

This Information Sheet provides guidance on how to carry out User Checks, Formal Visual Inspections and combined Inspection and Tests on portable and transportable electrical equipment with a three-pin plug. The Information Sheet forms part of a series of Information Sheets which supports the Safety of Electrical Equipment Policy Standard.

Background

The Law requires that electrical equipment is maintained to prevent danger and used in a suitable manner. Inspection and Testing is part of this process which helps to determine if an item is safe to use or should be repaired, maintained or disposed of.

Routine inspection and appropriate testing (where necessary) of portable electrical equipment should be part of any overall risk assessed strategy for ensuring the equipment is maintained in a safe condition. An Inspections and Test regime for a College / Department will probably involve the following:

- a) **User Checks** – these require basic instruction and / or knowledge and involve visually inspecting the equipment for signs of damage or danger.
- b) **Formal Visual Inspections** - carried out by a more knowledgeable or competent person, with frequency of the inspections dependent upon: the type of equipment and the environmental conditions and type of use.
- c) **Combined Inspection and Tests** – carried out by a Competent Person or Contractor with frequency dependent upon: the type of equipment, conditions and environment of use, after repairs or modifications or if there is the possibility the equipment may be defective. Detects loss of earth integrity, deterioration of insulation, contamination of internal and external surfaces.



**ELECTRICAL SAFETY TRAINING
CAN BE ARRANGED THROUGH
HEALTH AND SAFETY SERVICES**

Inspecting Electrical Equipment

Most faults or dangers with electrical equipment can be seen before it is switched on. Therefore, 'visual inspection' is key to ensuring electrical equipment are safe.

ALL electrical equipment owned/used by the University must be formally inspected to confirm its safety.

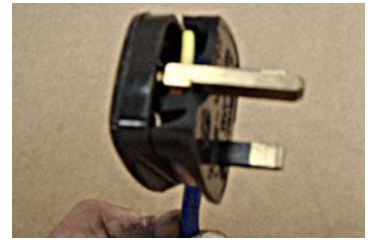
a) User Checks (Visual)

Simply checks on electrical equipment to check for signs of damage, eg:

- Damage (apart from light scuffing) to the cable sheath.
- Damaged plug, eg casing is cracked or pins bent or discoloured.



- There are non-standard joints to the cable, including taped joints.
- The outer sheath of the cable not effectively secured where it enters the plug or the equipment. Obvious evidence would be if coloured insulation of the internal core cables were showing.
- Signs the equipment has been subjected to conditions for which it is not suitable, eg it is wet or excessively contaminated.
- Signs of damage to the external casing or there are some loose or missing parts, covers or screws.
- There is evidence of overheating (burn marks or discoloration).



These checks should also be made on extension leads, other plugs and sockets. Any faults should be reported and the equipment labelled as 'faulty' and taken out of use. **Note:** Only persons with appropriate electrical competence can carry out repairs.

b) Formal Visual Inspections

The most important part of a maintenance regime is the formal visual inspection carried out by a competent person. This can be staff with sufficient knowledge and training on what to look for and what is acceptable, however, it is important they know the limit of their knowledge and experience and call upon an appropriate person when required eg electrician.



Formal Visual Inspections does not include taking the equipment apart but will pick up the majority of dangerous faults thereby controlling any risks and monitoring user checks. However:



- Includes same checks as a Visual Check (see above), in addition to:
 - The removal of the plug cover and a check that an appropriate fuse is being used (not a piece of wire, nail etc) which is the correct Amp for the appliance.
 - The cord grip is effective.
 - The cable terminals are secure and correct.
 - An 'earth' fitted where appropriate.
 - There is no sign of internal damage, overheating or ingress of liquid or foreign matter.



Step-by-Step Guide to Checking a Plug

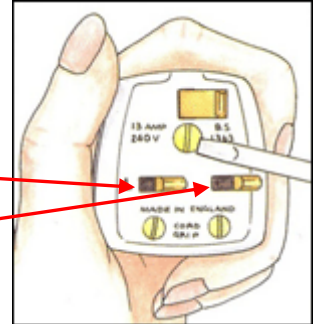
Checking a plug is straightforward. All you need is a small screwdriver. Firstly check what the 'plug' Amp rating is - ie most leads and plugs are rated 13 Amp but some are rated 5 Amp only. The plug's Amp rating will be stamped or embossed on the actual plug.

