ANSI/ESD SP10.1-2016
Revision of ANSI/ESD SP10.1-2007

ESD Association Standard Practice

For the Protection of Electrostatic Discharge Susceptible Items-

Automated Handling Equipment (AHE)

ANSI/ESD SP10.1-2016

Electrostatic Discharge Association
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ESD Association Standard Practice for the Protection of Electrostatic Discharge Susceptible Items –

Automated Handling Equipment (AHE)

Approved February 25, 2016
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FOREWORD

Recent years have witnessed an increasing use of automation in the electronics industry. There is hardly a device, circuit board, or assembly that does not undergo one or more types of automated handling at some point during its production cycle. Further, circuit density for most semiconductor devices has steadily increased, leading to a higher ESD susceptibility for some semiconductor devices. As a result, extensive measures are required to protect these sensitive devices during manufacture.

Many of the same methods used to deal with static charge on a workbench have been applied to automated handling equipment. Grounding, the use of static dissipative materials, and ionization are techniques commonly used to deal with static charge. Automated handling equipment (AHE) presents additional problems for effective static control. Devices may become polarized by an electric field, or charge can be induced onto a device that is grounded in the presence of the electrostatic field. Also, a charge can be generated by contact with or separation from various materials. Components of AHE, particularly when integral with thermal chambers, generally require the use of easily charged materials. Grounding of sliding or rotating components may also be a challenge. These are some common problems encountered by both manufacturers and users of automated equipment. ESD control methods should be verified periodically. Test methods are needed to insure grounding integrity and verify that product does not acquire an unacceptable level of static charge during its passage through automated equipment.

In order to achieve suitable ESD control in AHE, it may be necessary to monitor or verify electrostatic charge on a product as it passes through the equipment. This can provide both continuous verification of ESD counter-measures and a method for locating sources of charge generation.

Various types of measuring devices have been developed to determine the electrostatic potential or estimate the charge on product as it passes through the equipment. In order to verify the performance of these measuring devices, it is necessary to have a means of testing their repeatability and calibration, both at manufacture and periodically during service. This standard practice[1] has been developed to assist in the generation of meaningful, repeatable data using these measuring devices.

The diverse range of handling equipment, environments, and device sensitivities may require modifications to the test apparatus described in this standard practice. Further, the test conditions and results given within this standard practice may not always represent acceptable performance. Specifications should be agreed upon between the user and manufacturer of the automatic handling equipment in each application.

This document was originally designated ESD SP10.1-2000 and was approved on February 6, 2000. ANSI/ESD SP10.1-2007 was a reaffirmation of ESD SP10.1-2000 and was approved on June 27, 2007. ANSI/ESD SP10.1-2016 is a revision of ANSI/ESD SP10.1-2007 and was approved on February 25, 2016.

[1] **ESD Association Standard Practice (SP)**: A procedure for performing one or more operations or functions that may or may not yield a test result. Note, if a test result is obtained it may not be reproducible.

At the time ANSI/ESD SP10.1-2016 was approved, the 10.0 Handlers Subcommittee had the following members:

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1.0 PURPOSE, SCOPE, AND APPLICATION

1.1 Purpose

This standard practice provides test procedures for evaluating the electrostatic environment associated with AHE.

This document provides testing and data reporting procedures for the evaluation of ESD ground integrity in AHE and for the evaluation of charge generation and accumulation on devices in AHE. These methods evaluate newly installed and existing equipment by verifying the equipment's existing ground paths and by determining if charge on ESD-sensitive devices (ESDS) can be detected.

1.2 Scope

This standard practice covers resistance-to-ground measurements of machine components and sources of charge in AHE.

Two methods are described to measure sources of charge.

One method measures charge indirectly by measuring the voltage or field associated with the charge.

The second method directly measures the voltage induced on ESDS items.

In particular, it establishes test procedures for:

- the measurement of DC electrical resistance between machine components of AHE and the equipment grounding conductor (EGC). See Annex A.
- testing AHE to determine whether charge is being generated on devices as they move through the equipment.
- reporting the correlation between measured voltages and known test voltages as they apply to AHE. (Charge measuring devices are not addressed in this document.)

Grounding methods and materials specified herein may or may not provide adequate grounding for conditions other than steady state DC. Reactance considerations at any frequency are beyond the scope of this document. In addition, this standard practice does not determine the effectiveness of any grounding method for reducing electromagnetic interference (EMI). Explosive, ordnance, or flammable materials handling considerations are also excluded from this standard practice.

1.3 Application

Test procedures contained within this standard practice may be used by both AHE manufacturers and users to produce repeatable data describing the ground integrity of AHE and the charge generated and accumulated on specific package types during normal operating usage of the AHE. Since there is a wide variety of device sensitivities, AHE types, package types and environmental conditions, users and manufacturers are strongly urged to agree upon appropriate specifications, measurement accuracies, modifications, or additions to the tests described herein. This standard practice relies upon point-to-point DC resistance measurements taken from machine components of concern or the equipment chassis to the EGC.