
PAT500H HANDHELD PORTABLE APPLIANCE TESTER

216A911

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1. SAFETY

Read instructions before use.

Due to the potential hazards associated with any electrical circuit it is important that the user is fully familiar with the instructions covering the capabilities, applications and operation of this instrument.

The PAT500H has been designed and manufactured to conform with the safety requirements of IEC 1010. Various terminals on the product are used for working with potentially hazardous voltages and the equipment should therefore be used only after careful study of these instructions.

THE USER SHOULD ENSURE THAT ALL REASONABLE SAFETY PROCEDURES ARE FOLLOWED AND IF ANY DOUBT EXISTS SHOULD SEEK ADVICE BEFORE PROCEEDING.

Symbols used on this equipment.



- Equipment protected throughout by double or reinforced insulation.



- Caution - Risk of electric shock.



- Caution - (refer to accompanying documents)

- The PAT500H performs electrical tests which involve high voltages.
- Never touch the appliance being tested while the testing procedure is being followed.
- The product is designed for use by suitably trained personnel.
- Before using the PAT500H ensure that you have read and thoroughly understood the instruction manual.
- The unit contains no user serviceable parts, attempted repairs by unauthorised personnel will expose users to the risk of electric shock.

DESCRIPTION

The PAT500H is a compact portable appliance tester, performing three functions to ensure the safety of Class 1 and Class 2 240V appliances.

The instrument is enclosed in a robust plastic enclosure, functions are selected by a four way rotary switch, readings are displayed on a large liquid crystal display (LCD) below which are five LEDS which unambiguously display a pass or fail indication for thresholds dictated by national standards.

The PAT500H is suitable for performing tests as required by the following standards:

BS 3456	Insulation (Clause 16.3) Protective Earth (Clause 27.5)
BS 4533	Insulation (Clause 1.10.0) Protective Earth (Clause 1.7.2.3)
BS 2769	Insulation (Clause 15.0) Protective Earth (Clause 25.4)
BS 414	Insulation (Clause 10.3) Protective Earth (Clause 15.2)
BS EN 60950	Leakage (Clause 5.2.2) [1] Protective Earth (Clause 2.5.11) [2]

[1] The test performed by the PAT500H is a substitute leakage test.

[2] The test performed by the PAT500H is at a reduced safe current.

All internal power and the test outputs are derived from the 230V 50Hz supplies.


APPLICATION

The PAT500H is designed to check the electrical safety of portable appliances of Class 1 and Class 2 categories.

As a guide BS and IEC standards define these two categories as follows:

Class 1: Appliances which have a functional insulation throughout and an earth connected case. These are often described as earthed appliances.

Class 2: Appliances which have both functional and additional insulation where any metal parts cannot become "Live" under fault conditions.

The symbol  represents double insulation and no earth connection is present in this type of appliance.

Different regulations and standards describe a variety of tests for electrical appliances and in general cover type approval tests. Such testing involves prolonged sophisticated techniques. It is generally recognised that for periodic inspection to ensure that the safety of the appliance is maintained, tests of the type performed by the PAT500H are realistic and satisfactory.

WARNINGS

It is important that the PAT500H is used to test appliances in the following sequence. Failure to follow this sequence may lead to incorrect test results and unsafe equipment being released back into use. Failure of any test must result in the appliance being rejected and quarantined until the fault is repaired and the appliance is satisfactorily re-tested.

- a. **Do not touch the appliance while testing is in progress. A high voltage of 500V is applied with respect to earth during the insulation test.**
- b. **Ensure that the earth clip of the earth test cable is securely attached to the appliance. A poor connection may lead to arcing of the contact.**
- c. **If it is unclear which Class of Insulation applies to the appliance under test, it is recommended that the manufacturer should be consulted.**
- d. **It is recommended that the PAT500H is periodically checked by testing with a PAT Checkbox or an appliance of known characteristics.**
- e. **This instrument is not suitable for testing fixed installations.**
- f. **Do not use the instrument if liquid has been spilt on it or in damp situations.**

OPERATING PROCEDURES

Powering the PAT500H

Rotate the test selector switch to $\Omega+$.

The PAT500H should be connected to a source of mains power. There is no power switch and the unit is immediately ready for use. The LCD will display a 1.

Visual Inspection

Before commencing testing the user should undertake visual checks on the mains lead, case and that the correct type and rated fuse is fitted to the appliance under test. There should be no evidence of damage of a nature that may impair the electrical safety of the item.

Protective Earth Test

General

The objective of this test is to ensure the connection between the earth or the protective conductor of the appliance mains supply earth pin and the metal casing and accessible conductive parts of the appliance is satisfactory and of a low enough resistance value to satisfy safety standards. Business machines (computers + accessories) require that the test current will not damage the appliance. The test current utilised by the PAT500H is at a level that is safe for testing this category of appliances. The PAT500H offers a reversible polarity on the protective earth test. This is helpful diagnosing galvanic corrosion of connections. It is advisable to contact the manufacturer of the appliance for identification of accessible conductive parts.

Connections

The appliance under test should be connected to the PAT500H socket and the test clip lead plugged into the test lead connector jack. The PAT500H test selector switch should be set to $\Omega+$ or $\Omega-$.

Procedure

The test lead clip should be securely attached to each of the accessible conductive parts on the appliance and the results noted.

