing.

Press **OK** to delete the chosen memory location. Successive presses of **OK** will delete next higher memory locations sequentially. If no higher memory locations contain stored data, successive presses of **OK** button will delete next lower memory locations sequentially. When finished, use ← successively to exit the MENU screens.

2.19 Deleting All Test Data in Memory

To delete all test data stored in all memory locations enter the MENU screen, use ↑↓ to select **Del. All Memory**. Press **OK** to display **Really delete all memory?**.

Note: If the next steps are completed, all test data will be deleted from memory and cannot be recovered, so ensure that your records are correct before continuing.


Use ↓ to select **yes** and press **OK** to delete all the stored test data. Alternatively, select **no** and press **OK** to return to the MENU screen. When finished use ← to exit the MENU.

2.20 Resetting to Default Settings and Pass Levels (Factory Reset)

To reset all settings and pass levels to default (Refer to 2.7 for default settings and pass levels) enter the MENU screen and use ↑↓ to select **Reset to Def.** and press **OK**. All defaults will now be set and the HPAT600 will return to the SELECT TEST screen.

Note: Resetting to defaults will **NOT** delete stored test data.

2.21

The backlight is switched on and off by alternate pressing of the  button. It will not function if the MENU screen is active or the ↑ becomes enabled during testing.

2.22 Battery Low Message

When the batteries discharge to a predetermined low threshold value, the HPAT600 will display a 'Connect charger' message.

2.23 Auto Power Down



If the HPAT600 remains inactive for a period of 10 minutes or the HPAT600 batteries approach a level where the HPAT600 can no longer function correctly, the HPAT600 will automatically power down. The message 'Auto power down' will be displayed on the screen for 3 seconds before auto power down.

When the HPAT600 is next powered up, by pressing the green ON button, (after attaching battery charger if necessary) the unit will return to the same state as before Auto power down: Any test data that may have

been present at power down will be displayed. Any partially completed action can be continued as if the unit had never powered down.

2.24 Charging Batteries

 **Use rechargeable batteries of the specified type**

To charge the batteries, plug the battery charger into a mains power socket, connect the battery charger jack to the socket (4) on the HPAT600. The ~ symbol will flash on the display to show the battery charger is connected and the  sign will flash while the battery is being charged. When the battery is fully charged the  sign will become continuous.

The HPAT600 may be used for testing while powered from the battery charger.

The HPAT600 will operate fully from the battery charger in the event of discharged batteries.

2.25 Inadvertent Connection of Mains Supply Voltage

If mains voltage is inadvertently applied to the HPAT600, via the IEC socket (3) at the top end, an internal buzzer will sound continuously and 'Err' will be displayed on the HPAT600 display. All HPAT600 press buttons will be inhibited until the source of the applied voltage is removed.

3 PERFORMING APPLIANCE & LEAD TESTS

Warning

The HPAT600 and this Instruction Manual are intended for use by personnel who are adequately trained and familiar with the 'IEE Code of Practice for In-service Inspection and Testing of Electrical Equipment'.

3.1 Auto or Manual Test Mode?


The **Manual** test mode is aimed at the newcomer or those with limited experience of PAT testing. In this mode a diagram is displayed at the beginning of each test to show the connections to the appliance under test. Each step of a test type requires user confirmation by a press of the **OK** button before the HPAT600 will proceed to the next step.

A VISUAL CHECK screen is incorporated in this mode for Class I, Class II and IEC lead tests. If the operator indicates that any of the visual tests fail, the HPAT600 will abort the test.


In the **Auto** test mode, for the experienced operator, the HPAT600 will run through a selected test type automatically without any further user interaction, unless a failure is encountered.

In this mode the connection diagram is not displayed and the visual check screen is not incorporated. It is expected that the experienced user will have completed all these necessary steps properly without prompting.


3.2 Preliminary Checks and Set Up

 Ensure that the appliance is **NOT** plugged into the mains supply when removing fuses.

