Megger.

PAT32 Series Portable Appliance Testers

USER GUIDE

GUIDE DE L'UTILISATEUR

GEBRAUCHSANLEITUNG



SAFETY WARNINGS

- * PAT 32 must be properly earthed. A supply socket that has a protective earth contact must be used.
- * Test leads, probes and crocodile clips **must** be in good order, clean and with no broken or cracked insulation.
- * Circuit connections and exposed metalwork of an appliance under test **must not** be touched.
- * Tests **must** be performed in the specified sequence. If an appliance fails a test, the fault causing the failure **must** be rectified before testing. Re-testing **must** commence from the start of the sequence.
- * Replacement fuses **must** be of the correct size, type and rating. See '**Specification**' section.
- * The instrument **must not** be used in damp conditions or if any part of it is damaged.
- * Safety Warnings and Precautions must be read and understood before the instrument is used. They must be observed during use.

NOTE THE INSTRUMENT MUST ONLY BE USED BY SUITABLY TRAINED AND COMPETENT PERSONS.

Symbols used on the instrument



Evaluate display reading against appliance details and refer to this User Guide



Caution: Refer to accompanying notes.



Equipment complies with relevant EU Directives

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General Description

Introduction

Megger **PAT 32** series are designed to check the electrical safety of any product fitted with an appropriate mains plug, including information technology (IT) equipment, domestic appliances, industrial appliances and power tools.

The following tests are available:

- Circuit check
- Fuse check
- Earth Continuity test
- 10 Amp Earth Bond test
- 25 Amp Earth Bond test
- Insulation test
- Extension lead tests (*ELT1* or *ELT2* required)
 - Polarity (UK only)
 - Earth Bond
 - Insulation

Tests are effected by plugging the portable appliance or extension lead into the relevant socket and pressing the relevant Test switch. The readings from each test are shown on the unique analogue / digital liquid crystal display. The measurement scale for Earth Bond is marked with pass bands. This provides a rapid indication of a test **Pass** or **Failure** and allows proper test results to be kept.

Applications

Appliances and electrical equipment with Safety Class I, Class II and Safety Class III insulation may be tested. These classes of safety are defined in various IEC and BS safety specifications, and in general are:-

Class I Appliances which have functional insulation throughout and an earth connected body i.e. an 'Earthed' appliance.

Class II Appliances which have both functional and additional insulation, and where any metal parts cannot become 'Live' under fault conditions. This is 'Double Insulation' indicated by 🗐.

- Class I / II Appliances having part of the enclosure which meets Class I requirements and part which meets Class II.
- Class III Appliance where protection against electric shock is provided by an SELV supply. Class III construction is indicated by the m mark.

Typical uses for Megger PAT 32 are:

- Periodic tests of equipment used in Factories, Offices, Local Education Authorities, Hospitals etc.
- Routine tests before and after hiring electrical equipment.
- Basic tests following equipment repair.
 - Tests by manufacturers and distributors.

Specifications

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The Megger **PAT 32** may be used to test equipment originally manufactured to a range of specifications such as:

- IEC 335 -1 / BS3456
- BS 2769
- BS 4533
- BS415
- BS 7002

Power cord

The colour code of the cord is:

Phase	Brown
Protective Earth	Yellow / Green
Neutral	Blue

If using a fused plug, a 3 Amp fuse to BS 1362 should be fitted.

Note: A plug severed from the power cord should be destroyed, as a plug with bare conductors is hazardous in a live socket outlet.

Features and Controls



Test Mode Summary

Test Sequence

For safety reasons, it is important that appliance tests are carried out in the correct sequence:-

- Circuit Test
- Fuse Test (if necessary)
- Earth Continuity Test
 and / or
- Earth Bond Test
- Insulation Test

If a fault on an appliance is detected, testing must be stopped and the fault rectified. Testing must then recommence from the beginning of the test sequence.

Circuit Test

A low voltage d.c. Resistance test of the Phase to Neutral circuit.

FuseTest (if supply or appliance fuse is suspect) Checks the continuity of most types of fuses when removed from the appliance.

