

USB Wall Mounted Sockets

Today, it is unusual to find someone who does not use at least one battery powered device, such as a smart phone, e-book or tablet, on a daily basis.

According to Ofcom, the average household now owns more than three types of internet enabled devices, with one in five owning six or more. Most of these are likely to be in the form of smart phones and tablets.

The statistics do not even allow for those electronic items without internet connection – for example, some cameras and mp3 players.

The net result is an increase in the need to regularly recharge these devices. Most manufacturers now exclusively use some sort of USB lead for charging items - either plugged into a computer or a separate plug-in charger.

Due to the ever growing number of mains powered USB chargers, the quantity of available BS 1363 sockets in a normal house is often no longer sufficient.

Many people will use extension leads to overcome this issue but this is deemed bad practice and should only be used as a temporary solution.

The recommended option would be to add more outlets in each room, but this would be an expensive solution in existing installations.

Recent development in socket outlet design has sought to introduce a low cost fix for the householder by exchanging standard BS 1363 sockets for ones that incorporate dedicated USB ports within the faceplate. These ports are capable of charge currents up to 2 Amps. However they are not fully covered by BS 7671, falling between this standard and IEC 60950. Consequently there have been concerns over their safety. In response, Electrical Safety First have published a detailed report discussing the safety issues found on some of the sockets.



Obstacles in testing USB wall sockets

A USB powered device normally requires a supply of 5 Volts DC from the USB port on the wall socket.

To convert the nominal mains voltage of 230 V AC, voltage reduction and rectification is required.

This is achieved using a switch mode power supply (SMPS). Most sockets available today have this connected directly across the un-switched side of the Line-Neutral circuit.

This has the measured effect of placing a resistance of approximately 200 k Ω between Line and Neutral.

This resistance will be measured by an insulation tester, just as leaving a light bulb in circuit while testing would.

It should also be noted that the electronic circuitry inside the SMPS could easily be damaged by a 500 V insulation test injected across it. Consequently the USB port may fail to function following a 500 V Line to Neutral insulation test.

How to test an installation fitted with USB wall sockets

The only test affected by USB wall mounted sockets is the insulation test. All other tests can be performed normally.

Figures 2.4a and 2.4b of Guidance Note 3 section

2.6.7 requires insulation testing between line and neutral conductors. However, section 2.6.7 also states that “For circuits/equipment vulnerable to the test voltage, the test is made with the Line and Neutral conductors connected together and earth.”

Applying the advice in Guidance Note 3, when USB sockets are installed, it is possible to perform just one insulation test on that circuit. With Line and Neutral linked together, test down to Earth (as shown in figure 1), so as to prevent the test voltage from being applied through the SMPS and avoid damaging the USB socket.

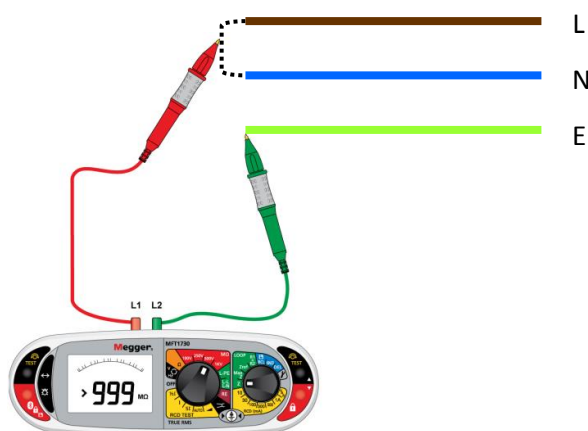


Figure 1 - Insulation test with Line and Neutral linked

However, this does not give us any indication as to whether there could be a line to neutral fault on the circuit. If gone unnoticed, this type of fault could result in tripping of the protective device or in the worst case a fire.

Most modern insulation testers offer the option of a

250 V insulation test. As the test voltage is within the allowed operating limits of the supply, this lower test voltage would not damage a USB wall mounted socket. Therefore, a 250 V insulation test can be performed between Line and Neutral (as shown in figure 2).

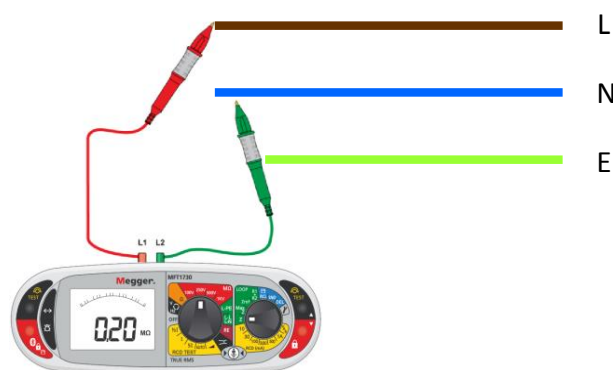


Figure 2 - 250 V insulation test from Line to Neutral

As previously stated, the Line to Neutral test may not result in the required measurement of $>1 \text{ M}\Omega$. However, most short circuit faults can still be identified by a reading of significantly less than the normal internal impedance of the SMPS, which is normally around $0.2 \text{ M}\Omega$.

Summary

Until the design and manufacture of these new USB augmented mains wall sockets is more tightly controlled, Megger Instruments with a 250V insulation test offer a practical alternative to “not testing” circuits with these devices.

UK

Archcliffe Road Dover
CT17 9EN England
T +44 (0) 1304 502101
F +44 (0) 1304 207342
UKsales@megger.com

UNITED STATES

4271 Bronze Way
Dallas TX 75237-1019 USA
T 800 322 2861 (USA only)
T +1 214 333 3201
F +1 214 331 7399
USsales@megger.com

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