



ESD Bag Selection Guide



An Introduction Into ESD Bags



ESD bags are one of the most preventative and effective methods used against ESD to protect electrical components and devices from static discharge. They are the ideal solution for storing or transporting electronic components and PCBs that are susceptible to ESD damage. In this guide, we are going to delve into the different types of ESD bags, what they are used for, why they are essential to every ESD control plan and much more.

Before we get started, you may want to familiarise yourself with the following glossary terms:



Glossary of terms

Surface resistance / Surface resistivity

ESD control packaging uses the terms surface resistance and surface resistivity to define their properties. Both are measures of a material's ability to electrostatically shield or provide dissipation of charge.

Surface resistance, measured in ohms, expresses the ability of a material to conduct electricity between two points on the surface. Its value is dependent on current and voltage and is a measure used to evaluate static-dissipative products where lower resistance characteristics are required. Measurement of surface resistance should be carried out as defined in EN 61340-5-1.

Surface resistivity is a measure used to evaluate products where higher resistance characteristics are required. Measured in ohms per square, it is the resistance measured between two opposite sides of a square on the surface. Its value is not related to the size of the square.

Faraday cage

A faraday cage is a conductive barrier against ESD that attenuates a stationary electric field. e.g. Metallised Shielding Bag, Conductive Box, etc.

Dissipative

Dissipative materials have a surface resistance of $>1 \times 10^{(5)}$ ohms and allow any static charge to be dispersed.

Antistatic

Indicates a typically conductive material designed to limit the build-up of static by removing it to Earth.

An Introduction Into ESD Bags



From manufacture to shipping, Electrostatic Discharge Sensitive (ESDS) Devices are constantly at risk to ESD. Most people are aware of the effects of static electricity in general terms; for example, scuffing shoes on carpet whilst touching a person or metal door handle can produce a small shock. But few people are aware of the damage that the static electricity behind these common events can cause on modern electronic circuits and devices.

As electronic circuits and their connecting pathways have reduced in size over the years, their susceptibility to damage from static electricity has increased. Fortunately, there are various protective packaging and precautions in place to help eliminate the threat of ESD.



What are ESD bags and why are they needed?

ESD bags are some of the **most important safety products** used in electronics manufacturing environments. They are the ideal solution for safely handling, storing and transporting parts such as nuts and bolts, RAM chips, motherboards and PCBS without the risk of ESD. Without these specialised packaging solutions, it would be virtually impossible to safely transport products and components from one production line to their final destination.

ESD bags offer protection to its contained items, ensuring no static charges are built up inside and dissipating any static charge build up on the exterior of the packaging. They essentially **protect your static sensitive devices and components** through the entire cycle of production, all the way to the customer's hands.

Besides from minimising the risk of electrostatic discharge, an ESD bag is also capable of **protecting its contents from mechanical damage, dust contamination, humidity, and corrosion**. This makes shielding bags and antistatic bags crucial for a company dealing with electronics. With ESD control measures such as protective packaging in place, a company can better protect their products from physical and ESD damage, ensure product quality and meet customers expectations.

Using the correct packaging and materials not only protects your static sensitive components, but can save you money too!

Threats & Types of Packaging

What are the threats?

There are three types of primary threats that electronic components should be protected from:

1. Direct Discharge (ESD):

A discharge directly to a bag can subject the device inside to a very high current, melting or fusing the circuit.

2. Static Fields:

Fields can induce destructive currents in circuit conductors. Field differentials can break down the circuit dielectric.

3. Tribocharging:

Friction between the bag and device can produce damaging static voltage and fields.





ESD-focused packaging is always classified in one of three levels:

Intimate packaging	Proximity packaging	Secondary packaging
Intimate packaging is a type of packaging that can safely come into contact with static-sensitive components and devices.	Proximity packaging is a type of packaging that can enclose (but not come into direct contact with) the product.	Secondary packaging is a type of packaging which can only be used for protection against physical damage during the shipping process.

There are many types of ESD bags available in the market that can protect electronic devices from these primary threats. The most commonly used in electronics manufacturing are static shielding bags, antistatic bags, and moisture barrier bags.

Examples of ESD Packaging Levels

Below are two examples showing the differences between the types of packaging levels.

