DESCO EUROPE

**2A DUNHAMS LANE, LETCHWORTH GARDEN CITY, HERTFORDSHIRE,
SG6 1BE, UNITED KINGDOM, PHONE: + 44 (0) 1462-672005**

Facility EOS ESD Assessment

Date:	2020-11-10
Report for:	Example Name
Company:	Example Company Name
Address:	Example Address
Date:	2019-11-05
Report by:	Tim Hacker
Distributor:	Example Distributor Name
Distributor cc:	Example Distributor Contact name

Facility Static Control Program per EN 61340-5-1:2016

The Desco Europe Assessment will check ESD control items and compare to the limits of EN 61340-5-1 Edition 2.0 2016-05. In addition, EMI voltage will be measured to compare peak voltage to IPC-A-610E.

There are some additions to EN 61340-5-1:2016 that should be addressed, and likely require a review and update of the company's written ESD control plan. Added is a requirement in clause 5.2.3 for a Product Qualification Plan. This can be performed by relying upon a trusted supplier's product data sheets and should be documented with a list maintained of specific ESD control products permitted to be used in the company's ESD control program.

The withstand voltage of ESD sensitive items (ESDS) is that voltage where the electronic component still passes quality control tests. It may fail at a higher ElectroStatic Discharge voltage. There are a number of models testing for withstand voltage; they include the Human Body Model (HBM), and the Charged Device Model (CDM) which list classifications. Previously EN 61340-5-1 was written to cover ESDS having a withstand voltage of HBM 100 volts or higher. New is adding CDM 200 volts or higher. Also new is that the company "shall document the lowest ESD withstand voltage(s) that can be handled" (clause 2.1.1).

A general fundamental rule of ESD control is to ground all conductors including people in the EPA. If a conductor is ungrounded, it is referred to as an isolated conductor. New to EN 61340-5-1 is the requirement that an isolated conductor has a maximum charge of ±35 volts (clause 5.3.4.3). An isolated conductor can have its charge neutralised by an ioniser. So the offset voltage (balance) limit for ionisation has been reduced to < ±35 volts.

New is a 1-inch rule (less than ±125 volts). Items that can charge more than ±125 volts should be removed from the EPA, or kept 2.5cm from ESDS, or the charge can be neutralised by an ioniser.

SCS Facility EOS/ESD Assessment Checklist

#	QUESTIONS	Y	N	COMMENTS
1	What is driving the customer's ESD Program?			Customer audits and visits
2	Is the customer to comply with EN 61340-5-1:2016?	Y		
3	Is the customer to comply with IPC-A-610E specifically EOS peak voltage?		N	
4	Is the product produced for the military, medical or any other specific industry?	Y		
5	Does the customer know the most sensitive ESD susceptible item being worked on?	Y		500 Volts CDM
6	How many benches does the customer have on the production floor?			30
7	How many automated tools (i.e. pick and place machine, conveyer, oven, printer, etc.) does the customer have on his SMT line, and how many SMT lines do they have in production?			6 automatic screw drivers 1 robotic arm
8	Is the customer using single-wire or dual-wire wrist strap technology?			Single Wire
9	How is the customer testing their wrist straps? Does the customer use continuous monitors?			Daily Touch Testing before each shift, a tick sheet is used
10	Is the customer using foot grounders?	Y		
11	How is the customer testing their foot grounders?			Daily touch testing, a tick sheet is used
12	What mat or worksurface does the customer have on their bench?			2 Layer rubber matting
13	Does the customer have an ESD floor?	Y		
14	Is the customer using, pink poly, shielding and/or moisture barrier bags?	Y		Shielding bags and Poly bags

EN 61340-5-1 EPA ESD Control Items Tested

Name of Area 1: Test and Rework

ESD Control Item	Required Limits	Desco Europe Device Used	Area 1
Humidity		19290	48%
Temperature		19290	25°C
Worksurface	1 x 10^6 to < 1 x 10^9 ohms	19290	Rg – 3.75 x 10^7 Ohms
Conductive Flooring	< 1 x 10^6 ohms	19290	N/A
Dissipative Flooring	< 1 x 10^9 ohms	19290	Rg – 2.6 x 10^7 Ohms
Foot Grounders	< 1 x 10^9 ohms	19290	Rg – 5.98 x 10^7 Ohms
Seating	< 1 x 10^9 ohms	19290	Rg – 4.62 x 10^6 Ohms
Shelving	< 1 x 10^9 ohms	19290	Rg – 2.8 x 10^6 Ohms
Trolleys-Mobile Equipment	< 1 x 10^9 ohms	19290	Rg – 3.7 x 10^7 Ohms
Groundable Static Control Garments	< 1 x 10^9 ohms	19290	Rg – 8.9 x 10^6 Ohms
Ioniser Offset Voltage	< ±35 volts	19493	N/A
Ioniser Discharge Times ±1,000 to ±100 volts	< 10 seconds user defined	19493	N/A
Insulators	< 125 volt static field	19492	8,000 Volts on plastic cover used in final assembly when collecting components
Isolated Conductors	< 35 volt static field	19492	N/A