Earth Continuity Test

The earth continuity test may only be performed on Class I (Earthed) appliances. The test checks protective conductor continuity and the earth connection to the metal parts of the appliance at a current of 100 mA. This test is used where a higher current Earth Bond test may cause damage to the appliance. A very low voltage (100 mV) is established between the main supply plug earth pin and the metal parts of the appliance. The low voltage of this test is designed to reveal bad connections by not breaking down any oxide films.

Earth Bond Test

The Earth Bond test may only be carried out on Class I (earthed) appliances.

The test checks protective conductor continuity and the earth connection (or Bonding) to the metal parts of the appliance. A very low voltage is established between the main supply plug earth pin and the metal parts of the appliance.

A choice of two Earth Bond tests is available:-

- Passing a current of 10 Amp. Used for appliances and equipment fused at 5 Amp or less.
- ii) Passing a current of 25 Amp. Used for equipment fused at greater than 5 Amp.

Test Mode Summary

Insulation Test

Checks the integrity of the insulation. For class I appliances, the test voltage is applied to the main supply plug between Phase and Neutral (shorted together) and the Earth pin, which is held at earth potential. For Class II appliances, the Earth Bond lead is used to make the return connection from the appliance to the instrument earth bond terminal.

The **PAT 32** develops 500 V d.c. into 0.5 M Ω and complies with the 1mA load current requirement.

Caution:- If an Insulation test fails, there will be a leakage path to earth somewhere on the appliance. Any metal parts of the appliance could become 'Live' and give the user an electric shock. Do not touch the appliance when applying the test.

Extension Lead Test

Using the Megger *ELT1* or *ELT2* optional accessory, the *PAT 32* checks Continuity, Earth Bond and Insulation of both 230 V and 110 V extension leads. (110 V adaptor required). *ELT1* (UK version) also checks the Polarity of the extension lead connections.

Error displays

Internal faults within the instrument are indicated by error messages consisting of the letter 'E' followed by a 2 digit number. Continuous testing on the Earth bond ranges may cause the display of **Hot**, and the analogue pointer

to move off the left hand end of the scale. Cease testing and allow the instrument to cool for about 15 minutes. If any error message displays, and the instrument will not re-set itself, return the instrument for service. See **Repair and Warranty**.

Performing Tests – General

Appliance Visual Checks

Before carrying out **PAT32** electrical tests, the appliance and its accessories must be given a visual inspection to identify any physical faults that may not be revealed by electrical testing.

Visually examine and check the condition of the:-

- Supply plug
- Plug fuse type and rating (if applicable)
- Mains cord
- Cord connection grommet (if applicable)
- Mains On /Off switch
- Auxiliary switches
- Conducting / Insulated parts of the outer case
- Removable covers which must be in place.

Any significant faults or defects must be rectified before proceeding with the **PAT 32** electrical tests.

Auto Nulling and Self check

When not being operated, *PAT 32* will periodically carry out measurement nulling. The word null is displayed. Press any **Test** switch to override this function.

A self check function is also continuously performed on the selected test range.

Tests must be performed with the appliance switched **On** and with good fuse(s) fitted.

If testing is interrupted, for instance due to the appliance not being switched **On**, or the mains fuse being ruptured, testing must be repeated from the start of the test sequence in the corrected condition. i.e. with a sound fuse and with the appliance switched **On**.

Appliance Testing

Preliminary Testing Procedure

1. Plug the *PAT32* into the 230 V mains power supply, and switch the supply on. Full screen details are displayed, and a self check is carried out. On completion, the '**Home**' screen is displayed.



- 2. Determine the Class / type of the appliance to be tested.
 - Class I Earthed appliance
 - Class II Double insulated appliance
 - Class III S.E.L.V appliance
- 3. Plug the appliance into the appropriate socket on the instrument front panel and switch the appliance **On**.

Appliance Testing Procedure



If fault(s) are indicated, cease testing and rectify. Re-commence testing from the start of the test sequence.

Tests must follow the given sequence

Circuit Test

- 1. Press and hold the **Circuit** Test switch. The **Circuit** screen is displayed.
- 2. Phase to Neutral resistance is displayed directly in $k\Omega$.