Static Shielding Bags	VS	Antistatic Bags
<p>Static shielding bags fall in to the categories of both intimate and proximity packaging. These bags protect ESD-sensitive products from static electricity that may build up inside or outside the bag. The way they do this is through their three layer construction.</p> 		<p>Antistatic bags are much simpler containers and are classed as either proximity packaging or secondary packaging. These bags “will not generate or hold a triboelectric charge” and can be used to safely transport non static sensitive components into a static controlled environment without the threat of static discharge.</p> 

The standard test for shielding demonstrates the difference between the various bags: shielding bags will generally stop 97% of a 1,000 volt pulse applied to the outside of the bag from reaching the inside and its contents. A black conductive poly bag will stop about 30%, a pink antistatic bag has no shielding ability.

In some cases the use of moisture barrier bags is required in addition to antistatic and static shielding bags. These are used in conjunction with desiccant and humidity indicator cards to ensure moisture is kept to a minimum.

The Benefits of ESD Bags



There are a number of benefits to using ESD bags. Here are our top five benefits of using ESD bags for electronics manufacturing:

1. Reduces damaged goods

Using the right type of anti-static packaging can prevent static electricity from building up and discharging onto the static sensitive component. ESD is one of the leading causes of electronic component damage.

2. Reduces costs

Protecting your static sensitive electronic components by storing them inside ESD bags during storage and transit will help to reduce the likelihood of ESD damage. This means you will save money on product repairs or replacement costs.

3. Increases efficiency

The lack of damaged static sensitive components will enhance the efficiency and, in turn, will reduce the amount of product returns.

4. Increases longevity

ESD and moisture damage can have a devastating effect on static sensitive components. Using ESD bags will ultimately protect your static sensitive components from this damage and therefore increase their longevity.

5. Increases customer satisfaction and repeat business

Using ESD bags can reduce the risk of an ESD event from occurring in the first instance. This ensures that any component or device shipped to the consumer will be at optimal performance; increasing customer satisfaction and repeat business.

Pink Antistatic Bags



What are pink antistatic bags?

Pink antistatic bags are specifically designed to dissipate static charge to ground, preventing charge from building up on the package or device when rubbed against other materials. Antistatic bags offer no effective protection against a contact ESD. The distinct pink/red colour is a colourant added to differentiate static control materials from standard packaging. They are the only form of 'plastic' bags recognised as being suitable for use within an EPA; conventional plastic bags have the ability to generate and hold in excess of 10,000 volts, which would be disastrous in proximity to static-sensitive electronic components or devices. Pink antistatic bags' resistivity is in the dissipative range and is usually around 10^9 to 10^{11} Ohms. Antistatic bags should be used for items that have no static susceptibility. Their primary use is to package support or processing materials that will be in close proximity to static sensitive components or devices. This keeps static generating packaging materials away from static sensitive areas.



Structure of pink antistatic bag

Anti-static bags are typically made from industry approved polyethylene laminates and an anti-static coating. Their anti-static coating prevents the bag from charging if rubbed against other materials.



Features and benefits:

- Surface resistance of 10^7 - $10^{11}\Omega$
- Soft texture and flexible material
- Ability to dissipate static charge to ground preventing static charge building up on the package or device
- Bag material allows visual identification of the items being stored
- Conforms to ESD STM11. 31-2006, EIA541, MIL-PRF-81705, ANSI/ESD S20.20 and IEC 61340-5-1

Applications / Uses:

Pink antistatic bags should only be used for holding non static sensitive items (e.g. nuts, bolts, screws, etc.)

Note: These bags have no shielding ability. A static field or discharge occurring outside the bag can penetrate the bag and can damage electronics inside. Antistatic bags can deteriorate with time and wear, monitoring them is very important.

Static Shielding Bags



What are static shielding bags?

Semi-transparent and silver in colour, static shielding bags provide similar dissipative and antistatic properties to the pink antistatic bag but also add a metal shield to stop static from entering the bag. If bags, holding static sensitive components, are to be handled outside of an EPA, they should be metalised shielding bags, a Faraday cage! Static shielding bags can be an effective Faraday cage, subject to the quality of material and physical condition. Static shielding bags can deteriorate with use, monitoring them for effectiveness is very important!



Structure of a static shielding bag

Static shielding or metal shield bags consist of several layers. This structure, with the metal between two layers of plastic, is called "buried metal" or "metal-in".

The innermost layer of the bag is constructed from a static dissipative polyethylene. The intermediary layers consist of polyester and an aluminium shield which offers additional protection against static damage. Finally, the outermost section of the bag is a static dissipative coating that helps dissipate external static charges.



