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IPC Irwin Patch (PAT) Tester

Part Number EPT5001

User Instructions



INTRODUCTION.

The **PATCH** (Portable Appliance Tester and Checker) is a versatile Portable Appliance Tester (PAT) which enables the user to easily test appliances fitted with a 13Amp plug, for electrical safety. The Patch Tester allows testing of both 'Class 1' (earthed case) and 'Class 2' (double insulated case) appliances and also includes the facility to test moulded IEC mains leads.

The Patch Tester is supplied with two types of Test Leads, 100 x Green 'Passed' labels and 50 x Red 'Failed' labels, a sample 'Certificate of Inspection' is also included with these User Instructions - which may be freely photocopied.

DESCRIPTION.

What should be tested?

Any appliance that is fitted with a 13Amp plug should be tested, this includes photocopiers, refrigerators, portable heaters, electric kettles etc. Any appliance brought from home by a member of staff etc., must also be tested.

There have recently been some concerns expressed about the testing of IT equipment such as computers, monitors etc., if in doubt the advice of the manufacturer should be sought. Similarly, some appliances are fitted with input filter capacitors on the mains input (e.g. some televisions). The insulation test applies up to 600VDC between earth and live and neutral. In some circumstances, this could stress the filter capacitors - once again the manufacturer's advice should be sought (see page 4 below).

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How often should I test?

The Electricity at Work (1989) regulations requires portable appliances to be tested 'regularly', the time interval for testing has not been defined. It is generally accepted that for most items, annual testing is sensible. However, items that are subjected to excessive movement of the power cord (e.g. kettles, electric drills, etc.) should be tested more frequently.

Beginning the tests.

Before electrically testing an appliance, the appliance should be visually inspected to ensure that it is safe to perform the electrical tests. A suggested order of testing is detailed in the Certificate of Inspection, included with these instructions. Should a fault become apparent, this **MUST** be rectified, by a qualified person, before proceeding to the electrical tests.

The tests to be performed using the Patch Tester (PAT) are designated numbers 8 and 9 in the Certificate of Inspection. Having assessed the insulation class of the appliance, the appropriate tests should be performed as detailed below. If the appliance has a mains switch, this must be switched **ON** whilst the electrical tests are performed.

INSTRUCTIONS.

The Patch Tester should be connected to a suitable mains supply, the unit is switched on using the Green Rocker switch on the front panel, which will illuminate. Once powered the Patch Tester is ready for use.

'Class 1' Appliance Testing.

Plug the appliance into the 13Amp socket on the front of the Patch Tester and select 'Class 1' with the slide switch.

Plug the test lead with the clip into the appropriate Earth Bond green 4mm socket - generally all appliances with a power consumption of 1kW or less should be tested using the 10Amp green socket. All other appliances above 1kW should be tested using the 25Amp green socket.

Connect the test lead clip to a part of the metal case that is bare metal - often fixing screws are a convenient point. If there is nothing on which to connect or touch the clip to you may have to remove a small section of paint (ideally out of sight) to uncover bare metal. While performing this test please ensuring that **YOU** are not physically touching the metal parts of the clip. If the case has several sections, a separate test should be performed on each section (e.g. base and lid). **Note:** if the appliance has an on/off switch, switch it **ON**.

Making sure that you are clear of the appliance, press and hold the red 'Test' button and observe the blue LED above it. Should the LED not illuminate then check the fuses and the mains switch.

When testing certain items e.g. switch-mode power supplies and electronically controlled drills, the blue LED will simply flash rather than stay on, this still constitutes a PASS. Releasing the button starts an automatic 5 second test sequence.

The results should be interpreted as follows:-

Earth Bond LED.

Green.

Red.

Results.

PASS = 25Amp test < 0.1Ω

PASS = 10Amp test < 0.45Ω

FAIL = Resistance above limits.

Insulation LED.

Green.

Red.

Results.

PASS = >2MΩ

FAIL = <2MΩ

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'Class' 2 Appliance Testing.

Plug the appliance into the 13Amp socket on the front of the Patch Tester and select 'Class 2' with the slide switch. Plug the test lead with the clip into either of the Earth Bond green 4mm sockets.

Connect the test lead clip to a part of the insulated case, if there is nothing on which to fasten the clip, it may be pressed firmly against the case ensuring that **YOU** are not touching the metal parts of the clip. Several tests should be applied to different parts of the case, if there are metal parts (e.g. the chuck of an electric drill), these should also be tested. **Note:** if the appliance has an on/off switch, this should be switched **ON**.

