ESD Open Forum

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Question:

How is ESD SP10.1-2007 used for testing Voltage levels in Automated Handling Equipment??

Answer:

ESD SP10.1-2007 can be used evaluate the electrostatic environment of the Automated Handler Equipment (AHE) or automated process. There are several aspects that have to be reviewed when discussing the use of this standard. They are the resistance measurement apparatus and procedures, voltage measurement apparatus and procedures, and correlation between the voltage measurement and a known voltage. We'll look at these in order with the resistance measurements briefly discussed since they use standard measurement techniques.

Resistance Measurements Apparatus:

The resistance measurements in SP10.1-2007 are straight forward and there are a number of manufacturers of various types of meters that meet the requirements of this standard. The prefered meter is one capable of measuring 0 to $1x10^6$ Ohms with an open circuit voltage of 10 Volts and $1x10^6$ ohms to $1x10^{11}$ Ohms with an open circuit voltage of 100 Volts.

Charge Accumulation Measurements:

Since it is difficult to measure electrostatic charge in an AHE that is running production material, voltage measurements are often made as an indirect method of evaluating charge. Voltage sensors are used along with electrostatic voltmeters since their response times are typically much faster then field strength meters and can resolve smaller surface areas.

It is critical to follow the manufacturer's specifications in selecting and using the correct sensor with aperture size and distance requirements. The measurement applications dictate the size and configurations of the probe.

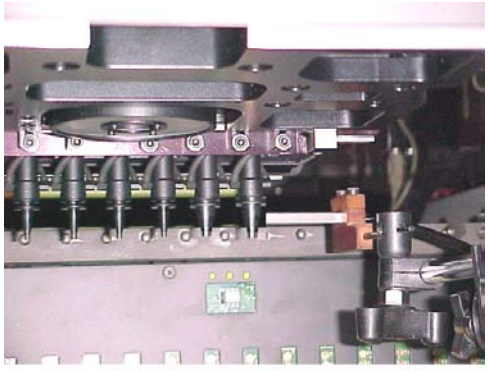

Photo 1

As shown in Photo 1, a probe is set up to measure the voltage on the nozzle tip. It is important that the objects pass within the specified distance to the probe and the

probe does not collide with the device being measured. By using a side aperture instead of an end aperture, the voltage on a component can be measured.

Photo 2

In Photo 2 the Electrostatic Voltage Sensor can be seen with the device passing over it at a known distance and velocity.

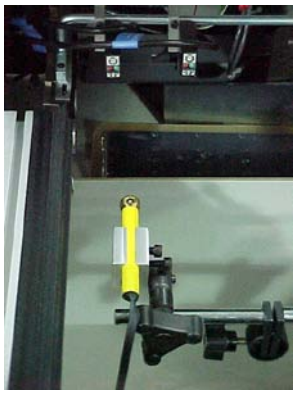

Photo 3

In Photo 3, a voltage probe is mounted to "view" or measure a specific part on a PCB as it passes over the sensor.

It is important to note here that in many or even most of these measurements, the velocity of the device moving past the probe may be faster than the response time of the meter display. If that happens then the meter will not display the correct level of voltage. Consequently a meter with a voltage output should be used in these applications to allow connection of an oscilloscope to the output. The voltage output circuit of the meter has a faster response time than the display, allowing the oscilloscope to capture the complete waveform. The complete waveform is more representative of the actual voltage present in the measurement.

Another factor is the distance and velocity of the device to the probe. As the distance and velocity of the device to be measured changes, the measured voltage will also change. The voltage measurement through the application has to be correlated to a known value. A device comparable in size to the one used in the actual application should be selected. To insure a good charge, place a piece of foil on an isolated surface of the test device that will pass closest to the probe. Charge the foil on the device with a known voltage. Make sure that the charge is not going to dissipate by

contacting a grounded surface such as a dissipative nozzle or gripper and that the device passes over the probes at the same velocity and distance from the probe aperture as in the actual measurement application. The difference in the measurement and known value is the correlation factor of the measurement. This should be repeated several times at different voltages and the data compared. Once this is completed for each function of interest, the measurements of the applications can take place and the results compared to the correlation voltages.

In measuring machine elements such as heads, grippers, belts, guides and nozzles, it may be possible to run the application for a period of time and then step the AHE through the process and make electrostatic measurements of the machine elements in a stationary mode. That way correlation may not be needed. One would only have to insure that the charge is not dissipating during the static measurement.

Photos 4 and 5 are of a few types of probes available. Becoming familiar with the available probes will allow the positioning of the probes to the surfaces being measured with a maximum range of clearance to the probe.

Note that the 2 rectangular probes, as seen in Photo 5, have different aperture locations, one is on the end and the other is on the side.

Photo 4

Photo 5

It should also be noted to review the manufacturer's documentation closely. Some of the probes may have a voltage equal to the measurement on the probe body and thus must be isolated. The voltage on the probe will affect the mounting mechanism of the probe.

The standard practice, ESD SP10.1-2007 is a fairly easy procedure to incorporate into AHE and process verification. The evaluations can be accomplished efficiently with the proper selections of probes, meters and process familiarization and proper correlation of the measurements.

Reference:

ANSI/ESD SP10.1-2007, Automated Handling Equipment (AHE), ESD Association, Rome NY.

About the Author:

This article was written on behalf of the ESD Association by Donn G. Bellmore, Reliability Analyst and Corporate ESD Specialist, Quality and Reliability Dept., Universal Instruments Corporation. During his 28 years employment with Universal Instruments Corporation, Donn has worked in the ESD field for 22 years and is currently responsible for the required process and materials research, design, and integration of ESD controls in Automated Assembly Equipment manufactured at Universal Instruments Corporation. Donn has been an active member of the ESD Association since 1995 and participates on the Garments and Ionization Committees, is a member of the Standards Committee. He is currently serving as a Director, Treasurer, Vice President and was this years Symposium General Chair. Donn is also a member of the ASQ and ASM organizations