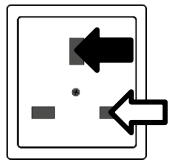
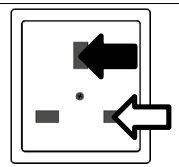
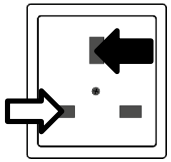
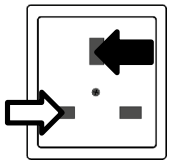
*Per EN 61340-5-1 Table 2 Personnel grounding requirements, note a “For situations where an ESD garment is used as part of the wrist strap grounding path, the total system resistance including the person, garment and grounding cord should be less than 3,5 x 10^7 ohm.”

Other items to test: Trays, Pink antistatic bags, Packaging, Tool fixtures, Material handling containers

Notes:

SCS CTM051 Ground Pro Meter to verify the integrity of equipment grounds (UK)

Modify the below to be consistent with the country's National Electrical Code limits to achieve Protective earth.

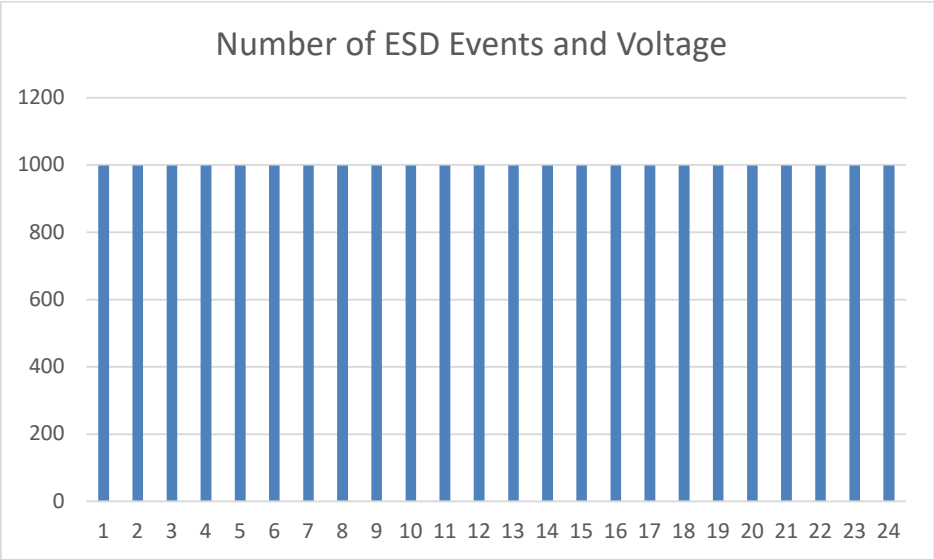
		Test Points	Test Button(s)	Area 1 Test and Rework Cell A	Area 2 Test and Rework Cell B	Area 3 Test and Rework Cell C
Black Probe: **Red Probe:** **Measurement:** **Expected Value:** **Standard:**	Ground Hot Voltage AC 230VAC ±10% National Electrical Code		V	230	233	232
Black Probe: **Red Probe:** **Measurement:** **Expected Value:** **Standard:**	Ground Hot EMI Voltage < 0.5V Hold Max Peak IPC-A-610F		EMI + HOLD HOLD MAX Display	3.57	2.78	1.56
Black Probe: **Red Probe:** **Measurement:** **Expected Value:** **Standard:**	Ground Neutral Ohm Impedance < 1 Ohm National Electrical Code		OHM	0.8	0.9	0.8
Black Probe: **Red Probe:** **Measurement:** **Expected Value:** **Standard:**	Ground Neutral EMI Voltage < 0.5V Hold Max Peak IPC-A-610F		EMI + HOLD HOLD MAX Display	0.8	1.48	1.29