Press and hold the red 'Test' button and observe the blue LED above it, should the LED not illuminate then check the fuses and the mains switch. When testing certain items e.g. switch-mode power supplies and electronically controlled drills, the blue LED will simply flash rather than stay on, this still constitutes a PASS. Releasing the button starts an automatic 5 second test sequence.

The results should be interpreted as follows (**note:** the Earth Bond LED is disabled during 'Class 2' testing):-

Insulation LED.

Green.

Red.

Results.

PASS = $>7M\Omega$

FAIL = $<7M\Omega$

Testing Computers with the Patch Tester.

It is possible to use the Patch Tester to test computers.

Please read the following carefully and ensure that you fully understand before starting computer testing.

Normally the testing of IT equipment uses a low current (100mA), whilst this will give an indication of Earth Bond condition, it is not particularly good as it does not stress the connection with a sufficiently high current to show a fault.

Any Portable Appliance Tester (including the Patch Tester) can be used to test a computer, but you have to be careful where you connect the Earth Bond test lead.

The computer may have a plastic or metal casing, but the electronics are built on a metal chassis, it is to this chassis that you must connect the test lead. Most computers have a set of serial and parallel ports on the back panel, **DO NOT CONNECT TO THESE**. Look for the case securing screws and use one of these to make the connection.

The problem is that computers use two types of earthing, one which is bonded to the mains earth and the other that is connected via the printed circuit board tracks to the ports (ie. the signal earth). If this wrong earth connection is made, the PAT will put approximately 15Amps through this circuitry, resulting in the computer being seriously damaged.



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PLEASE MAKE SURE THAT THE EARTH CONNECTION YOU USE IS THE CASE SECURING SCREW - NOTHING ELSE WILL DO!

The simplest way to test is to leave the computer and monitor linked and switched on and to test the whole system together. Select the 'Class 1' test and use the 10Amp Earth Bond green test socket. If you have any doubts, do not test, do a visual inspection only and mark your paperwork accordingly.

IEC Lead Testing.

IEC and high temperature IEC (ie. kettle) leads may be tested independently of the appliance if required. This is performed by connecting the IEC lead between the 13Amp socket and IEC socket on the front of the Patch Tester, the Earth Bond test lead is not required. The 'Class 1' test should be selected and the red 'Test' button pressed. The results should be interpreted as for 'Class 1' appliance testing detailed above.

Extension Leads.

Select 'Class 1' with the slide switch.

The Patch Tester is supplied with a facility for testing extension leads, to perform this test use the test lead with the UK mains plug fitted. First connect the green lead with 4mm plug into the green 25Amp socket, then connect the UK mains plug into the extension lead socket. Finally connect the UK mains plug on other end of the extension lead into the 13Amp socket on the Patch Tester. Now press and release the red 'Test' button, should the extension lead 'Fail', plug the test lead into the

10Amp green socket and repeat the test. **Note:** extension leads sometimes fail because of the length and/or current rating of the lead, ie. the resulting lead resistance exceeds the cut-off limit of the Patch Tester. Under these circumstances the advice of a qualified electrician should be sought.

As a guide, a 6Amp extension cable has a resistance of 28mΩ/m, and a 13Amp cable has a resistance of 17.5mΩ/m. This means that 6Amp extensions leads over 9m and 13Amp extension leads over 5m may fail the test. **Note:** similar problems may occur with appliances having very long mains leads.

Recording test the Results.

If the appliance **PASSES:** The results of the test should be recorded on the 'Certificate of Inspection' (included with these User Instructions) for that appliance, a completed green 'Passed' label should also be affixed to the appliance (100 x 'Passed' labels are also included).

If the appliance **FAILS:** The results of the test should be recorded on the 'Certificate of Inspection' for that appliance, a completed red 'Failed' label should also be affixed to the appliance.

The appliance should be clearly marked as being 'Unsafe' and taken out of circulation - until a qualified electrician has checked/repaired the appliance, and passes a repeat PAT.

Problems?

The Patch Tester green power switch neon does not illuminate when switched on:-

Check both the mains plug fuse (3Amp) and the rear panel fuse (2Amp quick blow).

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An appliance with a long mains lead fails the Earth Bond test but appears to be OK:-

The resistance of long cables, particularly if they are of a low current rating (ie. small wire gauge), can cause a test to fail. In this case the advice of a qualified electrician should be sought.

When testing, an LED illuminates red and then turns green within the 5 second test period:-

This does not indicate a fault, the status of the LED at the end of the test period should be deemed as the result.

Patch Testing Notes (Please read carefully before use).