Appliance Visual and Fuse Checks

- ◆ Visually inspect the appliance for any damage.
- ◆ Visually inspect the appliance mains lead and mains plug for any damage.
- ◆ Check that the fuse in the mains plug is of the correct rating.
- ◆ Check that any accessible fuses on the appliance are of the correct rating.
- ◆  **DO NOT** proceed with electrical testing if any of the visual or fuse checks fail.

IEC Lead/Extension Lead Visual and Fuse Checks

- ◆ Visually inspect the lead and plug for any damage.
- ◆ Visually inspect the extension lead socket for any damage.
- ◆ Check that the fuse in the plug is of the correct rating.
- ◆  **DO NOT** proceed with electrical testing if any of the visual or fuse checks fail.

Set Up

- ◆ Check that the HPAT600 pass levels are correctly set for the appliance or IEC lead being tested. This can be done by entering the **Set Pass Level** section of the **MENU** or alternatively if using the **Manual** mode the pass levels will be displayed on the **DIAGRAM** screen.

Reference should be made to the 'IEE Code of Practice for In-service Inspection and Testing of Electrical Equipment' when determining correct pass levels.

- ◆ Set the mains switch (if fitted) of the appliance being tested to the **ON** position.
- ◆ If required perform a **NULL** to compensate for the test probe lead resistance before testing Class I earth continuity. Refer to 2.10 (Null of Test Probe Lead Resistance).

3.3 IEC Lead Test

⚠ Always refer to and perform 3.2 before proceeding

The following are performed:-

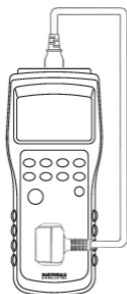
Earth Continuity measurement - measures resistance of the lead earth.

Insulation measurement - measures resistance between earth and line and between earth and neutral.

Wiring Polarity check - checks for open or short circuit wiring and crossed wiring.

Test Connections

- ◆ Refer to the IEC Lead connection diagram below.
- ◆ Plug the IEC lead plug into the HPAT600 front panel mains socket (1).
- ◆ Connect the other end of the IEC lead to the HPAT600 IEC input socket (3).



IEC Lead
Connection

Testing in Manual Mode

- ◆ Press **LEAD** to select the IEC Lead test and display the diagram screen.
- ◆ Press **OK** for the HPAT600 to display the VISUAL CHECK screen.
- ◆ If any visual or fuse checks fail, select **Fail** and press **OK** to abort the test and return to the select test screen.
- ◆ If all visual and fuse checks pass, select **Pass all** and press **OK** for the HPAT600 to display the test screen and perform a lead earth continuity measurement.

If '**FAIL**' is displayed after the lead earth continuity measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

- ◆ Press **OK** for the HPAT600 to perform a Class I insulation measurement.

If '**FAIL**' is displayed after the Class I insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

- ◆ Press **OK** for the HPAT600 to perform a wiring polarity check.

Testing in Auto Mode

- ◆ Press **LEAD** to select the IEC Lead test and display the test screen.
- ◆ The HPAT600 will perform the lead earth continuity measurement, Class I insulation measurement and wiring polarity check with no further interaction from the operator unless the test fails.

If '**FAIL**' is displayed after the lead earth continuity or Class I insulation measurements, refer to 3.12. (Earth Continuity/Insulation Failure)

Result of Test

- ◆ At the end of the IEC lead test the HPAT600 will display '**PASS**' or '**FAIL**' to indicate the overall result of the test. The individual measurement results are also displayed with a '**P**' or '**F**' alongside each to indicate a pass or fail.
- ◆ Test data can now be saved (**SAVE**) to memory if required. Refer to 2.14. (Saving Test Data to Memory).

3.4 Class I Test



Always refer to and perform 3.2 before proceeding

The following are performed for a Class I appliance test:-

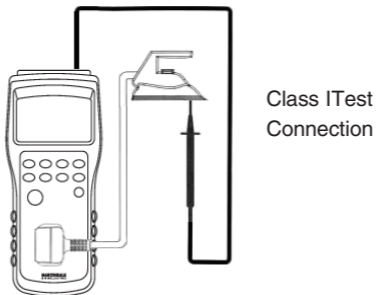
Fuse check - checks fuse continuity.

