

ANSI/ESD S20.20-2021

ESD Association Standard

ANSI/ESD S20.20-2021
Revision of ANSI/ESD S20.20-2014



*For the Development of an Electrostatic
Discharge Control Program for*

*Protection of Electrical and Electronic
Parts, Assemblies, and Equipment
(Excluding Electrically Initiated
Explosive Devices)*

EOS/ESD Association, Inc.
218 West Court Street
Rome, NY 13440

An American National Standard
Approved December 14, 2021

Published January 6, 2022

***ESD Association Standard
for the Development of an Electrostatic Discharge
Control Program for

Protection of Electrical and Electronic
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(Excluding Electrically Initiated Explosive
Devices)***

Published January 6, 2022.

Replaces version previously published on December 15, 2021.

Approved October 28, 2021

EOS/ESD Association, Inc.



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Published by:

EOS/ESD Association, Inc.
218 West Court Street
Rome, NY 13440

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Printed in the United States of America

ISBN: 1-58537-332-X

(This foreword is not part of ESD Association Standard ANSI/ESD S20.20-2021)

FOREWORD

This standard covers the requirements necessary to establish, implement, and maintain an electrostatic discharge (ESD) control program for activities that manufacture, process, assemble, install, transport, package, label, service, test, inspect, or otherwise handle electrical or electronic parts, assemblies, and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 volts human body model (HBM) and 200 volts charged device model (CDM). The CDM voltage level used in this document is based on managing process essential insulators to mitigate field-induced voltages on devices that could lead to damage.

This standard also defines the requirements for isolated conductors. The reference to machine model (MM) is retained in this standard for the historical association to the MM robustness of devices to isolated conductors.

HBM and CDM fully characterize the ESD robustness of devices. Therefore, MM testing is no longer required to qualify devices, and test data may not be available.

This document covers the ESD control program requirements for establishing a program to handle ESD sensitive (ESDS) items based on the historical experience of both military and commercial organizations. References include EOS/ESD Association, Inc., U.S. Military, and ANSI approved standards for material properties and test methods. The fundamental ESD control principles that form the basis of this document are:

- A. All conductors in the environment, including personnel, shall be bonded or electrically connected and attached to a known ground or contrived ground (as on shipboard or aircraft). This attachment creates an equipotential balance between all items and personnel. Electrostatic protection can be maintained at a potential above a "zero" voltage ground potential if all items in the system are at the same potential.
- B. Process essential insulators in the environment cannot lose their electrostatic charge by attachment to ground. Ionization systems provide neutralization of charge on these process essential insulators (circuit board materials and some device packages are examples of necessary insulators). Assessment of the ESD hazard created by electrostatic charge on the process essential insulators in the workplace is required to ensure that appropriate actions are implemented, commensurate with the risk to ESDS items.
- C. Transportation of ESDS items necessitates enclosures in protective materials, although the type of material depends on the situation and destination. While these materials are not discussed in the document, it is important to recognize the differences in applications. For more clarification, see ANSI/ESD S541.

Any relative motion and physical separation of materials or flow of solids, liquids, or particle-laden gases can generate an electrostatic charge. Common sources of electrostatic charge include personnel, items made from common polymeric materials, and processing equipment. ESD damage can occur in several ways, including:

- i. A charged object (including a person) coming into contact with an ESDS item.
- ii. A charged ESDS item making contact with ground or another conductive object at a different potential.
- iii. An ESDS item making contact with ground or another conductive object while exposed to an electrostatic field.

Examples of ESDS items include, but are not limited to, microcircuits, discrete semiconductors, thick and thin film resistors, hybrid devices, printed circuit boards, and piezoelectric crystals. It is possible to determine device and item susceptibility by exposing the item to simulated ESD events. The level of sensitivity, determined by testing using simulated ESD events, may not necessarily relate to the level of sensitivity in a real-life situation. However, the sensitivity levels are used to establish a baseline of susceptibility data to compare devices with equivalent part numbers from different manufacturers. Two different models are used for the characterization of electronic items: HBM and CDM.