Note: Do not use two pin plugs unless plugged into a suitable CE marked adaptor.

Step 1 – Opening the Plug:

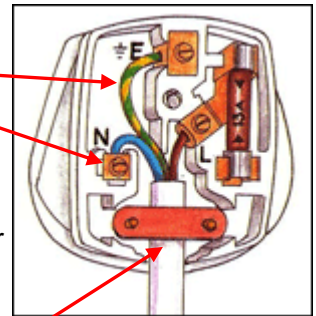
- Unscrew the plug cover (the plug-top) and loosen the cable clamp; this will allow you to inspect the plug wiring, the fuse and the cord grip.

Note: Two of the 'pins' (Neutral and Live) should be insulated at their base in case of accidental contact when withdrawing the plug from the socket.



Step 2 – Check the Wiring and Connections, confirm:

- The wires are connected to the correct terminals.
- The Earth wire (green / yellow) is connected to E and is (always) the 'longest' wire (and last to be 'pulled' out).
- The Neutral wire (which is blue: *formerly black*) is connected to N.
- The Live wire (which brown: *formerly red*) is connected to L (fuse).
- The wires are inserted in the terminals up to, but not catching onto, the insulation and there are no stray 'whiskers' of wire. Ensure the wires/inner cables are not strained or trapped.
- Cable grip should anchor the **outer** sheath of cable securely, not the wires, and there are no signs of damage or cracking on the sheath.
- All terminal screws are tight, but not too tight that they 'break' the copper wires.



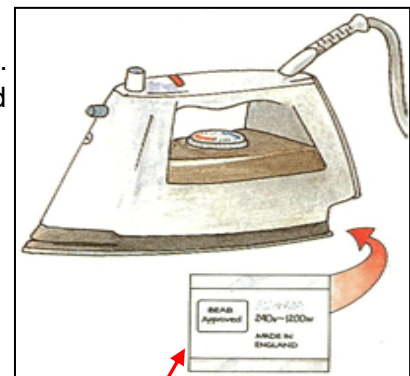
Note: Not all plugs although conforming to BS1363 are the same inside. The terminal's layout, the means of securing the wires and the cable in the plug may differ.

Note: For sealed plugs only the fuse can be checked.

- After inspecting cables, make sure cord grip is tightened and secured on the outer cable sheath.

Step 3 - Check the Fuse is the correct 'rating':

- This can be done by looking at the Data Plate on the appliance. This would normally show the Wattage(W) of the appliance and occasionally the correct Amp rating, eg. 2.4A (round up to 3Amp fuse). If the Amp rating is not shown use the following formula to work out the correct fuse rating:
- **Wattage of Appliance / Volts (230 volts) = Amps (fuse rating).** Please see examples on the next page.
- Replace the fuse with the correct type if necessary.
- Refit plug cover and screw tight.

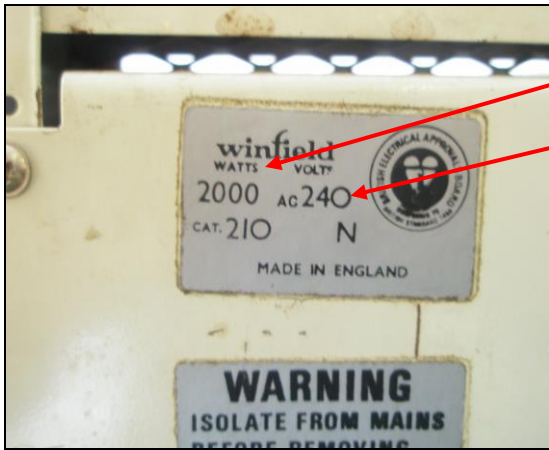


The Data Plate contains information on the equipment; including its voltage and wattage. Occasionally the actual 'Amp' rating is also provided.

