

ESD Protection for LED Systems

1 Introduction

1.1 Definition of electrostatic discharge - ESD

Electrostatic discharge is a spark or a sparkover resulting from a large potential difference in an electrically insulating material, which causes a very short high electrical current pulse. A cause of the potential difference is usually a loading by triboelectricity.

1.2 Examples



- Lightning
- Discharge by touching a car door
- Crackling from the many small discharges when removing a sweater

1.3 Typical electrostatic voltages

Many normal everyday activities cause very high voltages which are generated in our bodies. A human can feel electrostatic discharges from 3000V and higher. Semiconductor devices, including LED and LED driver, can easily be damaged by ESDs with a few volts.

Activity	Charge Voltage (dependent on rel. humidity)	
	10 – 20 %	65 – 90 %
Walking on a carpet	35000 V	1500 V
Walking on a vinyl floor	12000 V	250 V
Sitting in an office chair (Movements in the chair)	6000 V	100 V
Handling a plastic bag	20000 V	1200 V

2 Damages caused by ESD

LED can be damaged by ESD so badly that they fail totally. This means, that they emit neither light nor are electrically conductive. If the LED is damaged, but still electrically conductive, it is considered disturbance.

2.1 Total failure

An LED, which is completely failed by ESD, does not only remain completely dark, but is also no longer electrically conductive any longer. Therefore also any further LED in series connection do not light, even if they are undamaged. This is immediately visible after the damage.



- Immediately visible
- Several LED in one electrical row dark

2.2 Disturbance

In contrast to total failure, LED can be damaged in a way that initially still light, however rapidly become dim. Since the damaged components remain electrically conductive, the remaining module continues to light normally.



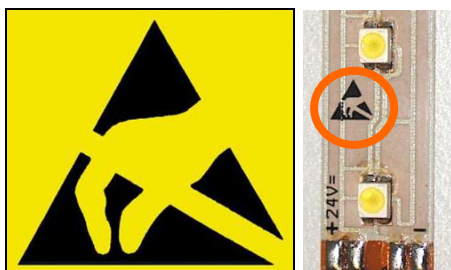
- Damaged LED can initially light
- Becomes dim quickly



Most damages become visible after a short period of operation. We recommend therefore a function test of approx. 1 hour, in particular for installations with difficult access.

3 Prevention against ESD- damages

3.1 Where to take care of ESD?



Left Pictogramm indicates that ESD preventive measures have to be taken. Objects and work areas can be marked.

3.2 Basics for static protection

1) Grounding



Grounding is a very important measure. The best prevention is to connect the personnel with personal earthing system direct with earth:

- Grounding with help of a special reel
- Conductive footwear
- Heel bands should be worn on both feet, in order to ensure a constant contact to the ground

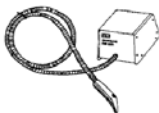
2) Neutralisation



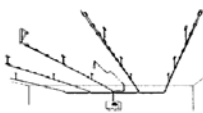
On the workdesk mounted ionizer



Over the workdesk mounted ionizer



Pistol for delivery of ionized air

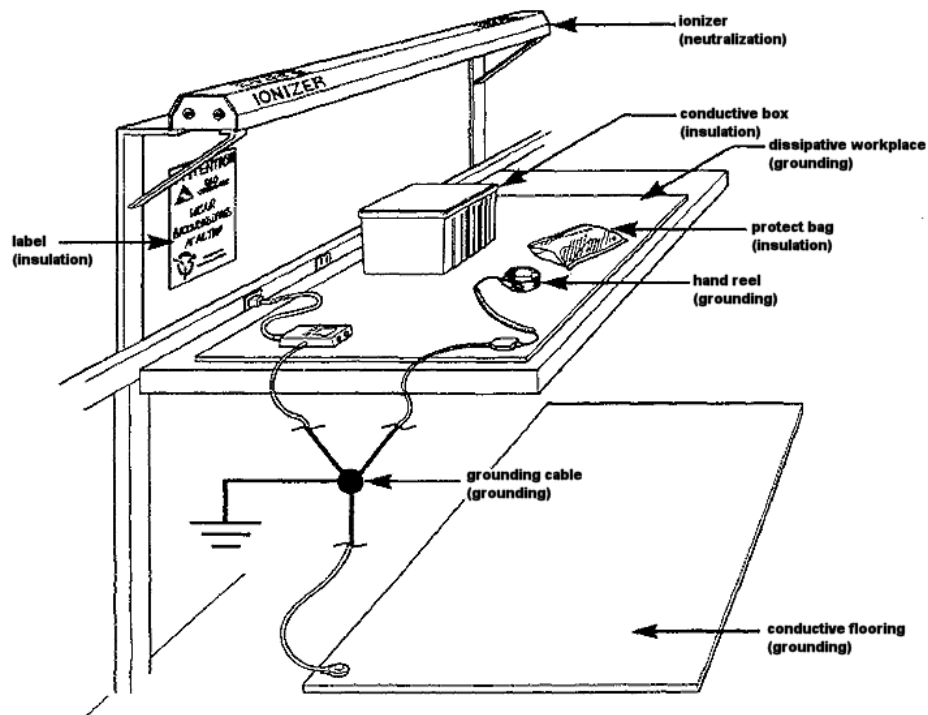


Complete room ionization system

If an isolator is statically loaded, ESD damage can be caused by contact. In order to reduce this risk, an ionizer can be used, which produces billions of charged particles and thus neutralizes the static loading of the isolator.

⚠ Neutralisation replaces neither grounding nor prevention!

Example of a staticsafe workplace



3) Prevention

a) In general



Never enter a ESD protected area, without making the appropriate safety precautions.



- at an ESD protected work desk there should be no unnecessary articles e.g. coffee cups or other insulators
- soldering irons, screwdrivers and other tools should be ESD certified, recognizable from adjoining symbol
- test grounding devices daily

b) for LED Systems



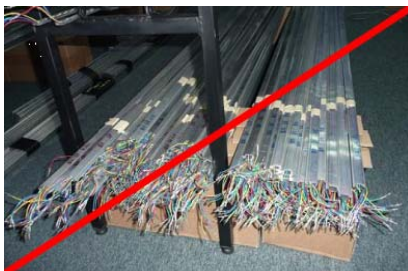
For handling the modules also wear grounding cotton gloves.

It also applies for the transfer of modules from one person to another one.

Avoid touching the metallic contacts.



For ESD safe laquering of the modules we recommend the use of spray lacquer. If you should apply the lacquer with a brush (not recommended), do not use brushes with plastic fibers.



The modules should be kept separated during storage and transport in such a way that they cannot touch each other. Also avoid components or modules coming into contact with clothes, hair or other insulators (e.g. carpet).



The consideration of these measures reduces the occurrence of ESD damages, but can not exclude them completely.

References: ESD Handbuch, Fa. ET und ESD Lösungen, www.et-esd.de