Note:- Readings of approximately 0,01 k Ω can be expected from appliances incorporating large wound components such as large transformers and motors. Heating appliances may give readings of approximately 0,02 k Ω .

3. Release the Test switch.

Note:- During the test, a display of **!--** indicates Open circuit. Check that the appliance is switched **On**, that any fuses fitted are good, the continuity of the power cord is good and that the appliance itself is not open circuit. Appliances with a switch mode power supply may indicate Open circuit. In this case, omit the **Circuit** test.

Note:- If the appliance circuit appears to be Open circuit, fuses (if applicable) may be checked as follows:

Fuse Check

1. Remove the suspect fuse from the appliance. With the '**Home**' screen displayed (no switches pressed) press the suspect fuse across the contacts.

A good fuse is indicated by the display of FUS accompanied by a continuous beep note.

Earth Continuity Test (Class I appliances only)

- With the 'Home' screen displayed (no switches pressed) connect the Earth Bond test lead to the 100mA terminal.
- 2. Firmly connect the crocodile clip to the metalwork of the appliance.



- 3. Earth continuity resistance is displayed directly in $\mathbf{m}\Omega$.
- 4. Disconnect the Earth Bond test lead.

Earth Bond Test (Class I appliances only)

- 1. With the 'Home' screen displayed (no switches pressed) connect the Earth Bond test lead to the **10A/25A** terminal.
- 2. Firmly connect the crocodile clip to the metalwork of the appliance.
- 3. Press and hold either the **10A** or the **25A** test switch. The **Earth Bond** screen is displayed.
- 4. Earth Bond resistance is displayed directly in $\mathbf{m}\Omega$.
- 5. Release the Test switch.
- 6. Disconnect the Earth Bond test lead.

A successful test is indicated on the solid scale line and the word **PASS** is displayed.



As a general rule, an appliances should have an Earth Bond resistance of less than 100 m Ω . Appliances with long supply leads will give higher readings due to conductor resistance. Corrections may be applied if lead

Appliance Testing

resistance figures are available and lead length is measured.

A reading of between 100 m Ω and 500 m Ω will be

indicated on the broken scale line together with the display of 4. Refer to the appliance manufacturer.

Readings greater than 500 m Ω are indicated by the flashing display of the word **FAIL**.

On the **10 Amp** range, the flashing display of \coprod will appear for resistance greater than 600 m Ω , indicating that the test current is below a satisfactory test level. It is suggested that the **25 Amp** range should then be used.

Insulation Test

Class I Appliance

- 1. Press and hold the **Insulation** Test switch. The **Insulation** screen is displayed.
- 2. Insulation resistance value is displayed directly in $\ensuremath{M\Omega}\xspace$.
- 3. Release the Test switch.



As a general rule, **Class I** appliances should have an insulation resistance value greater than 1 M Ω . A reading of less than 0.25 M Ω is indicated with the word **FAIL**.

Class II Appliance

- 1. Connect the Earth Bond test lead (or probe if available) to the **10A/25A** terminal.
- 2. Press and hold the **Insulation** Test switch. The **Insulation** screen is displayed.
- 3. Using the crocodile clip, probe areas of likely leakage around the insulation areas. i.e. joins / apertures / metal parts.
- 4. Release the Test switch.
- 5. Disconnect the Earth Bond test lead.



As a general rule, **Class II** appliances should have an insulation resistance value greater than $2 \text{ M}\Omega$.

A reading of greater than 2 $M\Omega$ is indicated on the solid scale line together with the word **PASS**.

A reading of less than $0.25~\text{M}\Omega$ is indicated with the word FAIL.

Appliance Testing

Between **0.25 M** Ω and **2 M** Ω , the \square is displayed. In this instance, the user must judge whether to **PASS** or **FAIL** the test, depending upon the insulation class of the appliance.

Extension Lead Testing (UK) – ELT1 Required



If fault(s) are indicated, cease testing and rectify. Re-commence testing from the start of the test sequence.

Plug the extension lead into the appropriate socket on the instrument front panel.