Fuse Rating Examples

Follow the manufacturer’s instructions but as a general rule to selecting the correct fuse:

3 Amp Fuse – for most appliances up to 720 Watts	13 Amp Fuse – for most appliances up to 3000 Watts (or 3kW)
<ul style="list-style-type: none"> • Radios • Table Lamps • Soldering Irons • Audio and Hi-fis • Slow Cookers • TV (may be 5amp) 	<ul style="list-style-type: none"> • Electric Heaters • Kettles • Fan Heaters • Fridges • Toasters • Microwaves



Watts rating “2000”

Voltage no longer “240” but “230” volts in UK

Therefore “Amp” will be $2000 / 230 = 8.7A$

Fuse Rating (rounded up): **13 Amp**



Wattage indicated as “3000”

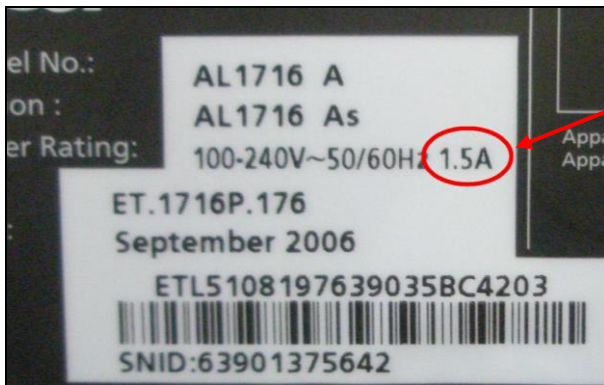
Voltage “230”

Therefore “Amp” will be $3000 / 230 = 13A$

Fuse Rating for equipment: **13 Amp**

Note: Maximum fuse rating within any domestic three-pin plug is 13 Amp.

On some equipment the Amp rating is clearly shown:



Amp Rating indicated as 1.5 Amp

Fuse required: **3 Amp**

Fuse Colour Coding:

Mains fuses in the UK are colour coded as follows



Note: Unfortunately you cannot buy fuses with a precise rating, so you must choose the nearest rated fuse ABOVE the figure you have calculated to a maximum of 13 Amp.

If you put a fuse with a lesser rating into the plug, you will find that the fuse blows repeatedly.

Step 4 - Check the Cable (lead / flex)

- Flexible cable **MUST** be used. Inflexible solid core cable should never be used.
- Check the cable is not damaged, eg split, rubbing against the appliance casing and always check for possible damage where cable may rub-against another item or panel on the equipment

Step 5 - Checking Extension Leads

- It is strongly recommended three-core flex is used (brown for live, blue for neutral and green and yellow striped for earth).
- If the wires are each 1.5 mm² in diameter you can use the lead for any appliance up to 3 kW.
- Make sure the extension lead is fully unwound (it could overheat and melt or cause a fire if used whilst still rolled up).
- An extension lead **MUST** have a plug at one end, a socket at the other, be 13 Amp rated and earthed (Class 1).

Combined Inspections and Test

Periodic combined Inspections and Test is the only reliable way of detecting some faults and should be carried out to back up the inspection regime.

Persons carrying out testing of portable electrical equipment should be trained for the work they are to undertake. Health and Safety Services can provide training on how to undertake Formal Visual Inspections and how to use the Primetest 100 Portable Appliance Tester; these Testers are easy to use with no technical interpretation of readings necessary for most items of equipment.

Providing the appropriate test procedures are followed and acceptance criteria are clearly defined, this routine can be straightforward. **However, before using test equipment Users must always read the accompanying operating instructions and follow the advice given during training.**

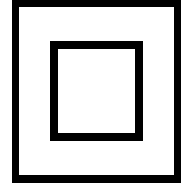
The two tests usually carried out under the Combined Inspections and Test are:

- a) Earth Bond Test / Earth Continuity Test** - The objective of this test is to ensure the connection between the earth or protective conductor of the appliance's mains plug earth pin and the metal casing of the appliance is satisfactory and satisfies accepted safety standards.
Please note where an item is 'double insulated' the equipment's earth bond cannot be tested.

Double Insulated Equipment



Double Insulated Equipment is normally identified by the “square within a square” symbol on the Data Plate.



Earth Bond Test cannot be undertaken on “double-insulated” equipment.

- b) Insulation Resistance Test** - Electrical insulation starts to age as soon as it is made and the objective of this test is to ensure age has not deteriorated the insulation affecting personnel safety and / or power reliability.

Note: Testing of ‘surge-protected’ extension leads and socket adaptors is more difficult and guidance should be obtained from the manufacturer on how to undertake the necessary safety tests. In many cases only the Earth can be tested as typical Testers ‘surge’ the appliance to test its connectivity and safety.

The following steps should be followed to carry out a combined Inspection and Test:

- Follow the guidance outlined in the above Formal Visual Inspections section.
- Use the Primetest 100 to carry out the Earth Bond and Insulation Resistance Test following the instructions provided during the Health and Safety Services training and those on the relevant Information Sheet.

