ISCE

The Institute of Sound and Communications Engineers

Engineering Note 7.4

Insulation resistance

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Safety standards, and IEC/EN 60065 in particular, specify a minimum insulation resistance at 500 V d.c. that every product must meet. For basic or supplementary insulation, the minimum insulation resistance specified is 2 MΩ, while for reinforced insulation it is 4 MΩ.

Some products may need such low limits because the insulation has to be bridged for functional reasons by one or more physical resistors, such as a discharge resistor for a 'Y' capacitor in a mains filter. But for the majority of products, when new, the insulation resistance is of the order of hundreds or even thousands of megohms. With modern constructional methods and ventilation techniques, contamination of the surfaces of insulation is often minimal, so that even after a few years service, the insulation resistance is not greatly degraded.

What then are we to make of the tendency for PAT testers and the like to register a 'FAIL' on insulation test only if the limit in the relevant standard is violated? Is it sensible to consider that a fall in insulation resistance from 100 MΩ, say, to 2 MΩ is quite OK, but a fall to 1.9 MΩ is not? Of course not! A fall to 2 MΩ is a sure sign that something needs investigating immediately, because a complete insulation failure may be imminent. Murphy's Law says that it will occur when the earth lead has also fallen off somewhere in the set-up, so that the fault represents maximum safety-of-life hazard.

In the standards world, this subject seems to be firmly in the 'too difficult' file, along with the question of 'one or two primary fuses and a single or a double-pole mains switch' for Class 1 products that may be equipped in service with detachable mains leads bearing reversible Schuko plugs.

So what should we do? I tried to get BSI interested in something like this:

The manufacturer shall state the minimum insulation resistance for the product when new. (There must be a limit set in the factory test set that signals a failure.)

The (professional) user is encouraged to measure the insulation resistance of the product as delivered and operated for an hour to dry out, and to record this value. In subsequent testing, either PAT testing or after maintenance or repair, any value of insulation resistance less than one-third of the recorded 'as-new' value shall be subject to further investigation.