1. The testing of portable appliances includes a visual inspection as indicated on the sample 'Certificate of Inspection'. The inspection and tests should only be performed by a competent person.
Further details on inspection standards are available from HSE, of particular interest is Guidance Note HS(G)107, 2001. Two free leaflets are also available: Maintaining Portable Electric Equipment in Offices and other Low Risk environments and Maintaining Portable Electric Equipment in Hotels and Tourist Environments.
2. When testing appliances, the term 'portable' applies to anything fitted with a mains plug including photocopiers, and other large stationary appliances, etc.
3. When performing an insulation test on 'Class 2' (double insulated) appliances, the test lead crocodile clip should be pressed against various parts of the insulated case e.g. near where the mains supply enters etc., either of the Earth Bond green sockets may be used for this test. **Note:** care should be taken to hold the crocodile clip via the insulating shroud, if the metal of the clip is touched during the test, a mild tingling may be felt - this is unpleasant but not dangerous.
Some double insulated appliances may have an insulating case - but metal screws etc. may be visible, these do not necessarily mean that it is 'Class 1'. Provided the screws are driven into enclosed insulating material, 'Class 2' integrity is maintained.
4. The insulation test applies a 500 to 600VDC voltage between the live and neutral conductors and earth. If the appliance is fitted with mains input filter capacitors, this high voltage can stress these components. The fitting of filter capacitors may also give misleading results, under these circumstances the manufacturer's advice should be sought.
5. When testing electric kettles, the test lead should be clipped to the kettle element. In hard water areas, this will require you to scrape away scale until the bare metal can be seen.
6. When testing computers, ensure that the Earth Bond test point is a genuine Mains Earth and not a Signal Earth point. If there is any doubt, simply complete a visual inspection and skip the PAT, a note should be made on the 'Certificate of Inspection'.
7. When assessing 'Class 1' and 'Class 2' appliances and mains plug fuse values, the following information may be helpful:-
 - i) Items fitted with 2-core cables are 'Class 2' (double insulated), some 'Class 2' appliances may be fitted with a 3-core cable, but 'Class 1' appliances are never fitted with 2-core cables. Plastic electric kettles are 'Class 1', please see paragraph No5 above.
 - ii) Generally, the only appliances which will require 13Amp fuses are kettles, water heaters, irons and electric heaters. Colour televisions require a 5Amps fuse, while most other appliances require a 3Amp fuse. If in doubt fit a 3Amp fuse, if this 'blows' move up to a 5Amp fuse, if this 'blows' try a 7Amp fuse, finally if this 'blow' fit a 13Amp fuse.

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SPECIFICATIONS.

Mains Input:-	240V, 50Hz, 5A fused mains plug, rear panel fuse: 2A quick blow.
Earth Bond Test:-	Test voltage: 6V AC nominal, Short circuit current: 36Amp. 25A, pass limit = $<0.1\Omega$ 10A, pass limit = $<0.45\Omega$
Insulation Test-	Test voltage 500 to 600VDC, Short circuit current = $<0.5\text{mA}$. Class 1 - pass limit = $>2\text{M}\Omega$ Class 2 - pass limit = $>7\text{M}\Omega$
IEC and Kettle Lead Tests:-	25A Earth Bond and $2/7\text{M}\Omega$ insulation tests.
Extension Lead Test:-	10/25A Earth Bond and $2/7\text{M}\Omega$ insulation tests.
Case Construction:-	18swg Steel, Size: 250 x 155 x 135mm, finished with a Black Powder Coated Paint, includes a Carry Handle and Rubber Feet.
Supplied with: -	Test lead No1: 4mm plug to insulated crocodile clip. Test lead No2: 4mm plug to 13Amp UK mains plug. 100 x 'Passed' labels and 50 x 'Failed' labels. Copyright free sample of a 'Certificate of Inspection' document.

IMPORTANT - ELECTRICAL SAFETY NOTICE

Only connect the product to single phase mains electrical supply (with neutral nominally at each potential), also check that the supply voltage and frequency are within the products stated range. Before connecting to the mains electrical supply, examine the information on the products rating label (the value of the fuse fitted to the product is also stated), ensure that the mains plug, or outlet circuit is fitted with an appropriate fuse of higher value.

WARNING: THIS PRODUCT MUST BE EARTHED

This product is designed for Electrical **Safety 'Class 1'**, if a mains plug is not fitted, connect the wires to a Standard UK, 3-pin plug as follows:-

Green/Yellow wire to the terminal marked:	E (<u>Earth</u>) or coloured Green or Green/Yellow.
Brown wire to terminal marked:	L (Live) or coloured Brown.
Blue wire to terminal marked:	N (Neutral) or coloured Blue.

LIVE PARTS SHOULD NEVER BE EXPOSED UNLESS THE PRODUCT HAS BEEN SWITCHED OFF AND ISOLATED FROM THE MAINS ELECTRICITY SUPPLY.

