

# In God We Trust... All Others Bring Data

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All ESD control products are not created equal. In fact, there are products on the market that despite the claims, fall below the expected performance when put into service.

The manufacturing of ESD control products (wrist straps, footwear, flooring, mats, ionizers, shielding bags, etc.) for handling electronic devices is a multi-million dollar business. There are many options available for almost all types of ESD control products and they cover a wide range in performance and price.

For decades, companies have made significant investments into their ESD control programs, yet many of these companies do not (or cannot) verify that the controls they selected are providing them with the protection they need. Over the past several years, the ESD Association and the International Electrotechnical Commission (IEC) have developed testing standards for the qualification of ESD control materials. Industry professionals from both organizations have developed and validated test methods that provide reliable and repeatable performance characteristics when followed precisely. It is critical that companies verify that ESD control products meet their needs before they put them into service.

Ron Gibson, Sr. ESD Consultant at Celestica, who performs product qualification testing on ESD control products for Celestica worldwide, is very aware of the importance of qualification testing.

“I tested 110 products in 2008/09 for Celestica. Of the 110 only 28% of the products met industry standards from the ESDA or IEC while 72% did not. The items tested consisted of packaging (various), garments, work surfaces, gloves and tape products, and came from sources in Europe, Asia and North America.”

Currently, the developers of the ANSI/ESD S2020 standard have made qualification testing a requirement for compliance to the standards. In order to meet the product qualification requirements, users of the ANSI/ESD S2020 have three choices; internal qualification testing, independent laboratory testing and the product manufacturers’ data sheet.

## QUALIFICATION TESTING

Unlike compliance verification testing, which is conducted on the factory floor during regularly scheduled audits, qualification testing is typically conducted during the initial selection of ESD control products and materials. Qualification testing requires a controlled lab environment and lab grade test instruments. Product samples typically must be pre-conditioned in 12% ( $\pm 3\%$ ) and 50% ( $\pm 5\%$ ) relative humidity at  $23 \pm 1^\circ\text{C}$  for a minimum of 48 hours prior to, and during testing. In many cases, this conditioning requires a bench top enclosure, and in the case of larger samples (chairs, floors and bench tops) it may require the use of a walk-in environmental chamber. Testing at both high and low humidity reveals product performance in a wide range of environmental conditions.

What if you do not have the controlled environment or test instruments required for ESD qualification testing? The standards provide you with additional options for product qualification.

### INDEPENDENT LAB TESTING

Independent laboratory testing can be used by the end user to qualify and select products intended for ESD control in their factory. Independent labs have been used for many years, primarily by product manufacturers to provide end users with test data that validates their performance claims. When selecting an independent lab for ESD product testing, it is important to verify that the lab has a strong understanding of, and the capability to perform, industry standard test methods.

### SUPPLIER DATA SHEETS

The third and easiest option comes with a degree of risk. Although manufacturers' data sheets are acceptable documentation for product qualification they should be scrutinized very carefully before relying on them for product selection. During a review of data sheets posted on internet web sites by various manufacturers, there were a number of instances where the test method cited on the data sheet was not the correct method to use for the product. Both ANSI/ESD S20.20 and IEC 61340-5-1 list the specific standard test method in the product qualification section of the standard. It is important that the test method stated on the data sheet matches the requirement in the standard.

### PRODUCT PERFORMANCE DETERMINES LEVEL OF CONTROL

Both the ANSI/ESDA and IEC standards are designed to protect devices down to 100 volts Human Body Model (HBM) and the required limits are designed with the 100 volt level in mind. However, today devices with sensitivity thresholds of less than 100 volts are becoming more prevalent and in these instances the required limits in the standards may not be enough to provide adequate protection. By simply modifying the limits, the standards can be used for these more sensitive devices, as illustrated in Figure 1. When the resistance to ground is less than 10 MΩ, we can expect the voltage on personnel to be less than 40 volts.

One common example is the use of ESD control flooring and footwear to ground personnel. The use of an ESD control floor and footwear program, which allows personnel the flexibility to move throughout the production area, is typically the largest single investment in ESD control. The standards require a system resistance (person, footwear and flooring to ground) of <35 MΩ. Laboratory testing has shown that resistance to ground has a direct correlation to the maximum voltage on a person. By keeping the system resistance < 35 MΩ, it is unlikely that the body voltage will ever reach 100 volts. By reducing the system resistance, you will limit the peak voltage on the person.

When making this type of investment however, it is wise to conduct body voltage generation testing as well. There are instruments available that will measure, record and calculate the body voltage generation potential with specific floors, footwear and people. Only by conducting this test will you know the level to which you can control personnel charging. Figure 2 illustrates an example of a report generated from the ANSI/ESD STM97.2 voltage generation test method. With the flooring and footwear combination used in this test, we see that there is no chance that body voltage will exceed 75 volts and a less than 2.28% chance that the voltage will ever exceed 50 volts. This is very valuable data for demonstrating ESD process capability.

There are many ESD control products available in the market today. It is in the best interest of the end user of these products to ensure that they are providing the protection required to minimize yield losses attributed to ESD damage, and that they meet the corporate ESD Program requirements. ■

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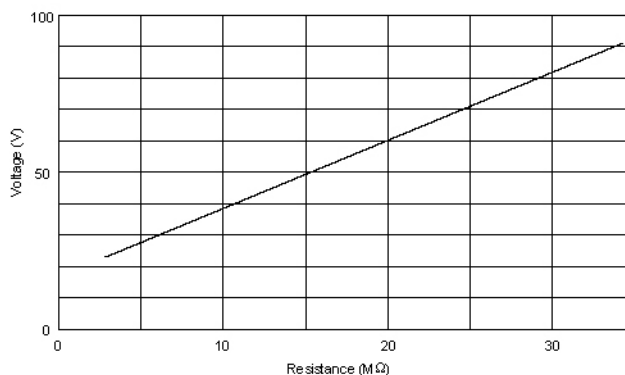
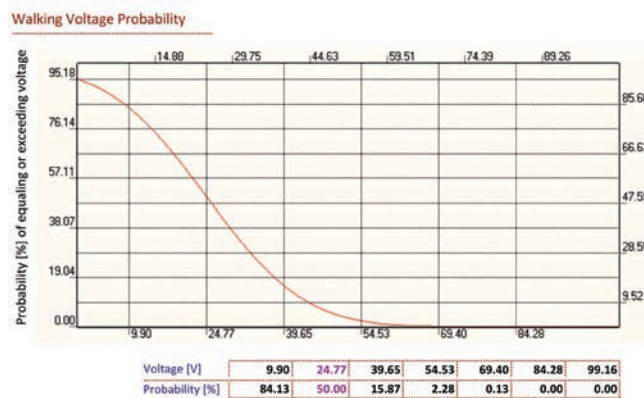


Figure 1



Data acquired using Prostat PGA-710 courtesy of Stephen Halperin & Associates, Ltd.

Figure 2