Class I Earth Continuity measurement - measures resistance between earth and exposed metalwork.

Class I Insulation measurement - measures resistance between earth and line and between earth and neutral.

Test Connections

- ◆ Refer to the Class I connection diagram below.
- ◆ Plug the appliance mains plug into the HPAT600 front panel mains socket (1).
- ◆ Connect the test probe to the HPAT600 4mm test probe socket (2) and connect the other end to any exposed metal work on the appliance.
- ◆ If the appliance being tested has more than one instance of exposed metalwork, it is advisable to connect the test probe to each in turn and perform an earth continuity measurement. This can readily be done at the end of the Class I appliance test by making individual earth continuity measurements. Refer to 3.7 (Class I Earth Continuity Test).



Testing in Manual Mode

- ◆ Press **CLASS I** to select the Class I appliance test and display the diagram screen.
- ◆ Press **OK** for the HPAT600 to display the **VISUAL CHECK** screen.
- ◆ If any visual or fuse checks fail, select **Fail** and press **OK** to abort the test and return to the select test screen.
- ◆ If all visual and fuse checks pass, select **Pass all** and press **OK** for the HPAT600 to display the test screen and perform the fuse check.

If '**FAIL**' is displayed after the fuse check, refer to 3.11.
(Fuse Check/Simulated Load Failure)

- ◆ Press **OK** for the HPAT600 to perform the Class I earth continuity measurement.
- ◆ If '**FAIL**' is displayed after the Class I earth continuity measurement, refer to 3.12. (Earth Continuity/Insulation Failure)
- ◆ Press **OK** for the HPAT600 to perform the Class I insulation measurement.
- ◆ If '**FAIL**' is displayed after the Class I insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Testing in Auto Mode

- ◆ Press **CLASS I** to select the Class I appliance test and display the test screen.
- ◆ The HPAT600 will perform the fuse check, Class I earth continuity and Class I insulation measurements with no further interaction from the operator unless the test fails.

If '**FAIL**' is displayed after the fuse check, refer to 3.11. (Fuse Check/Simulated Load Failure)

If '**FAIL**' is displayed after the Class I earth continuity or Class I insulation measurements, refer to 3.12. (Earth Continuity/Insulation Failure).

Result of Test

- ◆ At the end of the Class I appliance test the HPAT600 will display '**PASS**' or '**FAIL**' to indicate the overall result of the test. The individual measurement results are also displayed with a '**P**' or '**F**' alongside to indicate a pass or fail.
- ◆ Test data can now be saved (**SAVE**) to memory if required. Refer to 2.14. (Saving Test Data to Memory).

3.5 Class II Test



Always refer to and perform 3.2 before proceeding

The following are performed for a Class II appliance test:

Fuse check - checks fuse continuity.

Insulation measurement - measures resistance between live and exposed metalwork and between neutral and exposed metalwork.

Test Connections

- ◆ Refer to the Class II connection diagram below.
- ◆ Plug the appliance mains plug into the HPAT600 front panel mains socket (1).

- ◆ Connect the test probe to the HPAT600 4mm test probe socket (2) and connect the other end to any exposed metal work on the appliance.
- ◆ If the appliance being tested has more than one instance of exposed metalwork, it is advisable to connect the test probe to each in turn and perform additional individual Class II insulation tests. Refer to 3.9 (Class II Insulation Test)
- ◆ Where the appliance being tested has one or more areas of possible insulation breakdown, such as cooling slots or cover joints, it is advisable to wrap metal foil tightly around the appliance and connect the test probe to the metal foil then perform Class II insulation tests.



Class II Test Connection

Testing in Manual Mode

- ◆ Press **CLASS II** to select the Class II appliance test and display the diagram screen.
- ◆ Press **OK** for the HPAT600 to display the VISUAL CHECK screen.
- ◆ If any visual or fuse checks fail, select **Fail** and press **OK** to abort the test and return to the select test screen.