Features and benefits:

- Surface resistance of $10^{(6)} - 10^{(10)}\Omega$
- Semi-transparent for easy content identification
- Metal "Faraday cage" layer shields products from static charge inside and prevents static build-up
- Conforms to ESD STM11. 31-2006, EIA541, MIL-PRF-81705, ANSI/ESD S20.20 and IEC 61340-5-1

Applications / Uses:

Static shielding bags should be used for all electronic components, boards and assemblies.

Tip: Do not crease the bag as this can break down the integrity of the metallised shield!

You should not use any bags damaged with tears and / or punctures, as these can destroy the function of the Faraday cage.

High Shield Cushion Pouches



What are high shield cushion pouches?

High shield cushion pouches provide full ESD and physical protection for delicate, static sensitive assemblies. Static shield cushion bags form a Faraday cage around the product providing superior static shielding protection. The inner bubble cushioning provides excellent physical protection for electronic parts and components that are susceptible to impact damage whilst in transit. The bags can be fully reused for extended use, protecting the environment. They can also be heat sealed. The flap allows the bag to be closed by folding the seal flap onto the bag.



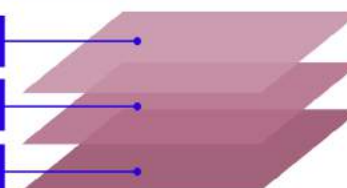
Structure of high shield cushion pouch

The bags have a three-layer construction. The outermost layer of the bag is constructed with a polyester aluminium shield. The intermediary layer consists of a polyethylene cushion for extra padding. Lastly, the innermost layer of the bag is static dissipative polyethylene.

Polyester aluminium shield

Polyethylene cushion

Static dissipative polyethylene



Features and benefits:

- Fully reusable for extended use and protecting the environment
- Provides full ESD and physical protection for delicate, static sensitive assemblies
- Faraday cage layer shields assemblies from electrostatic charge inside and prevents static build-up
- Conforms to ESD STM11. 31-2006, EIA541, MIL-PRF-81705, ANSI/ESD S20.20, ASTM D 882, MIL-STD-3010, IEC-61340-5-1, CE, RoHS and REACH

Applications / Uses:

Use for storing delicate static sensitive components or parts susceptible to impact damage during transit.

Moisture Barrier Bags



What are moisture barrier bags?

Moisture barrier bags are developed for the dry packing of electronic components (e.g. SMDs or PCBs) protecting them from moisture and static damage during storage and transportation. The bags are opaque and light-tight ensuring the contents cannot be seen from the outside, adding a layer of operational security. Moisture barrier bags are suitable for storing moisture-sensitive electronic components in humid environments. Dry devices are placed inside the moisture barrier bag and the moisture laden is evacuated. The puncture-resistant and moisture-proof packaging has a flexible structure and its suitable for vacuum-sealing. Some moisture barrier bags, like ours, are Jedec compliant, allowing for the safe transportation of Jedec trays.



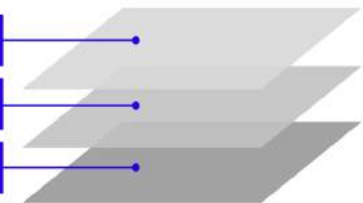
Structure of a moisture barrier bag

Moisture barrier bags typically consist of three layers. The outermost layer of the bag is constructed from a static dissipative polyester. The intermediary layer consists of an aluminium shield which blocks the moisture and provides Faraday cage protection. Lastly, the innermost layer of the bag is a static dissipative polyethylene.

Static dissipative polyester

Aluminium shield

Static dissipative polyethylene



Features and benefits:

- Firm lamination and hot sealing offers superior resistance to vapour and oxygen
- Surface resistance of $10^{(6)}$ - $10^{(10)}\Omega$
- Flat open top style with printable surface
- Flexible structure, easy to vacuum seal
- Puncture resistant

Applications / Uses:

Should be used for all moisture sensitive equipment and products (e.g. PCBs or integrated circuits) protecting the contents from both ESD events and moisture damage during transportation and storage.

Note: Before each use, ensure that there are no wrinkles or surface scratch, damage or pin holes. All bags should be used with a humidity indicator card and desiccant to monitor humidity levels.

Controlling Humidity Levels & Moisture



Protection from elements such as moisture and humidity is critical in electronics manufacturing. It is common for transit and storage conditions to be humid. With this in mind, there are several things you can do to safeguard the electronic components you manufacture or work with.

A moisture barrier bag will aid in protecting the contents stored inside the bag in humid environments. Coupled with a humidity indicator card and desiccant bag, the effectiveness of the bag can be monitored and any moisture inside the bag will instantly be captured; enhancing the protection.

