

Floored: Insulation resistance meter tests for electrostatic discharge

Application Note



Testing Functions Case Study

Manufacturers of electronic systems and devices go to great lengths to protect their equipment and products from electrostatic discharge (ESD) damage. The cost of ESD-damage—repair and rework, shipping, labour, overhead, and loss of production time—ranges from a few cents for a simple component to several hundred dollars for complex devices. Most technical personnel in the electronics industry have ESD protection processes in place for both the factory and field.

Electrostatic dangers

When a statically-charged person or object touches an ESD sensitive device, the electrostatic charge can be drained through sensitive circuitry in the device. If the electrostatic discharge possesses sufficient energy, localized overheating can damage the device.

Two kinds of damage may result:

1. Catastrophic damage, where the electronic device is rendered inoperable immediately after the ESD event
2. Latent damage, where the electronic device appears to be working fine but has been damaged nonetheless and could fail to operate properly at some time in the future.

To protect against ESD, manufacturers advocate wearing smocks on the production floor and using ESD protective wrist straps, antistatic work shoes, and static dissipative flooring.

Static dissipative flooring

When Computerstate Systems of Calgary, a manufacturer of embedded systems for the oil and gas, global positioning and communications industries, moved facilities last year, the company hired Diamond Hard Surfaces Inc, a local concrete coatings and specialty concrete flooring company, to apply an ESD floor coating system.

After a client interview, Diamond Hard President Walt Curilla, P.Eng. had a clear idea of the appropriate polymer coatings for the job—the only question was how to accurately measure the resistance the coating would provide, so that he could substantiate the reduction of static discharge to an acceptable dissipative level. Curilla found the answer in the Fluke 1520 insulation resistance tester.

Typically, an insulation resistance meter is used for testing motor wiring or electrical distribution systems for fault conditions. Since all insulation degrades over time, insulation resistance meters are helpful for monitoring wiring conditions and scheduling maintenance in advance of failure.

When it comes to static dissipative flooring however, Curilla discovered that insulation resistance meters are also adept at measuring resistance between two points. For example, the average distance between the feet of a worker walking across the production floor.

Measuring tools: Fluke 1520 Insulation Resistance Tester*

Operator: Diamond Hard Surfaces Inc., Calgary

Inspections: Resistance (Ohms)

*Note: The Fluke 1520 has been replaced by the Fluke 1507/1508 Insulation Testers.

Systematic testing

To gather measurements, Curilla placed 5 lb weights three feet apart, an industry specification for measuring resistance on the floor. His team wrapped tin foil around the weights and applied shaving cream and water as conductors under the weights. "There is a bit of black art to it," Curilla says. Then, the meter applied 500 volts to measure resistance.

"We needed to sample ten test points after each layer was applied: Carbon black epoxy and polyurethane protective layers," Curilla explained. That way, the flooring installers could repair any local anomalies, if necessary, for each coating layer until the work-in-progress system achieved the expected resistance values. (Acceptable readings in ohms are defined by an electrostatic safety standard: conductive is under one megohm; dissipative is one megohm to one gigohm).

For instance, the tester's measurements showed the installers which areas needed light sanding to lessen resistance. Grinding off any undesirable insulative barrier increases the floor's conductivity, dissipating the static electricity that a person walking across the floor could otherwise build to unacceptable levels with each step.

This type of floor testing cannot be done with a standard multi-meter. A megohmmeter that can apply a specified voltage across the measured surface was needed. "Without the insulation resistance meter, there would have been no way to do the testing," said Curilla.

Follow up

Being able to confirm levels of ESD protection should bring additional assurance to contract electronics manufacturers and OEMs. "Without testing the resistance, we wouldn't be doing a service to the client," Curilla says. "We'd be taking many, many chances."

"For example, whether we're installing dissipative / conductive coating or tile systems, how would the client know that their protective floor system works after it has been installed, if the installer did not test the floor before, during or after installation? More importantly, how does the client know if their janitorial staff are properly maintaining the client's floor six months, twelve months or five years later? One bad wax job can spoil your floor's performance."

"An ESD flooring system is like a fire extinguisher or any other life safety device: Without regular proper testing, you will not know if your protective system will function per the original dissipative / conductive design intent unless you test it regularly."



The Fluke Family of Insulation Resistance Testers

Fluke Insulation Resistance Testers measure resistance, primarily to determine the integrity of windings or cables in motors, transformers, switchgear, and electrical installations.

The newest models are the Fluke 1507 and 1503. They're smaller than previous units, and offer multiple test voltages for troubleshooting, commissioning, and preventative maintenance applications. They also include a remote probe, for rapid multi-point testing.

The Fluke 1587 and 1577 Insulation Multimeters combine a 1 kV digital insulation tester with a full-featured True-RMS digital multimeter in a single, handheld device.

The Fluke 1550B is a more powerful tester capable of testing up to 5 kV. The Fluke 1520 MegOhmMeter 1 kV insulation resistance tester also measures voltage and checks connections with its Lo-Ohms function.

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Fluke Corporation
PO Box 9090, Everett, WA USA 98206

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:
In the U.S.A. (800) 443-5853 or
Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or
Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or
Fax (905) 890-6866
From other countries +1 (425) 446-5500 or
Fax +1 (425) 446-5116
Web access: <http://www.fluke.com>

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