- ◆ If all visual and fuse checks pass, select **Pass all** and press **OK** for the HPAT600 to display the test screen and perform the fuse check.

If **'FAIL'** is displayed after the fuse check, refer to 3.11. (Fuse Check/Simulated Load Failure)

- ◆ Press the **OK** button for the HPAT600 to perform the Class II insulation measurement.
- ◆ If **'FAIL'** is displayed after the Class II insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Testing in Auto Mode

- ◆ Press CLASS II to select the Class II appliance test and display the test screen.
- ◆ The HPAT600 will perform the fuse check and Class II insulation test with no further interaction from the operator unless the test fails.

If **'FAIL'** is displayed after the fuse check, refer to 3.11. (Fuse Check/Simulated Load Failure)

If **'FAIL'** is displayed after the Class II insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Result of Test

- ◆ At the end of the Class II appliance test the HPAT600 will display **'PASS'** or **'FAIL'** to indicate the overall result of the test. The individual measurement results are also displayed with a **'P'** or **'F'** alongside to indicate a pass or fail.
- ◆ Test data can now be saved (**SAVE**) to memory if required. Refer to 2.14. (Saving Test Data to Memory)

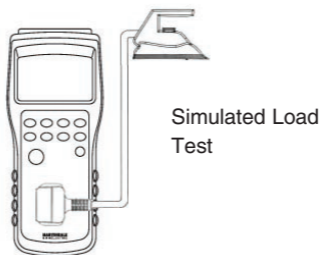
3.6 Simulated Load Test

⚠ Always refer to and perform 3.2 before proceeding

This test calculates the appliance load current and power for a simulated mains voltage of 230V and unity power factor.

Test Connections

- ◆ Refer to the Simulated Load Test connection diagram below.
- ◆ Plug the appliance mains plug into the HPAT600 front panel mains socket (1).



Testing in Manual Mode

- ◆ Press **LOAD** to select the appliance simulated load test and display the diagram screen.
- ◆ Press **OK** for the HPAT600 to display the test screen and perform the simulated load test.

If '**FAIL**' is displayed after the simulated load test, refer to 3.11. (Fuse Check/Simulated Load Failure)

Testing in Auto Mode

- ◆ Press **LOAD** to select the simulated load test and display the test screen.
 - ◆ The HPAT600 will perform the simulated load test.
- If '**FAIL**' is displayed after the simulated load test, refer to 3.11. (Fuse Check/Simulated Load Failure)

Result of Test

- ◆ At the end of the test the HPAT600 will display the value of the simulated load test current and the calculated power. These values are referenced to a simulated mains supply voltage of 230V and a unity power factor.
- ◆ If the HPAT600 displays the '**Simulated load current Hi**' message, refer to 3.13. (Simulated Load Current Hi)
- ◆ Test data can now be saved (**SAVE**) to memory if required. Refer to 2.14. (Saving Test Data to Memory)

3.7 Class I Earth Continuity Test

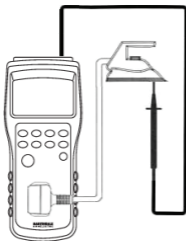


Always refer to and perform 3.2 before proceeding

This is a single test to measure resistance between earth and exposed metalwork.

Test Connections

- ◆ Refer to the Class I Earth Continuity connection diagram below.
- ◆ Plug the appliance mains plug into the HPAT600 front panel mains socket (1).
- ◆ Connect the test probe to the HPAT600 4mm test probe socket (2) and connect the other end to any exposed metal work on the appliance.
- ◆ If the appliance being tested has more than one instance of exposed metalwork, it is advisable to connect the test probe to each in turn and perform an earth continuity measurement.



