

ESD Product Classification

DSF 3.2.5

Scope:

This document provides an overview of the **ESD Standards, Effects of ESD, Acceptance Criteria** and indicates the applicable **ESD Capability Verification (DST 1.1.5)** test requirements to be performed on an individual component, sub assembly or completed product.

Standards:

Electrostatic Discharge (**ESD**) standards define guidelines and standard practice in an Electrostatic Protected Area (**EPA**), for a manufacturing environment ANSI/ESD standards also provide guidance for Automated Handling Equipment (**AHE**).

ASM references the following standards:

- BS EN 61340-5-1-2016
- BS EN 61340-5-2-2018
- BS EN 61340-5-3-2016
- BS EN 61340-2-1-2015
- BS EN 61340-2-3-2016
- ANSI/ESD S4.1-2006
- ANSI/ESD SP10.1-2016
- ANSI/ESD S20.20-2014
- ANSI/ESD STM11.13-2004

Note: additional sections and referenced standards within these standards may also be applicable.

Resistance Range:

The table below reflects the resistance definitions stated in BS EN 61340-5-3:2015*, components will typically comply within the **Conductive** and **Static Dissipative** ranges.



* The above chart can be referenced in the following sections: 6.2.2, 6.2.3, 6.2.4 and 6.2.5

Note: Each range above indicates its minimum and covers the range up to the range to its right
E.g., 10⁸ covers the range 1*10⁸ (100MΩ) to <1*10⁹ (<1GΩ or <1,000MΩ)

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Definition:

Electrostatic Discharge is the swift release (**flow**) of static (**stationary**) electricity that has been allowed to build up in one product, often as a result of different materials rubbing together (**tribocharging**).

If a product is electrostatically charged and comes into contact with an opposite charged object or a conductive path to ground then the energy will be rapidly transferred (**discharged**) causing an ESD event.

Properties:

ESD discharges cause two types of electrical equipment damage:

- Permanent damage
 - Product failure, requiring rework or scrappage of the product
- Nearly undetectable damage
 - Damages component or substrates – there may be a degree of continued equipment performance, reduced life/performance or early product failure.

ASM Acceptance Criteria:

Product measurements are to be completed in accordance with the testing indicated in the matching **Product Classification** table and the results are to be compared to the accompanying **Acceptance Range** (unless otherwise stated on the drawing).

Examples of measurements required:

- Environmental conditions at the time of test (**Temperature/Humidity**)
- Type of tests conducted in accordance with the **Product Classification**:
 - **Point to Point Resistance (Large or Small 2-pin Probe)**
 - **Point to Point Resistance (3mm Round Belt)**
 - **Resistance to Ground (Large or Small 2-pin Probe)**
 - **Surface Tribocharging Test**

Measurements outside of the **Acceptance Range** are considered **non-compliant** and will not be acceptable. The **Acceptance Range** will be in the following formats:

- Upper limit only: $<1 \times 10^9$ ($<1\text{G}\Omega$), in this format all values below the stated acceptance range will be considered as **ESD Compliant**.
- Band limit: $>1 \times 10^6$ ($>1\text{M}\Omega$) to $<1 \times 10^9$ ($<1\text{G}\Omega$), in this format all values between the stated acceptance range will be considered as **ESD Compliant**.
- Voltage limit: $<100\text{V}$ after 2seconds, in this format values below the stated acceptance voltage after the indicated duration will be considered as **ESD Compliant**.

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Test Report:

The following table is an example template that can be used to report the results for a product when performing the selected tests:

Part/Rev Number:				
Date/Operative:				
Test Equipment:				
Test Probe Type:				
Environment:		°C		% R.H.
Flag Note	Sheet	Test Type/ Reference	Resistance (Ω) / Voltage (V)	ESD Compliant
				Yes / No
				Yes / No
				Yes / No
				Yes / No
				Yes / No

The **Resistance/Voltage** column is used to record the following:

- For resistance results: Record measured **Resistance** (Ω) value and the **Voltage** (V) setting on the test equipment used, E.g., **10V** or **100V** setting
- For Tribocharging results: Record the **Voltage** (V) measured from an electrostatic meter.