Health and Safety Information Sheet: E1- 3

Iechyd a Diogelwch – Health and Safety

USING THE PAC500 PLUS PORTABLE APPLIANCE CHECKER

This Information Sheet provides guidance on how to use the PAC500 Plus Portable Appliance Checker. This unit can be used to carry out electrical safety tests on portable and transportable electrical equipment with a three-pin plug following suitable training and / or instruction. The Information Sheet forms part of a series of Information Sheets which supports the Policy Standard ‘Safety of Electrical Equipment’ PS: E1 (2008).

The PAC500 is a hand held mains powered unit for carrying out electrical safety checks on Class I / Class II mains powered appliances and IEC mains leads.

This Tester is an easy to operate basic unit and is one of a number of Tester types available to loan from the central stock of Testers.

- **HOW TO USE THE TESTER**

Before using any tester it is imperative that a thorough visual inspection is undertaken to ensure the item is sound and in good working order.

WARNING: The tests performed by this instrument involve high voltages. Do not touch the appliance or clip lead while the test is in progress or immediately after completing the test sequence.

The Connections

The front panel of the instrument is divided into three zones:

1. **Indication Panel** - the indication window is translucent red plastic and covers 4 neon indicators which will show either Pass or Fail for Earthbond and Insulation.
2. **Test Button** - the Earth Bond Test is performed once only, a short time after pressing the button. To re-test, release the test button then press again.

Note: an Earth Bond Test cannot be carried out any electrical item that is double insulated, indicated by this symbol.

The Insulation Test is active all the time the Test Button is pressed to allow the Connector to be fixed to all isolated metalwork on Class II appliances.
3. **Connector** (crocodile clip) – this needs to be connected to the metal casing on the appliance to enable the Insulation Test to be carried out.

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Health and Safety Information Sheet: E1- 4

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USING THE PRIMETEST 100 PORTABLE APPLIANCE TESTER

This Information Sheet provides guidance on how to use the Primetest 100 Portable Appliance Tester. The Tester can be used to carry out electrical safety checks on portable and transportable electrical equipment with a three-pin plug following suitable training and/or instruction. The Information Sheet is part of a series of Information Sheets which supports the Policy Standard ‘Safety of Electrical Equipment’ PS: E1 (2008).

The PrimeTest 100 is a hand held battery powered unit suitable for carrying out electrical safety checks on Class I / Class II appliances, IEC mains leads and extension leads.

This Tester is the easiest to operate and handle of the central stock of Testers, though Departments and Colleges wishing to loan the Tester will be required to replace the AA batteries from time to time.

- **HOW TO USE THE TESTER**

Before using any tester it is imperative that a thorough visual inspection is undertaken to ensure the item is sound and in good working order.

The Connections

(NB: Numbers refer to numbers on pictures)

Test Connections:

- 1 = Mains socket on front panel for connecting the appliance under test.
- 6 = 4mm socket on end panel for earth test probe.
- 7 = IEC socket on end panel for mains cord testing.

User Interface:

- 5 = LCD display shows test progress, results for tests and overall test result for an appliance or mains cord.

Tests are initiated by pressing:

- Power On / Off = 2 + 3 until two beeps are heard.
- Class I Appliance Test = 2
- Class II Appliance Test = 3
- Cord / Extension Lead Test = 4


(Note: The PrimeTest 100 will switch off if no buttons have been pressed in 3 minutes)

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Labelling Equipment and Recording Inspections and Test

A record of Inspections and Test will prove an electrical appliance has been maintained in the event of an accident / incident involving the appliance. Suitable labels should be affixed to the equipment following inspection or test (see below), these provide evidence to the user that the equipment has been inspected / tested and will enable easier identification of items that have not been tested or which must not be used.

Your findings should also be recorded. Contact Health and Safety Services for advice.

ELECTRICAL SAFETY TEST	
<input type="text"/>	
APP. I.D.	<input type="text"/>
BY	<input type="text"/>
TEST DATE	<input type="text"/>
 PASSED	

Electrical Safety Test	App ID: <input type="text"/>	
	DO NOT USE	
	Test Date: <input type="text"/>	Test Eng: <input type="text"/>
	<input type="text"/>	
FAILED		

Frequency of Testing and Inspection

Guidance and recommendations on when formal inspections and testing of portable electrical equipment should be undertaken is available on Information Sheet E1-2: Frequencies of Electrical Equipment Inspection and Test.