Class I Test
Connections

Testing in Manual Mode

- ◆ Press SHIFT and EARTH (LEAD) to select the Class I earth continuity test and display the diagram screen.
- ◆ Press OK for the HPAT600 to display the test screen and perform the Class I earth continuity measurement. If 'FAIL' is displayed after the Class I earth continuity measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Testing in Auto Mode

- ◆ Press SHIFT and EARTH (LEAD) to select the Class I earth continuity test and display the test screen.
- ◆ The HPAT600 will perform the Class I earth continuity measurement. If 'FAIL' is displayed after the Class I earth continuity measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Result of Test

- ◆ At the end of the test the HPAT600 will display 'PASS' or 'FAIL' to indicate the result of the test. The measurement result is also displayed.
- ◆ Test data can now be saved (SAVE) to memory if required. Refer to 2.14. (Saving Test Data to Memory)

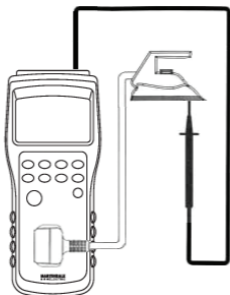
3.8 Class I Insulation Test

 **Always refer to and perform 3.2 before proceeding**

This is a single test to measure resistance between earth and line and between earth and neutral.

Test Connections

- ◆ Refer to the Class I Insulation connection diagram below.
- ◆ Plug the appliance mains plug into the HPAT600 front panel mains socket (1).



Class I Test
Connections

Testing in Manual Mode

- ◆ Press SHIFT and INS I (CLASS I) to select the Class I insulation test and display the diagram screen.
- ◆ Press OK for the HPAT600 to display the test screen and perform the Class I insulation measurement.

If 'FAIL' is displayed after the Class I insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Testing in Auto Mode

- ◆ Press SHIFT and INS I (CLASS I) to select the Class I insulation test and display the test screen.


- ◆ The HPAT600 will perform the Class I insulation test.

If 'FAIL' is displayed after the Class I insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Result of Test

- ◆ At the end of the test the HPAT600 will display 'PASS' or 'FAIL' to indicate the result of the test. The measurement result is also displayed.
- ◆ Test data can now be saved (SAVE) to memory if required. Refer to 2.14. (Saving Test Data to Memory)

3.9 Class II Insulation Test

 **Always refer to and perform 3.2 before proceeding**

This is a single test to measure resistance between live and exposed metalwork and between neutral and exposed metalwork.

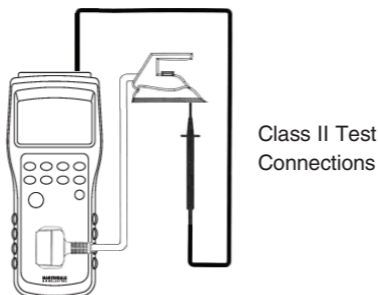
Test Connections

- ◆ Refer to the Class II connection diagram below.
- ◆ Plug the appliance mains plug into the HPAT600 front panel mains socket (1).
- ◆ Connect the test probe to the HPAT600 4mm test probe socket (2) and connect the other end to any exposed metal work on the appliance.
- ◆ If the appliance being tested has more than one instance of exposed metalwork, it is advisable to connect the test probe to each in turn and perform additional individual Class II insulation tests. Refer to 3.9 (Class II Insulation Test)
- ◆ Where the appliance being tested has one or more areas of possible insulation breakdown, such as

cooling slots or cover joints, it is advisable to wrap metal foil tightly around the appliance and connect the test probe to the metal foil then perform Class II insulation tests.

Testing in Manual Mode

- ◆ Press SHIFT and INS II (CLASS II) to select the Class II insulation test and display the diagram screen.



- ◆ Press OK for the HPAT600 to display the test screen and perform the Class II insulation measurement. If 'FAIL' is displayed after the Class II insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Testing in Auto Mode


- ◆ Press SHIFT and INS II (CLASS II) to select the Class II insulation test and display the test screen.
- ◆ The HPAT600 will perform the Class II insulation measurement.