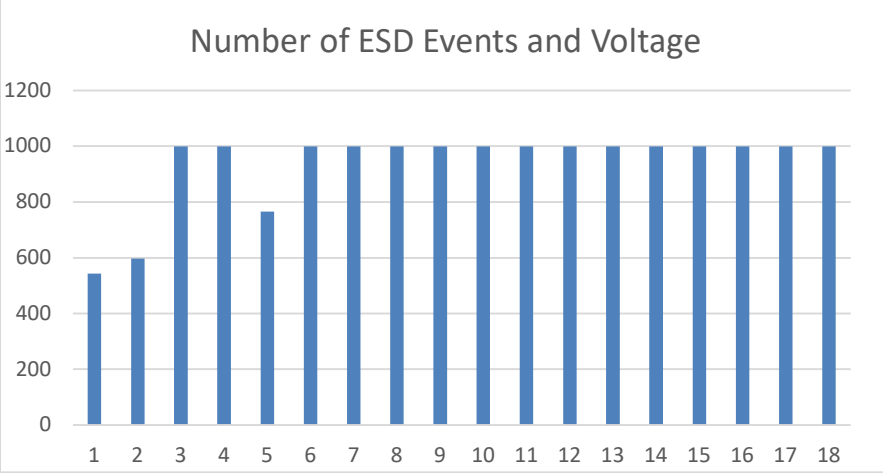
Red Probe **Black Probe**

SCS CTM048-21 EM Eye – ESD Event Meter to detect, count and measure ESD events

Operation 1: Picking components and assembly	Location: Picking Area
Operation 2: Picking components and assembly	Location: Picking Area

	Operation 1	Operation 2
Number of ESD Events	24	18
Max Event Voltage	>999 Volts	>999 Volts





Desco Europe EOS ESD Assessment Findings

The results of the assessment can be broken down into three categories:

1. **Observations** – for organisational consideration only.
2. **Minor Non-Conformances** – observations that do not represent a breakdown of the EOS ESD control program and can be easily taken care of right away.
3. **Major Non-Conformances** – observations that do represent a breakdown of the EOS ESD control program and cannot easily be taken care of right away (ESD instrumentation, monitoring, or further preventive measurement must be purchased).

#	Area	Summary	Type of Findings	Corrective Actions
1	Test and Rework	8,000 Volts on plastic cover	Major Non-Conformance	Remove unnecessary insulators and replace with ESD safe alternative. If the insulator is necessary and cannot be removed, then ionisation should be implemented.
2	Test and Rework	No Internal compliance verification plan	Major Non-Conformance	"A compliance verification plan (ensuring that the ESD control items are still functional) is an essential part of any ESD control program. While the compliance verification may occur on a periodic basis, it is considered part of the overall program. However, it should not be considered an audit or assessment of the process." IEC TR 61340-5-2:2018 - 5.2.4.1 Compliance verification plan. Work benches, flooring and all materials used to prevent ESD should be tested periodically per the specification of the standard. The surface resistance meter can be used to measure the surface to ground and surface point to point resistances of these materials. The field meter can measure surface voltage and polarity on objects. For more information please see the Test Equipment section below.
3	Test and Rework	42 ESD Events recorded in the Picking Area	Major Non-Conformance	Check the grounding of the employees, trolley and the automated drill. The Ground Pro can be used to check the impedance to ground of equipment and to help identify potential EOS generators. The EM EYE ESD Event Meter, would allow the company to carry out their own detection of processes that might be generating ESD Events. Alternatively, the company might consider continuous monitoring of their equipment for ESD Events, impedance to ground and more. For more information please see the Static Management Programme section below.
	Test and Rework	Daily touch testing	Observation	Daily touch testing is taking place and a tick sheet is completed, however, with data acquisition the ESD coordinator will receive an email to confirm who has and who hasn't tested. The introduction for continuous monitors to continuous monitor the grounding integrity of the work surface matting and the operator's wrist strap and coiled cord. Please see the Continuous (or constant) Monitoring and SmartLog Pro and TEAM5 software sections below.

Recommendations

Continuous (or Constant) Monitor

- Because wrist straps have a finite life, it is important to develop a test frequency that will guarantee integrity of the system. Typical test programs recommend that wrist straps that are used daily should be tested daily. However, if the products that are being produced are of such value that knowledge of a continuous, reliable ground is needed, then continuous monitoring should be considered or even required.

- Daily wrist strap testing may be omitted if continuous (or constant) monitoring is used.

- Obtain the manufacturer's continuous monitor checker or calibration unit. Constant monitoring devices (when used) should be checked to ensure that they are functional and operating before ESDS products are handled. In addition, constant monitoring devices should be functionally checked periodically to ensure that they are operating as designed. In addition, quick checks can be performed by just detaching a ground wire and verifying that the proper alarm occurs.

