

Choosing a PAT Tester for 110V Appliances - FAQ

How do I decide which is the best PAT Tester for testing 110V appliances?

If you have lots of 110V appliances to check, then the best machines to go for are those which have a dedicated 110V socket. The machines which we would particularly recommend would be the Megger PAT320 & PAT420, or Kewtech KT77 or even a Seaward Supernova or similar.

If you have a machine which is not fitted with a dedicated 110V socket (such as a Kewtech KT71 or BattPAT), then it is still possible to test 110V appliances using an adaptor (A PTA3) – however this is something of a ‘workaround’ and it is better to use a dedicated machine.

In summary, if you expect to be testing mainly 110V appliances then you should definitely buy a machine with a dedicated 110V socket, but for occasional testing of 110V appliances then it is possible to use an adaptor. We would normally recommend a machine with a dedicated 110V socket if you have more than 20 (approx.) 110V appliances to test.



Kewtech KT76



Kewtech KT77



Megger PAT320



Megger PAT420

Examples of PAT Testing Machines with a dedicated 110V socket – ideally suited for testing 110V appliances.



BattPAT



Kewtech KT71



Fluke 6500



Seaward PT100

Examples of PAT Testing Machines without a dedicated 110V socket – can be used for testing 110V appliances using a PTA3 adaptor.

What's Wrong with using an 110V adaptor such as a PTA3?

Actually, there's nothing wrong with this method at all, providing you know what you're doing and are aware of the limitations. The main issue concerns the 110V PAT Testing adaptor itself.

Take a look at the picture of the PTA3 adaptor on the next page. It has a 230V mains plug connected to a 110V socket. The expected way of wiring an adaptor would be to connect the live to the live, neutral to neutral, and earth to earth. This would allow the 110V appliance to be connected directly to the PAT Testing machine. However, imagine what would happen if that appliance were to be accidentally connected to the mains? We'd be putting 230V into a 110V appliance, and it would be dangerously overloaded (110V drills have been known to catch fire in this situation!) This means that the adaptor itself would be a serious hazard, especially if you lost it on a building site! And although most people would know NOT to plug a 110V appliance into the mains like this, there is a chance that

you could accidentally carry out a load or leakage test with the PAT Tester, which would also put 230V into a 110V appliance. Very Dangerous!



PTA3 110V Pat Testing Adaptor



PTA2 110V Extension Lead Adaptor



PTA4 Power Adaptor

To avoid this very serious situation, the 110V adaptors must be wired in a special way, which allows the PAT Testing machine to carry out Earth Bond and Insulations tests safely, but won't allow the appliance to be 'powered up' with the wrong voltage during a load test, or if the device was connected to the mains by mistake.

The above situation is complicated by some of the PAT testers (example Kewtech KT71 or Seaward Primetest 100,) which carry out a small 'continuity' test prior to the Insulation Test. It is important to remember to switch the appliance 'ON' before carrying out the tests, and this 'continuity' test is designed to highlight an issue such as a blown plug fuse or an appliance which is switched off. Of course, because of the way the adaptor is wired, it will ALWAYS appear that the appliance is switched 'OFF' and so the tester will indicate a problem. In the case of the Kewtech KT71, the machine will indicate 'Off?' on the display. In this case it is a simple matter to over-ride the warning, but it is still an extra level of complication that isn't needed, and can cause confusion to the person carrying out the tests.

Can I use a Battery Powered PAT Test Machine to test 110V appliances?

There are many advantages to using a battery powered machine to carry out general PAT Testing – the main being that the machines are lightweight, usually easier to use, cheaper to buy and can be moved around easily without having to be plugged in, thus making them quicker.

Examples of Battery Powered machines are the BattPAT, Seaward Primetest 100 and the Kewtech KT72 – see above.

The downside of battery powered machines is that they always carry out the Earth Bond test at a low current (usually 100mA or 200mA.) Whilst this 'soft' earth bond test is perfect for office equipment, it's not considered quite powerful enough for industrial appliances such as 110V power tools and machinery.