If 'FAIL' is displayed after the Class II insulation measurement, refer to 3.12. (Earth Continuity/Insulation Failure)

Result of Test

- ◆ At the end of the test the HPAT600 will display 'PASS' or 'FAIL' to indicate the result of the test. The measurement result is also displayed.
- ◆ Test data can now be saved (SAVE) to memory if required. Refer to 2.14. (Saving Test Data to Memory)

3.10 Extension Lead Testing

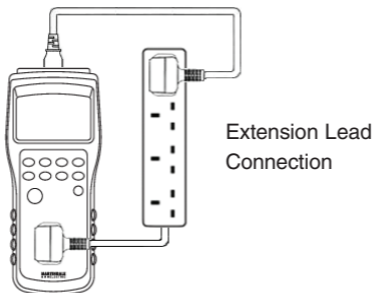
 **Always refer to and perform 3.2 before proceeding**

To test extension leads the HPAT600 IEC Lead Test is used with connections as detailed below. Refer to 3.3 (IEC Lead Test).

A Martindale EX332 IEC mains lead (or similar) is required to perform extension lead tests.

Test Connections

- ◆ Refer to the Extension Lead connection diagram below.
- ◆ Plug the extension lead plug into the HPAT600 front panel mains socket (1).
- ◆ Plug the EX332 IEC lead mains plug into the extension lead socket.
- ◆ Connect the other end of the EX332 IEC lead to the HPAT600 IEC input socket (3).



3.11 Fuse Check/Simulated Load Failure

Possible Reasons for Failure other than a Faulty Appliance or Ruptured Fuse

- ◆ Appliance mains switch not set to the ON position.
- ◆ Appliance not correctly connected to the HPAT600.
- ◆ Some types of appliance, for example those with switched mode power supplies, will indicate 'FAIL' for the fuse check and simulated load test due to the nature of their circuitry.

A 'FAIL' in such circumstances does not necessarily mean a fuse is ruptured or the appliance is faulty.

Remove the fuse/fuses and check fuse continuity by an alternate means.

Ensure the appliance is NOT plugged into the mains supply when removing fuses.

Continue Test

If it is determined the fuses are satisfactory and the appliance was of a type that would fail the fuse check, Class I or Class II appliance tests can be continued by selecting **Continue** and pressing **OK** to proceed to the next step of the test.

Repeat Fuse Check/Simulated Load Test

If for example the appliance had not been switched ON the fuse check or simulated load test can be repeated by selecting **Repeat** and pressing **OK**. The fuse check or simulated load test is then repeated.

Abort Test

If it is decided the appliance is faulty, or a simulated load test is not possible because the appliance is of a type that would fail the test, then the Class I, Class II or Simulated Load tests can be terminated by selecting **Abort** and pressing **OK**.

3.12 Earth Continuity/Insulation Failure

Possible Reasons for Failure other than a faulty appliance or Lead

- ◆ Appliance or lead being tested not correctly connected to the HPAT600.
- ◆ Test probe is not making good contact with the appliance.
- ◆ Pass levels are not correct for the type of appliance or lead being tested.
- ◆ Null of the test probe lead resistance incorrect. (Refer to 2.10)

Repeat Test

If for example the test probe was not connected correctly, the failed test step can be repeated by selecting Repeat and pressing OK.

Abort Test

If it is decided the appliance or lead is faulty, the test can be terminated by selecting Abort and pressing OK. The HPAT600 will display 'FAIL' and the individual measurement results.

This data can now be saved (SAVE) to memory if required. Refer to 2.14. (Saving Test Data to Memory).

Note: If the earth continuity or insulation measurements FAIL, then Repeat and Abort are the only options. For example if a Class I test fails earth continuity the HPAT600 will not proceed to the insulation measurement.

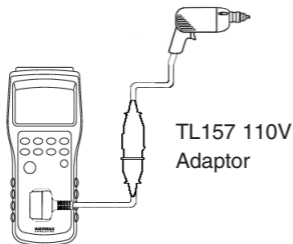
3.13 Simulated Load Current Hi

- ◆ If the simulated load test indicates a load current value $> 16A$, the 'Simulated load current Hi' message is displayed.
- ◆ If the simulated load test current value is $> 30A$, the display will flash '30.0'.
- ◆ The HPAT600 is designed for the testing of appliances that are powered from 13A mains sockets, so if the 'Simulated load current Hi' message is displayed it would be advisable to have the appliance investigated by a suitably qualified technician.

