UPS fails Insulation Resistance Test (PAT Test)

Insulation Resistance: What is it?
In short, it is an electrician's safety test. During the test, all phase conductors, including neutral, are shorted together. Which makes Test Node 1.
A DC voltage source is connected between Test Node 1 and Ground. The source is turned up to 500VDC and the source has a meter which measures the insulation of the circuit under test. As there are usually no conductive connections between phase and ground, typical values are in the GOhms(10^9).
The limits that have historically been specified by safety standards is about 2Mohms($2x10^6$). The purpose of the test is to check that there has been no damage to the product (or building) wiring and also to check for any damage to components connected mains to ground (in the old days capacitors were very "leaky" and they could cause a problem). Electricians historically are the people who use this test as it is a convenient way for them to make sure that the wires, they have installed aren't damaged. The test is to be done on the building wiring without any load devices (in our case a UPS or surge suppressor) connected.

Why do people ask us for this?
When safety standards were first written (sometime circa 1927 for Europe, 1893 in US) they applied building codes to products. Over time, product specific standards have been created and these are written by laboratories and Industry leaders. The people writing the product specific standard look at the specifics of the product as opposed to general building codes. The point is that Insulation Resistance was a staple of early safety standards. As technology evolved and standards were updated, many standards eliminated this requirement.
A UPS or Surge strip is considered a piece of Information Technology Equipment (ITE). The standard for ITE as it exists today, is very different from what it was 12 years ago. When the ITE standard was created, it focused on mainframe computers which had wiring that wasn't all that different than building wiring. Because of this Insulation Resistance was part of the standards (IEC 380 in Europe)

Why doesn't this apply to us anymore?
As everyone knows, we are in the age of the PC revolution. Along comes the PC with all sorts of technological breakthroughs. Mains wiring in the product became simpler, but circuitry became more complex. As a result of this the ITE standard was completely overhauled (circa 1988). The new standard, IEC 950 in Europe, did away with Insulation Resistance and hence the test does not apply to us.

Why then do people STILL ask for this?
There are 2 areas that drive this
1. Building safety codes. In Europe, many countries (France and Belgium come to mind immediately) have local rules which require the building to have a routine safety inspection of the wiring conducted. To do this, an inspector will perform an Insulation Resistance test on the premises wiring (with power disconnected from the utility). Unfortunately, they usually do not disconnect load devices (a UPS in our case) and because of some really neat circuitry in our products, the meter indicates a failure. **This is not a safety issue and is simply a case of someone not performing the test properly.**

2. Equipment check ups. Many countries in Europe (UK in particular) require a routine inspection of equipment to make sure it is still safe. There are a lot of companies that offer to perform these inspections. Because they want to do this quickly, all they do is inspect the power cord and perform an Insulation Resistance test. **This is wrong as in many cases they are weakening the equipment by this test and are in fact making the equipment less safe. Tragically, insurance companies direct their clients to hire these inspection services to check equipment.**

To Sum Up!

1 Our UPS do not require this test and they have been determined to be safe by the VDE, the most highly respected independent safety lab in the world.

2. How they can be safe when they fail this test? Some customers will say. There is certain circuitry we use that causes the failure. Obviously, we cannot give out schematics. The answer is that VDE examined this circuitry and has proven that the current available to the user through the ground, in the event of a fault (when operating at nominal line voltage) is less than 0.7mA(0.0007A). This is less than the allowable leakage current limits.

3. If they are a technical person, refer to clause 2.2.8 and 2.4 of IEC/EN 60950.