Circuit Test

1. Press and hold the **Circuit** Test switch. The **Circuit** screen is displayed.

For an unterminated extension lead a reading of **!--** should be displayed. Any other reading indicates a faulty lead and must be investigated.

2. Release the Test switch.

Polarity Test

Plug Extension Lead Tester **ELT1** into the socket end of the Extension lead (use the adaptor for 110 V leads).



Do not plug the ELT1 into a live circuit

- 1. Press the Circuit Test switch twice.
- 2. Check the polarity of the extension lead against the following display options:
 - **YE5** Polarity Correct
 - POL Connections reversed
 - Short Circuit
 - C. Open Circuit

Earth Bond Test

- 1. Connect the Earth Bond test lead to the **25A** terminal.
- 2. Firmly connect the crocodile clip to the **ELT1** metal stud.
- 3. Press and hold the **25A** Test switch. The **Earth Bond** screen is displayed.
- 4. Earth Bond resistance is displayed directly in $\mathbf{m}\Omega$.
- 5. Release the Test switch.
- 6. Disconnect the Earth Bond test lead.

Insulation Test (Class I leads only)

- 1. Press and hold the Insulation Test switch. The Insulation screen is displayed.
- 2. Insulation resistance value is displayed directly in $M\Omega$.
- 3. Release the Test switch.

Specification

Circuit Test

onedit reet				
	Meter reading range: Open Circuit Voltage: Short Circuit Current:	0 to 9,9 k Ω Range 0 to 1 k Ω 1 k Ω to 2 k Ω 2 k Ω to 5 k Ω 5 k Ω to 9,9 k Ω 4,5 V d.c. 1 mA d.c.	Resolution 0,01 kΩ 0,02 kΩ 0,05 kΩ 0,1 kΩ	Accuracy 2,5% of reading ± 0,02 kΩ 2,5% of reading ± 0,02 kΩ 2,5% of reading ± 0,05 kΩ 2,5% of reading ± 0,1 kΩ
Fuse Check		5 V. d.c. 0,5 mA Typical		
Earth Contin	uity Test			
		<u>Range</u> 0 to 999 mΩ 900 mΩ to1990 mΩ	<u>Resolution</u> 1 mΩ 10 mΩ	$\begin{array}{l} \underline{Accuracy} \\ 2,5\% \text{ of reading } \pm 5 \ m\Omega \\ 2,5\% \text{ of reading } \pm 10 \ m\Omega \end{array}$
	Open Circuit Voltage: Constant Current:	Typically 100 mV d.c. Typically 100 mA into <1Ω		
10A Earth B	ond Test			
	Meter reading range:	0 to 1990 mΩ <u>Range</u> 0 to 600 mΩ 600 to 999 mΩ 900-1990 mΩ	<mark>Resolution</mark> 1 mΩ 1 mΩ 10 mΩ	<u>Accuracy</u> 2,5% of reading ±5 mΩ Current below level for satisfactory Bond test. Transfer to 25A test
	Pass Band Limits: Open Circuit Voltage:	100 and 500 mΩ Typically 3 V rms a.c. 50 H:	Z	

Specification

	Spec Point Current Short Circuit Current	10A into 100 m Ω at 240 V. 8,7 A into 100 m Ω at 230 V. Typically 12 A		
25A Earth Be	ond Test Meter reading range:	0 to 1990 mΩ Range 0 to 999 mΩ 900-1990 mΩ	<u>Resolution</u> 1 mΩ 10 mΩ	Accuracy 2,5% of reading ± 5 mΩ 2.5% of reading ± 10 mΩ
	Pass Band Limits: Open Circuit Voltage: Spec Point Current: Short Circuit Current	100 and 500 m Ω Typically 6 V rms a.c. 50 Hz Typically 25A into 100 m Ω (Typically 36.5 A	<u>,</u> 10A into 500 mΩ	2)
Insulation Te	e <u>st</u> Meter reading range:	0-99 MΩ Range 0 to 10 MΩ 10MΩ to 20 MΩ 20MΩ to 50 MΩ 50MΩ to 99 MΩ	Resolution 0,1 ΜΩ 0,2 ΜΩ 0,5 ΜΩ 1 ΜΩ	$\label{eq:accuracy} \begin{array}{l} \textbf{Accuracy} \\ 2,5\% \text{ of reading } \pm 0,1 \text{ M}\Omega \\ 5\% \text{ of reading } \pm 0,2 \text{ M}\Omega \\ 5\% \text{ of reading } \pm 0,5 \text{ M}\Omega \\ 1 \text{ Indication only} \end{array}$
	Pass Band limit: Open Circuit Voltage: Spec Point Voltage Short Circuit Current:	2 MΩ (Class I) – 7 MΩ (Cla ≤ 600 V d.c. ≥ 500 V d.c. into 0.5 MΩ < 2 mA	ss II)	
	D	General		
Iemperature	Hange Operating: Storage:	5 °C to +40° C -25°C to +65° C		