3.14 Testing of 110V appliances

A TL157 PAT 110V Adaptor (available separately) is required for testing 110V appliances (yellow BS4343 16A 110V plug).

Refer to the connection diagram below.



Ensure that the appliance is switched ON.

Undertake a test sequence as appropriate for the appliance (See 3.4 to 3.9).

NOTE: Connect the test probe to the HPAT 4mm test probe socket (2) and connect the probe to the appliance appropriately, according to the test descriptions in sections 3.4 to 3.9.


NOTE: The TL157 PAT 110V Adaptor has a special configuration of internal connections to enable the safe testing of Earth Continuity and of Insulation Resistance for 110V appliances.

However, for reasons of safety, the TL157 will not allow a 110V appliance to draw any run current through the mains socket (1). (This is to prevent inadvertent connection of a 110V appliance to 230V mains).

For this reason, the test of a 110V appliance using the TL157 will always result in a FAIL at the Fuse Check or at Simulated Load test.

Check that the appliance is switched ON - Begin the test again if necessary. The user should also have checked the fuse (if fitted). Assuming such checks above have been made, the Class I or Class II appliance test sequence can be continued beyond the FUSE FAIL result by selecting **Continue** and **OK**. (See 3.11)

3.15 110V Extension Lead Testing

 **Always refer to 3.3 and perform extension lead checks before proceeding**

To test 110V extension leads the HPAT600 Lead Test is used with connections as detailed below. Also refer to 3.3 (IEC Lead Test).

A Martindale EX331 IEC to 110V adaptor lead, plus TL157 PAT 110V adaptor is required to perform 110V extension lead tests.

Test Connections

- ◆ Refer to 110V the Extension Lead connection diagram below.
- ◆ Plug the TL157 110V adaptor into the HPAT600 front panel mains socket (1).
- ◆ Connect the TL157 coupler to the 110V plug of the 110V extension lead under test.
- ◆ Plug the EX331 110V plug into the coupler of the 110V extension lead under test.
- ◆ Connect the other end of the EX331 to the HPAT600 IEC input socket (3).
- ◆ Ensure that any switches are set to ON
- ◆ Undertake a LEAD test (3.3)

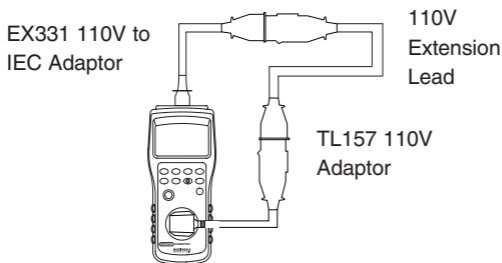
NOTE: The TL157 PAT 110V Adaptor has a special configuration of internal connections to enable the safe testing of Earth Continuity and of Insulation Resistance for 110V appliances.

However, for reasons of safety, the TL157 will not allow a 110V extension lead to draw any run current through the mains socket (1). (This is to prevent inadvertent connection of a 110V appliance to 230V mains).

For this reason, the LEAD test of a 110V lead using TL157 will always result in a FAIL on Polarity.


However the LEAD test will have tested already that the Earth Continuity is satisfactory and will have tested


that the Insulation is satisfactory between centre tapped earth and the two live 55V conductors. If both Earth and Insulation tests PASS, the extension lead is proven electrically safe. Because the concept of polarity is irrelevant on 55-0-55, the failure of the polarity test can be ignored.



4. MAINTENANCE


4.1 Fitting Batteries


 Ensure the HPAT600 is disconnected from any possible voltage sources and the HPAT600 is powered off before removing the battery cover.

 Do not fit non-rechargeable batteries.

- ◆ Remove the battery cover of the HPAT600 by unscrewing the quarter turn retaining screw.
- ◆ The battery cover will now lift off.
- ◆ Fit 6 new AA NiMH rechargeable batteries, observing correct polarity.
- ◆ Replace the battery cover and secure the quarter turn retaining screw.