For more information on the requirements in this standard, there is a technical report, ESD TR20.20 – ESD Association Technical Report – Handbook for the Development of an Electrostatic Discharge Control Program for the Protection of Electronic Parts, Assemblies, and Equipment.

Compliance with this standard can be demonstrated through third-party certification. The certification process is like any quality management system certification such as ISO 9001. Information on the certification process can be obtained by contacting an EOS/ESD Association, Inc. approved certification body. For a list of EOS/ESD Association, Inc. approved certification bodies, see www.esda.org.

This standard¹ was originally designated ANSI/ESD S20.20-1999 and was approved on August 4, 1999. ANSI/ESD S20.20-2007 was a revision of ANSI/ESD S20.20-1999 and was approved on February 11, 2007. ANSI/ESD S20.20-2014 is a revision of ANSI/ESD S20.20-2007 and was approved on March 25, 2016. ANSI/ESD S20.20-2021 is a revision of ANSI/ESD S20.20-2014 and was approved on October 28, 2021.

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¹ **ESD Association Standard (S):** A precise statement of a set of requirements to be satisfied by a material, product, system, or process that also specifies the procedures for determining whether each of the requirements is satisfied.

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ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment (Excluding Electrically Initiated Explosive Devices)**1.0 PURPOSE**

The purpose of this standard is to provide administrative and technical requirements for establishing, implementing, and maintaining an ESD control program (hereafter referred to as the "Program").

2.0 SCOPE

This document applies to organizations that manufacture, process, assemble, install, package, label, service, test, inspect, transport, or otherwise handle electrical or electronic parts, assemblies, and equipment susceptible to damage by electrostatic discharges greater than or equal to 100 volts human body model (HBM) and 200 volts charged device model (CDM). Also, protection from isolated conductors is handled by limiting the voltage on isolated conductors to less than 35 volts. Processes that include items susceptible to lower withstand voltages may require additional control elements or adjusted limits. Processes designed to handle items with a lower ESD withstand voltage can still claim compliance to this standard. This document does not apply to electrically initiated explosive devices, flammable liquids, or powders.

NOTE: The CDM voltage level used in this document is based on industry experience when managing process essential insulators to mitigate induced voltages on devices that could lead to damage.

3.0 REFERENCED PUBLICATIONS

Unless otherwise specified, the following documents of the latest issue, revision, or amendment form a part of this standard to the extent specified herein:

ESD ADV1.0, ESD Association's Glossary of Terms²

ANSI/ESD S1.1, Wrist Straps²

ANSI/ESD STM2.1, Garments – Resistive Characterization²

ANSI/ESD STM3.1, Ionization²

ANSI/ESD SP3.3, Periodic Verification of Air Ionizers²

ANSI/ESD STM4.1, Worksurfaces – Resistance Measurements²

ANSI/ESD S6.1, Grounding⁽²⁾

ANSI/ESD STM7.1, Flooring Systems – Resistive Characterization²

ANSI/ESD S8.1, Symbols – ESD Awareness²

ANSI/ESD STM9.1, Footwear – Resistive Characterization²

ANSI/ESD SP9.2, Foot Grounders – Resistive Characterization²

ANSI/ESD STM11.11, Surface Resistance Measurement of Static Dissipative Planar Materials²

ANSI/ESD STM11.12, Volume Resistance Measurements of Static Dissipative Planar Materials²

ANSI/ESD STM11.13, Two-Point Resistance Measurement²

ANSI/ESD STM11.31, Bags²

ANSI/ESD STM12.1, Seating – Resistance Measurements²

ANSI/ESD S13.1, Electrical Soldering/Desoldering Hand Tools²

ESD TR53, Compliance Verification of ESD Protective Equipment and Materials²

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