Specification

Humidity Range	
Operating:	≤ 90% RH at 25°C
Supply	230 V(+10% -6%) 50 Hz 300 VA
Safety	Meets the requirements for double insulation to IEC 61010-1
Fuses	2 x 2 A (F) 20 mm x 5 mm HBC, IEC 127/1 2 x 250 mA (F) mm x 5 mm HBC, IEC 127/1 Mains power cord fused plug (as applicable) – 3 A fuse to BS1362
EMC	In accordance with IEC61326-1
Operational inaccuracies:	Refer to www.megger.com
Dimensions	314 mm x 152 mm x 206 mm (12,5" x 6" x 8")
Weight	3,75 kg (8,25 lb approx.)
Cleaning:	Wipe the disconnected instrument with a clean cloth dampened with soapy water or Isopropyl Alcohol (IPA).

Accessories

Supplied		Part Number
	User Guide	6172-265
	Accessory Pouch	6420-108
	Earth Bond test lead with crocodile clip	6280-043
Optional Extras		
	Extension lead tester ELT1 (UK)	6111-130
	Extension lead tester ELT2 (France & Germany)	6111-320
	Earth Bond lead and Probe EP1	6320-225
	Bare wire adaptor lead with 3 pin plug to BS1363/A	6331-230
	Appliance safety log book (complete)	6131-813
	Log book test sheets (pack of 30 sheets)	6171-417
	Log book test stickers (Pack of 3 sheets [72 stickers])	6171-418
Training Media		
	VHS Video: 'Portable Appliance Testing'	6131-999

Repair and Warranty

The instrument circuit contains static sensitive devices, and care must be taken in handling the printed circuit board. If the protection of an instrument has been impaired it should not be used, and be sent for repair by suitably trained and qualified personnel. The protection is likely to be impaired if, for example, the instrument shows visible damage, fails to perform the intended measurements, has been subjected to prolonged storage under unfavourable conditions, or has been exposed to severe transport stresses.

New Instruments are Guaranteed for 1 Year from the Date of Purchase by the User.

Note: Any unauthorized repair or adjustment will automatically invalidate the Warranty.

Instrument Repair and Spare Parts

For service requirements for Megger Instruments contact:

Megger Limited or	Megger
Archcliffe Road	Valley Forge Corporate Center
Dover	2621 Van Buren Avenue
Kent CT17 9EN	Norristown, PA 19403
England.	U.S.A.
Tel: +44 (0) 1304 502100	Tel: +1 (610) 676-8579
Fax: +44 (0) 1304 207342	Fax: +1 (610) 676-8625

or an approved repair company.

Approved Repair Companies

A number of independent instrument repair companies have been approved for repair work on most Megger instruments, using genuine Megger spare parts. Consult the Appointed Distributor / Agent regarding spare parts, repair facilities and advice on the best course of action to take.

Returning an Instrument for Repair

If returning an instrument to the manufacturer for repair, it should be sent freight pre -paid to the appropriate address. A copy of the Invoice and of the packing note should be sent simultaneously by airmail to expedite clearance through Customs. A repair estimate showing freight return and other charges will be submitted to the sender, if required, before work on the instrument commences.

Notes