In the IEE (IET) Code of Practice, we are advised that the Earth Bond Test should be carried out using a HIGH test current (1.5 times the plug fuse rating up to a maximum of 26A) or using a softer current whilst manually manipulating (wiggling) the cable to identify any breaks or weak points. Technically, this should mean that it's acceptable to test ANY appliance using a 'soft' test' but in practice most PAT Testing engineers would prefer to do a HIGH current test on industrial appliances as this is considered more likely to reveal a weak earth. In any case, it is almost impossible to 'wiggle' every inch of a long mains cable (especially a long extension lead) during a 5 second test and so a low current ('soft') test is not recommended for 110V appliances.

Of course the issue above ONLY applies to the Earth Bond Test, and this test is ONLY done on CLASS 1 appliances. Most of the 110V power tools you will come across will be CLASS 2, however some older appliances such as welding sets and site lamps may be CLASS 1. Of course, ALL 110V extension leads should be CLASS 1.

Therefore – If you only have a few 110V power tools to test (all CLASS 2) then a battery powered machine should be fine. However if you will be testing a range of 110V appliances (which might include some CLASS 1 appliances and extension leads), then it will be better to use a mains powered tester which can carry out a high current (up to 26A) Earth Bond Test.

What if I want to carry out Load Tests on 110V Appliances?

The two tests which are important to carry out are the Earth Bond Test and the Insulation Test. However, some people also prefer to carry out additional tests such as Load, Earth Leakage, Touch Current etc. These extra tests are normally carried out when the appliance is operating (in other words mains voltage is applied to the test socket and the appliance comes 'ON' during the test.)

This can be problematic with 110V appliances, especially if you are using an adaptor with a 'standard' PAT Tester without a 110V socket. If you use the wrong adaptor, for example you could put 230V into a 110V appliance.

If you are using a tester with a dedicated 110V socket, then you are usually able to plug the tester itself into a 110V supply (thus making the PAT Testing Machine a 110V appliance as well) and then the additional tests can be carried out as expected. The Megger PAT320/350/420 and Kewtech KT77 all allow the tests to be carried out in this way. To connect the PAT Tester to a 110V supply you can use a PTA4 adaptor, as pictured above.

If you are using a tester without a dedicated 110V socket, then you cannot do these additional tests – only Earth Bond and Insulation.

What About Testing 110V Extension Leads?

Again, the best way to test 110V extension leads is with a PAT Tester with a dedicated 110V socket. If using a Kewtech KT76 / KT77 or Megger PAT320 / 420 / 450 you can use a 110V extension lead adaptor (PTA2 – see above) to connect the extension lead directly into the machine. The best way to do this is to plug the PAT Tester into a 110V supply and use the 'Extension Lead' Setting.

If you want to test 110V extension leads with a machine which does not have a dedicated socket, then you will need two adaptors – a PTA2 and PTA3. You can connect the extension lead up and test it in the same way as a 230V extension lead, although any Polarity Test carried out by the tester will always fail. You can safely ignore this condition, which is caused by the special wiring in the adaptor. (You can check the polarity separately with a continuity tester or simply by opening the plug and socket and having a look!)

So, After All That, Which Machine Should I Buy?

Ultimately, you have to make a decision based on cost, ease of use and how many 110V appliances you're going to check.

There is no doubt that a PAT Tester such as the Megger PAT320 would be the best for testing 110V appliances (or even the Megger PAT420 or Kewtech KT77 if you want data storage / label printing etc) and any of these machines will allow you to test 110V appliances in the best way possible, without any compromise. We would always recommend a machine such as this if you have lots of 110V appliances to test or want to be certain that you can test anything. This would be the professional choice – but of course you also have to bear in mind that these machines are more expensive.

As a slight compromise, a Kewtech KT71 would be an excellent choice, using a PTA3 adaptor (and a PTA2 as well for 110V extension leads.) You will need to understand that the PTA3 adaptor will make each appliance 'appear' to be 'switched off' and you will need to over-ride this to carry out the insulation test. Any 110V extension leads will always fail the Polarity test and you will have to do this manually. We would recommend this approach if you are mainly testing 230V appliances and have a few 110V appliances – say up to 20 or so.

A Battery Powered machine such as a BattPAT, Kewtech KT72 or Seaward Primetest would be third choice – again using the PTA3 adaptor above (and a PTA2 for 110V extension leads) We would not normally recommend this approach if you know you will be testing lots of 110V appliances, but you can use the adaptors to get you out of a sticky situation if you are unexpectedly asked to test the occasional piece of 110V equipment.