New batteries may need charging prior to use. - See section 2.24 (Charging Batteries).

 Used batteries should not be discarded with other metal objects.

 Used batteries should be disposed of in accordance with current EU directives.

4.2 Calibration

To maintain the integrity of measurements made using your instrument, Martindale Electric recommends that it is returned at least once a year to an approved Calibration Laboratory for recalibration and certification. Martindale Electric is pleased to offer you this service. Please contact our Service Department for details.

Email: service@martindale-electric.co.uk

Tel: 01923 650660

4.3 Cleaning

The unit may be cleaned using a soft dry cloth. Do not use moisture, abrasives, solvents, or detergents, which can be conductive.

4.4 Repair & Service

There are no user serviceable parts in this unit other than batteries. Return to Martindale Electric if faulty. Our service department will quote promptly to repair any fault that occurs outside the warranty period.

Before the unit is returned, please ensure that you have checked the:

- unit - leads - batteries
- fuses - poor connections - damage

4.5 Storage Conditions

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

5. WARRANTY AND LIMITATION OF LIABILITY

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

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

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

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

Since some jurisdictions do not allow limitation of the term of an implied warranty, or exclusion or limitation

of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any part of any provision of this warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision or other part of that provision. Nothing in this statement reduces your statutory rights.

MARTINDALE
ELECTRIC

Specification
HPAT600
HandyPAT



Earth Continuity

Test voltage: 4V DC (into open circuit)

Test current: 200mA DC (into short circuit)

Range: 0 - 19.99 Ω

Resolution: 0.01 Ω

Accuracy: \pm (5% reading + 2 digits)

Default pass levels:

Lead: $\leq 0.1\Omega$

Class I: $\leq 0.1\Omega$

User selectable pass levels:

$\leq 0.1\Omega$ to $\leq 0.9\Omega$ in 0.1 Ω steps

Insulation

Default test voltage:

>500V DC at 1mA (< 625V DC into open circuit)

User selectable test voltage:

>250V DC at 1mA (< 312.5V DC into open circuit)

Test current: 1.5mA (into short circuit)

Ranges: 2.00M Ω , 20.0M Ω , 200M Ω

Resolution: 0.01M Ω

Accuracy: <100M Ω \pm (5% reading + 2 digits)

$\geq 100\text{M}\Omega$ \pm (10% reading + 2 digits)

Default pass level:

Lead: $\geq 1\text{M}\Omega$

Class I: $\geq 1\text{M}\Omega$

Class II: $\geq 2\text{M}\Omega$

User selectable pass levels:

$\geq 0.3\text{M}\Omega$ to $\geq 1\text{M}\Omega$ in 0.1 M Ω steps

$\geq 1\text{M}\Omega$ to $\geq 10\text{M}\Omega$ in 1 M Ω steps

Fuse Check

Test voltage: 4V DC (into open circuit)

Test current: 200mA DC (into short circuit)

Pass level: >2mA

Simulated Load Test



Specification
HPAT600
HandyPAT

Test voltage: 4V DC (into open circuit)

Test current: 200mA DC (into short circuit)

Accuracy (referenced to 230V rms):

± (5% reading + 2 digits)

Threshold for 'Simulated Current Hi': 16A

Memory

Completed test types that can be stored: 200

General

Overload protection: 300V AC/DC

Protection class: IP20

Safety: Complies to BS EN 61010-1

Temperature Range: -10 to 40°C, non-condensing

Batteries: 6 x 1.2V AA NiMH rechargeable batteries
1800mAh, or greater

Caution - use only the battery type specified

Battery Life: Fully charged, minimum 600 complete tests, stored to memory. The HPAT600 will operate fully from the battery charger in the event of discharged batteries. Do not remove batteries.

Auto Power Down:

After 10 minutes of inactivity, or when battery low

Battery Charger:

Input: 230V 50Hz

Output: 12VDC at 300mA, 5.5 jack x 2.5 bore centre positive

Dimensions: 90 x 210 x 54mm

Weight: Approx 700g (including batteries & leads)

Check out what else you can get from Martindale:

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



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