Humidity Indicator Cards

Humidity indicator cards are used in the packaging of moisture sensitive electronic equipment to **determine whether products have been exposed to moisture and humidity above recommended storage levels**. Any change in humidity is tracked through the colour change on the indicator card which turns from blue to pink as the humidity in the area increases.

In order to constantly verify that dry packaging methods are not compromised during storage and transportation of products, the humidity indicator cards allow operators along the supply chain to monitor the package's conditions. **Early identification prevents damaged items from entering production!**



Desiccant Bags

Desiccant bags are used for **protecting packaging and enclosure contents that are susceptible to damage from moisture**. Desiccant bags are a drying agent which **attract moisture from the atmosphere**. Desiccant bags contain natural bentonite clay with no additives and are filled with high active agents; offering the ideal solution for protecting moisture-sensitive goods such as printed circuit boards, integrated circuits and SMDs. The desiccant's absorption capacity can be as high as 30% of its weight. It absorbs and holds particles of water to itself.



Design Features



Loc-top resealable

A recloseable bag with grip seal simplifies access to parts. They keep contents safely and securely inside the bag until they're needed.



Open top

An open top bag allows for easy access of components and can be temporarily closed with an ESD label.



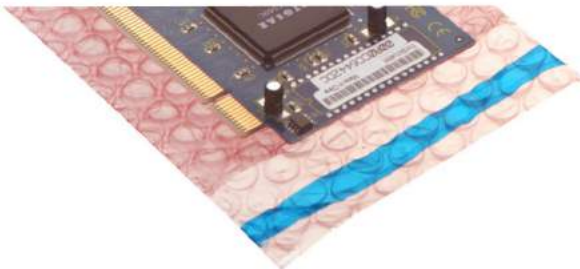
Write-on panels

A bag with write-on panels allows you to label the contents inside the bag in pen or pencil.



Extended lip

An oversized lip at the opening improves part insertion, and is easy to close with an ESD label.



Seal flap

A seal flap allows the bag to be closed by folding the seal flap onto the bag.



Bubble cushioning

Some bags have a bubble material to add extra cushioning for components that are susceptible to impact damage during transit.



Printing and Labelling



Printed plate stamping

Our bags are stamped via a printed plate. Different plate sizes are used depending on the size of the bag. Since our ink is yellow and not black, the ink has never smudged.



Lot numbers and regulations

All of our ESD bags are labelled with an individual lot number for traceability and quality assurance. Each label features the bag's compliance to RoHS regulations.



Recycle symbols

The symbols on the bags relate to how they should be recycled at your local recycling centre. As per the requirement under the Packaging and Waste Regulation.



Cautionary labels

Labels should be applied to ESD packaging containing static sensitive components to provide clear identification of the contents inside. They can act as tamper-proof when applied to bags or packaging. Open top bags can be temporarily closed with an ESD label. Labels come in a variety of sizes to allow you to select the most suitable sized label for your bag or packaging.



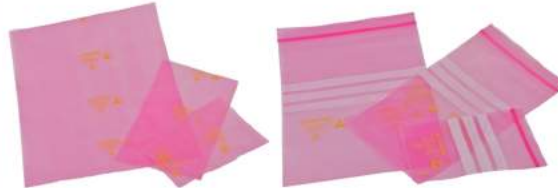
Our Range of ESD Bags



1. Static Shielding Bags



2. Pink Antistatic Bags



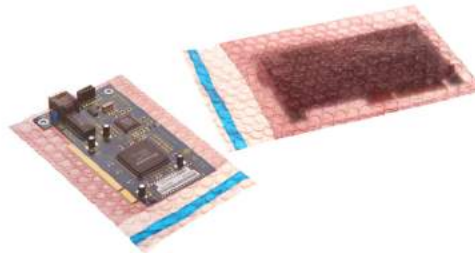
3. High Shield Cushion Pouches



4. Moisture Barrier Bags



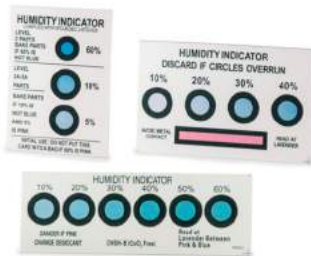
5. Antistatic Bubble Bags



6. Desiccant Bags



7. Cobalt Humidity Indicator Cards



8. Cobalt Dichloride Free Humidity Indicator Cards



To view our full range of ESD bags, scan the QR code above.

When Should You Use ESD Bags?