Resistance to Ground

This test can only be conducted on Components/Products meeting the following conditions:

- Has a **Ground/Earth** stud as part of the design or assembly
- Has an **Earth** wire connection, E.g., via a plug-in connector to act as an Earth
- Has a **conductive** datum surface or earth **tag** to attached to
- Has a drawing note indicating a **Ground/Earth** point to be used in testing
- Has a jig designed to aid ESD measurement with a **Ground/Earth** point

If none of the above are possible and there is no logical ability to conduct a **Resistance to Ground** test then the results should be marked as "*Not possible*" and noting the reason for not conducting the test as part of the **ESD Test Report**.

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Product Classification:

The following table details known product groups and the required tests for each, measured results are to be recorded in an **ESD Test Report**:

Component/Product Group	Test Results Required
ESD Powder Coated Framework	1) Temperature and Humidity 2) Point to Point Resistance (Large Probe) 3) Resistance to Ground (Large Probe) Acceptance range: • $<1 \times 10^9$ ($<1\text{G}\Omega$)
ESD Powder Coated Metal Panels	1) Temperature and Humidity 2) Point to Point Resistance (Large Probe) 3) Resistance to Ground (Large Probe) Acceptance range: • $<1 \times 10^9$ ($<1\text{G}\Omega$)
Plastic Panels with applied Conductive Undercoat	1) Temperature and Humidity 2) Surface Tribocharging Acceptance range: • $<100\text{V}$ 2seconds after test Note: Original test outlined prior in this DSF to verify compliance of Plastic cover panels with an applied conductive undercoat layer.
Small ESD painted panel/cover/tray	1) Temperature and Humidity 2) Point to Point Resistance (2-pin Probe) 3) Resistance to Ground (2-pin Probe) Acceptance range: • $<1 \times 10^9$ ($<1\text{G}\Omega$) Note: Tests to be conducted where large probes are unsuitable due to their size compared to the item to be tested.
Electroless Nickel Finished components	1) Temperature and Humidity 2) Point to Point Resistance (2-pin Probe) 3) Resistance to Ground (2-pin Probe) Acceptance range: • $<1 \times 10^0$ ($<1\Omega$)

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Component/Product Group	Test Results Required
ESD Flat belt	1) Temperature and Humidity 2) Point to Point Resistance (2-pin Probe) - Outside Surface - Inside Surface Acceptance range: $>1 \times 10^4$ ($>10\text{K}\Omega$) to $<1 \times 10^9$ ($<1\text{G}\Omega$)
Solid Anti-static 3mm Round ESD belt	1) Temperature and Humidity 2) Point to Point Resistance (3mm Round Belt) Acceptance range: $<1 \times 10^{11}$ ($<100\text{G}\Omega$) Note: This acceptance is suitable for original solid belts only designed for DEK Printing Machines.
Coated Anti-Static 3mm Round ESD Belt	1) Temperature and Humidity 2) Point to Point Resistance (3mm Round Belt) Acceptance range: $<1 \times 10^9$ ($<1\text{G}\Omega$) Note: This acceptance is suitable for original coated anti-static belts designed for DEK Printing Machines.
Solid Dissipative 3mm Round ESD belt	1) Temperature and Humidity 2) Point to Point Resistance (3mm Round Belt) Acceptance range: $>1 \times 10^4$ ($>10\text{K}\Omega$) to $<1 \times 10^9$ ($<1\text{G}\Omega$) Note: This acceptance is suitable for ASM hybrid compound solid belts.
ESD Plastics (Dissipative)	1) Temperature and Humidity 2) Point to Point Resistance (2-pin Probe) 3) Resistance to Ground (2-pin Probe) Acceptance range: $>1 \times 10^4$ ($>10\text{K}\Omega$) to $<1 \times 10^9$ ($<1\text{G}\Omega$) Note: These items are typically too small for the large probes to be used on.

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Component/Product Group	Test Results Required
ESD Plastics (Conductive)	1) Temperature and Humidity 2) Point to Point Resistance (2-pin Probe) 3) Resistance to Ground (2-pin Probe) Acceptance range: • $<1 \times 10^4$ ($<10\text{K}\Omega$) Note: These items are typically too small for the large probes to be used on.
Small ESD components (General)	1) Temperature and Humidity 2) Point to Point Resistance (2-pin Probe) 3) Resistance to Ground (2-pin Probe) Acceptance range: • $<1 \times 10^9$ ($<1\text{G}\Omega$) Note: These items are typically too small for the large probes to be used on.

Contact Protocol:

Should clarification be required for any issues, contact Supplier Quality or Manufacturing Engineering who will note the issue and assist with resolution. Please email details of your request to engineering_enquiries@asmpt.com

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