Results

The $\geq 0.2\Omega$ LED will illuminate for readings in excess of this threshold value. Normal appliances should not exceed this value but those with long leads or extension leads may exceed this value. The table below will enable the user to determine an appropriate threshold for longer leads.

Nominal Cross Sectional Area of cord mm ²	Rated Current of Appliance Amps	Resistance per Conductor ohm / metre @ 10°C
0.5	3	0.035
0.75	6	0.023
1	10	0.017
1.5	16	0.011
2.5	25	0.007

A display of 1 indicates a result exceeding 1.999 Ω .

Insulation

General

The objective of this test is to ensure that the insulation between phase or neutral conductor of the appliance mains supply and the metal casing and accessible conductive parts of the appliance is satisfactory and of a high enough value to satisfy the relevant safety standard.

Connections

The appliance under test should be connected to the PAT500H socket and the test clip lead plugged into the test lead connector jack. The PAT500H test selector switch should be set to $M\Omega$.


Procedure

The appliance under test must be switched ON.

The test lead clip should be touched to the metal case and each of the accessible conductive parts on the appliance and the results noted.

Results

The indicated insulation resistance should be in excess of:

Class 1	Class 2 
2.0 MΩ	7.0 MΩ

The PAT500H has LED indicators which illuminate when the resulting measurement is below the applicable threshold of 2.0 MΩ or 7.0 MΩ.

A display of 1 indicates a reading in excess of 19.99 MΩ.

Leakage

General

The objective of this test is to ensure that leakage current between phase or neutral and the earth connector of the appliance mains connector is satisfactory and low enough to satisfy the relevant standard.

Connections

The appliance under test should be connected to the PAT500H socket and test clip lead removed from the test lead connector jack. The PAT500H test selector switch should be set to mA.

Procedure

The appliance under test must be switched ON.

Results

The indicated values should typically be less than:

BS1363 Connector (13A Plug)	BS4343 Connector (Industrial Plug)
3.5 mA	10mA

The PAT500H has LED indicators which illuminate when the resulting measurement exceeds the applicable threshold of 3.5mA or 10.0mA.

NOTE: The PAT500H performs a "substitute leakage" test by applying a safe test voltage of 40V ac between Phase and Neutral and the earth of the appliance under test. The results are displayed as though the appliance would be powered from a supply voltage of 230V + 6%. The resultant measurement is to be accepted as advisory and not as an absolute measurement.

Appliances that are fitted with a differential mains filter will display a doubled reading.

ENVIRONMENTAL CONDITIONS

Operating temperature range: 0 - 40°C
Relative Humidity: Max 80% up to 31°C; 50% to 40°C

- indoor use
- altitude up to 2000 metres
- installation category II
- pollution degree 2

MAINTENANCE

The PAT500H contains no user serviceable parts. Maintenance should be confined to ensuring that the unit is kept clean, dry and undamaged. Cleaning should be carried out using a non-abrasive non-wetting material. The unit should be regularly inspected for physical damage and returned for service if damage is found. All connection leads should be regularly checked and should be replaced if damaged.

WARRANTY AND REPAIR

In the unlikely event that this unit should require repair or calibration it should be returned to the service agent or manufacturer.

OVERSEAS

If the instrument owner resides outside the UK, he may either return the instrument directly to Seaward at Peterlee, or to his local service agent a list of whom can be obtained from Seaward. It is important to note that a copy of the invoice and packing note are sent by airmail to clear the product through customs.

Estimated repair charges (where appropriate) and freight charges will be advised to the owner before work is commenced.

SPECIFICATION

Protective Conductor Test

Measuring Range: 0.03 - 1.999 Ω
Resolution of Measurement: 0.001 m Ω
Measuring Current: 200mA DC
Open Circuit Voltage: 10 V DC
Measuring Technique: Kelvin (4 Wire)
Accuracy: 0.05 - 1.000 Ω \pm 5% \pm 5 digits

Insulation Resistance

Measuring Range: 0.05 - 19.99 M Ω
Resolution of Measurement: 10K Ω
Nominal Test Voltage: 500V DC
Test Current @ 500 V: \geq 1 mA
Short Circuit Current: \leq 5 mA
Accuracy: 0.05 - 10M \pm 5% \pm 5 digits

Leakage Current

Measuring Range: 0.05 - 19.99mA
Measuring Resolution: 0.01 mA
Measuring Voltage: 40 V AC
Accuracy: 0.05 - 10 mA \pm 5% \pm 5 digits

Controls: Test selection by rotary control switch to select tests as detailed above.

Display: 3.5 Digit Liquid Crystal Display (Digit size 12.7mm)

Indicators: Five Pass / Fail indicator LED's are provided. These LED's are controlled directly by display signals. There is no variation between the display and the indicators.

Protective Earth	$\geq 0.2 \Omega$
Insulation Class I	$\leq 2.0 M\Omega$
Insulation Class II	$\leq 7.0 M\Omega$
Earth Leakage Domestic	$\geq 3.5 \text{ mA}$
Earth Leakage Industrial	$\geq 10.0 \text{ mA}$

Supply Voltage: 230 V (+ 10% - 6%) 50 Hz

Dimensions: 180 x 95 x 50 mm

Weight: 1Kg

Relevant Standards: IEC1010

Due to a policy of continuous improvement Seaward Electronic reserves the right to alter the equipment specification and description outlined in this document without prior notice. No part of this document shall be deemed to be part of any contract for the equipment unless specifically referred to as an inclusion within such contract.