There are an infinite number of situations where ESD bags are both necessary and required. Static sensitive components and devices require protection through the entire manufacturing and production process. This is right up until they are in the hands of the consumer. While they protect the contents from outside elements, ESD bags goes one step further. They shield a component or device from the hidden dangers of static.

This ESD protection aims at satisfying two criteria:

- Preventing electrostatic charges from building up inside the package itself.
- Both resisting and dissipating any electrostatic charges on the exterior of the product.

Choosing The Right ESD Bag

When selecting ESD bags, it's important to consider the level of ESD protection that is required, the environment it will be used in, alongside any additional features that are needed, such as protection from moisture or mechanical damage. As many electronic components are sensitive to more than just ESD, choosing the right packaging is a critical way of protecting goods and reducing unnecessary losses.

Points to consider:

- What you intend to put inside the ESD bag; static sensitive components (i.e. PCBs) or non-static sensitive items (i.e. studs, bolts).
- Whether moisture is an issue for your business.
- How sensitive your products are; knowing the degree of sensitivity that your components have to static will ultimately determine the level of protection that you invest in.
- The size that is required.
- Whether the item you intend to pack into the bag is sharp or sensitive to physical damage; a durable bag is needed in this instance.
- Whether you would need resealable (loc-top) bags or open-top bags with ESD tape/labels to close the bag.
- How the ESD bags will be stored or transported.

Summary



Static protective bags should be used as part of a static control program. Selecting the appropriate bag can help reduce static damage and save money on costly repairs and rework. The cost of static protective packaging is insignificant when compared to the protection it affords the costly items placed in the package.

Bags overview

- Use static shielding or moisture barrier bags for all electronic circuits.
- Use pink antistatic bags for non-electronic parts and production goods that must be near electronics.
- Use humidity indicator cards and desiccant bags inside a moisture barrier bag to monitor humidity and moisture levels.
- Use high shield cushion pouches for transporting delicate and fragile electronic components.

Bags sourcing

Key things to remember when sourcing bags:

- The least expensive bag may not be the best investment. Look for a product that works for its application. Materials and bags should be tested by the manufacturer before shipping. Look at a supplier's quality program, material traceability, and test standards.
- Consider the supply chain; stability and delivery.
- A large selection of standard sizes, (more than 100) will keep you from paying for custom sizes.
- Look for a technical depth to support the product.
- Ability to customise; if this is something you would require.
- Compliance to Standards; consider IEC 61340-1-5 International Standard.

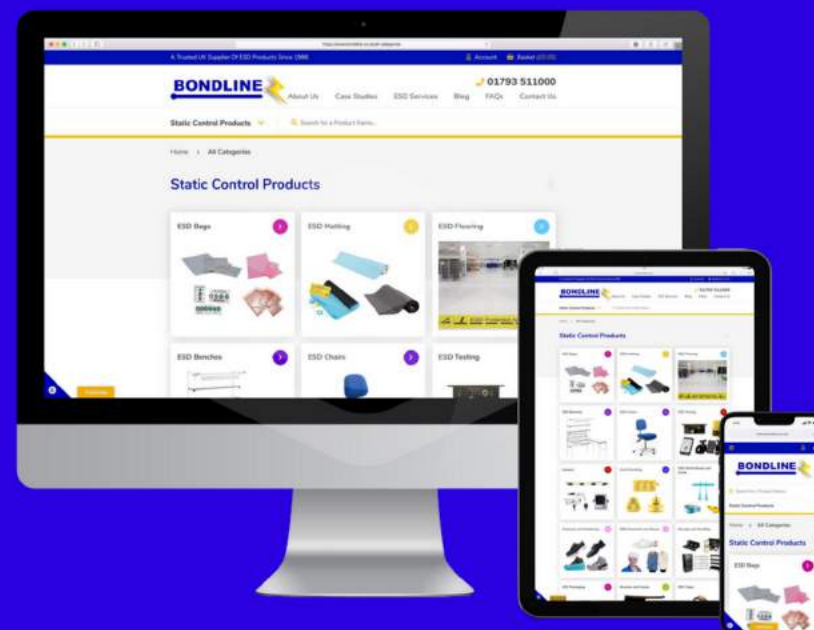
Customisation

Our bags are available in custom sizes or several industry standard sizes. The bags are offered with a loc-top resealable grip seal or with an open top. We can also offer bespoke thicknesses and special printing on request.

Eliminate Costly Static Damage...

Whether you are experiencing unacceptable levels of damage in transit, need a specific cleanroom solution or simply don't know which ESD safe equipment is best for you, we can help!

Request complimentary, no obligation advice by speaking with one of our technical experts today.



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