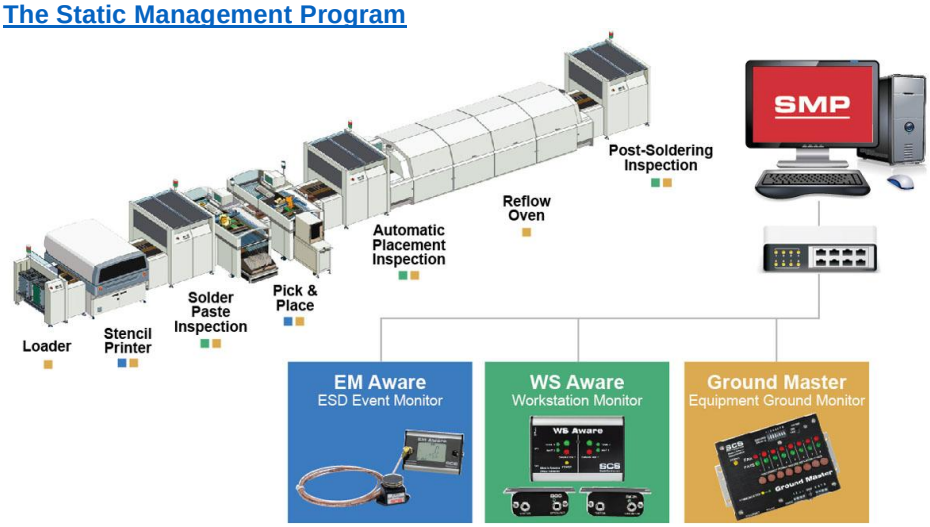
- Since the function of wrist strap grounding is to limit voltage build-up on personnel, consider using body voltage continuous monitors.

Single Wire Continuous Monitors

Dual Wire Continuous Monitor

Please see our Continuous Monitor Selection Guide

The Static Management Program



Ionization

- Obtain an ionizer that meets the required limits of IEC 61340-5-1:2016
- A complete static control program must deal with insulating materials that can create a static charge in an ESDA. Ionizers are introduced when it is not possible to ground process necessary insulators and is used in tandem with other static control measures.

Please see our Ionizer Selection Guide

Overhead Ionizers

[Bench top Ionizers]

[Forced Air Ionizers]

- **Test Equipment**
  Obtain Test Equipment capable of measuring AC impedance which is the requirement to equipment ground per ANSI/ESD S20.20. Use to verify low leakage (peak and average voltage) from electical system ground and neutral.

- Obtain a meter to measure EMI field strength, and to verify meeting IPC-A-610 peak voltage at solder iron tip or automated equipment contacting points.

[CTM051 - GROUND PRO METER]

- Obtain a surface resistance megohmmeter to perform ANSI/ESD S20.20 required compliance verification testing of ESD control products.

[19290 - Digital Surface Resistance Meter Kit]

[222635 - Analogue Surface Resistance Meter Kit]

- Obtain a Charged Plate Analyser or a battery operated ioniser tester to measure the offset voltage balance and the decay times of ionisers.

- Obtain a static field meter to check if items in the ESD protected area are capable of charging above ±125 volts. If so, remove them from the EPA or mechanically secure all such items in place to prevent them coming within 2.5cm of ESD sensitive items.

19493 - Ionisation Test Kit

19492 - Digital Static Field Meter

19440 - Portable Test Kit Upgrade for Ionisers

- Obtain test equiment capable of testing wrist straps and/or foot grounders.

Wrist Strap and Footwear Testers

SmartLog Pro® and TEAM5 Data Acquisition

Please see our Tester Selection Guide

- Obtain an ESD event detector to be able to troubleshoot areas of concern for number, type, and magnitude of ESD events, and to verify effective corrective action.

CTM048-21 - EM EYE - ESD EVENT METER

- Verify that the test equipment used is capable of making the measurements defined in the Compliance Verification Plan.

ESD Training

- Document an ESD Training Plan for all personnel who handle ESD sensitive (ESDS) items.
- Personnel ESD Training should include initial and recurrent ESD awareness and prevention training that is to be provided to all personnel who handle or otherwise come into contact with any ESDS items. The option that is selected is to include an objective evaluation technique to ensure trainee comprehension and training adequacy.
- Suppliers should be trained on ESD control and/or contractually required to train their personnel.

Tim Hacker

Report submitted by

DESCO EUROPE
2A Dunhams Lane, Letchworth Garden City,
Hertfordshire, SG6 1BE, United Kingdom
+ 44 (0) 1462-672005
DescoEurope.com

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