Thank you for choosing this IPC Irwin product, which has specifically been designed for education and we know it will bring you good service long into the future. This is just one product of a wide range of UK designed and manufactured products to enhance a STEM education, please see www.ipcirwin.com website for more details on the products and service we provide to support teaching and learning in science and technology.

IPC Irwin also offer an annual Patch (PAT) Tester calibration service, for more details please go to www.ipcirwin.com or call our sales and technical support line on 015395 58555.

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Declaration of Conformity (In Accordance with EN ISO 17050-1:2010).

Manufacturer: **IPC Irwin, Holker School, Cark-in-Cartmel, Grange-over-Sands, Cumbria, LA11 7PQ, United Kingdom.**

Product/Part No: **Patch (PAT) Tester (230V AC, 50Hz main voltage)/EPT5001**

This conformity certificate approves the compliance of the product with the essential safety requirements of the following UK Standards and Regulations:

SI 2005 No.1803	General Product Safety Regulation (implements Directive 2001/95/EC).
SI 2016/1101	Electrical Equipment (Safety) Regulation (implements Directive 2014 /35/EU.
EN 61010-1: 2010	Electrical Requirements for Laboratory Test & Measurement Equipment.
EN 61000-6-1: 2019	EMC, Generic Standards, Immunity for Residential, Commercial and Light Industrial Environments.
EN 61000-6-3: 2019	EMC, Generic Standards, Emission for Residential, Commercial and Light Industrial Environments.
SI 2012 No. 3032	Restriction on Hazardous Substances (RoHS) in Electrical and Electronic Equipment Regulation, (implements Directive 2011/65/EU).



Mark can be used only in the case of conformity assessment according to all relevant UK Standards and Regulations.

EU Declaration of Conformity (In accordance with European Parliament and Council Decision No: 768/2008/EC Annex III).

This conformity certificate approves the compliance of the product with the essential safety requirements of the following EC/EU Directives (Manufacturer, Product/Part No: as above).

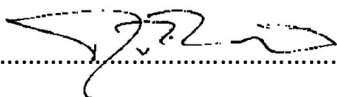
2001/95/EU	General Product Safety Directive.
2014/35/EU	Low Voltage Directive (LVD).
2014/30/EU	Electromagnetic Compatibility (EMC) Directive.
2011/65/EU	Restriction on Hazardous Substances Directive (RoHS).

European harmonised Standards used for conformity assessment and declaration:

EN 61010-1: 2010 **Electrical Requirements for Laboratory Test & Measurement Equipment.**



Mark can be used only in the case of conformity assessment according to all relevant EC/EU Directives.

Dickon Knight (Director):  **Date of Issue: 24th May 2023.**

In the event of any correspondence concerning this product, please contact your supplying agent quoting the catalogue number and serial number shown on the apparatus rating label, together with the voltage and frequency of the mains electrical supply. This will help us to process your enquiry quickly. Any spare parts which may be required are supplied on the understanding that the replacement of those requiring the exposure of live electrical connections **will** be undertaken by an electrically qualified person.

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Patch Portable Appliance Certificate of Inspection.

Inspector Appliance Date

Location Serial Number

TEST	PASS REQUIREMENT	PASS	FAIL	NOTES
1. Inspection of Cable.	No insulation damage. BS colour.	.....	.....	.....
2. Inspection of plug.	No damage. Correct fuse.	.....	.....	.....
3. Inspection of Male Connector.	BS type or equivalent.	.....	.....	.....
4. Open socket without Tool.	Unopenable.	.....	.....	.....
5. Pull cable from female Connector.	No movement.	.....	.....	.....
6. Cable grommet or clamp.	Cable insulation protected. Cable pull - no movement . Cable twist - no movement.	..... ..... .....	..... ..... .....	..... ..... .....
7. Inspection of mains Switch.	Correct operation. No Damage.	.....	.....	.....
8a. Case Earth connection (Class 1).	No damage.	.....	.....	.....
8b. Fuse/mains switch test.	Flash/Cont. Blue LED.	.....	.....	.....
8c. Earth Bond (Class 1) Earthed case	<0.1Ω (25Amp Test) <0.45Ω (10Amp Test)	..... .....	..... .....	..... .....
9a. Insulation Test (Class 1).	>2MΩ	.....	.....	.....
9b. Insulation Test (Class 2) Double Insulated.	>7MΩ	.....	.....	.....
10. Remove accessible fuse.	No damage. No access to live parts >50V.			
	ASSESSMENT.			

Recommended date for next test/...../.....

Signed

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