# Static Dissipative vs. Conductive

What is the Difference?

## Properties

Static dissipative and conductive plastics are two key categories of ESD (electrostatic dissipative) plastics used to control static electricity in sensitive environments. Static-dissipative materials limit current so charge disperses slowly, while conductive materials clear charge via a fast, low-resistance route to the ground.

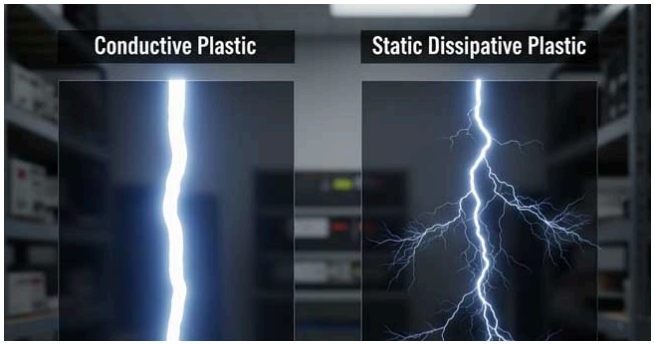
**Static Dissipative Plastics**

- Bleed off static slowly in a controlled way.
- Have intermediate resistivity, limiting current and helping avoid sudden sparks.
- Typically have antistatic agents, conductive fillers, or inherently dissipative polymers/coatings.
- Can be light-colored or translucent.
- Are favored for electronics handling, cleanroom fixtures, and environments requiring sensitive component protection.
- Example materials include ESD acetal, ESD polycarbonate/acrylic, ESD UHMW, and ESD PEEK.

**Conductive Plastics**

- Static charges flow very quickly to ground.
- Not all conductive plastics are automatically ESD-safe/anti-static.
- Have very low resistivity that prevents charge buildup.
- Typically loaded with conductive fillers.
- Usually black or dark in color due to fillers.
- Are chosen for grounding, EMI/RFI shielding, and explosive/ATEX environments where instant equalization is critical.
- Example materials include carbon-filled PTFE, conductive acetal, and carbon fiber-filled PEEK.

## Applications and Uses




Choose static-dissipative plastics when you need to protect sensitive electronics or prevent sparks in moderate-risk scenarios. Choose conductive plastics when you need rapid elimination of charge and can ground the part effectively, or when you need maximal conductivity.

**Static Dissipative Plastics**

- **Semiconductor & Electronics Manufacturing:** Wafer handling pods, IC chip trays, circuit board assembly racks, robot end-effectors.
- **Cleanroom & Medical Device Production:** Windows, walls, & enclosures - prevent dust buildup.
- **Data Centers & IT Infrastructure:** Anti-static flooring, cable trays, server rack mounts, cooling fan blades
- **Packaging & Material Handling:** Conveyor belt parts, hoppers, chutes, liners, ESD-safe packaging.
- **Automotive & Aerospace:** assembly area airbag controls, ECU units, mats, tooling.

**Conductive Plastics**

- **Semiconductor & Electronics Manufacturing:** Grounding blocks, EMI shielding enclosures.
- **Data Centers & IT Infrastructure:** Anti-static flooring.
- **Packaging & Material Handling:** Grounding straps, grounding connectors.
- **Automotive & Aerospace:** Fuel hose and pump housing liners, lightweight EMI shielding.

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# Static Dissipative vs. Conductive Comparison Table

| Property | Static Dissipative Plastics | Conductive Plastics |
|---|---|---|
| **Surface Resistivity** | ~$10^5$ to $10^{11}$—$10^{12}$ Ω/sq (moderate resistance). | < $10^5$ Ω/sq (low resistance), often $10^3$—$10^5$ Ω. |
| **ESD Behavior** | Controlled dissipation: slowly bleeds off charge to ground, preventing sudden static discharge. | Highly conductive: rapidly equalizes charge with ground, so static does not build up at all. |
| **Typical Additives** | Antistatic additives or light conductive filler (carbon or fiber in small amounts), or surface dissipative coatings. Often no carbon sloughing, maintaining cleanliness. | Heavy loading of conductive fillers (e.g. carbon black, carbon fiber, metal fibers). Usually black or composite material. |
| **Common Applications** | ESD work surfaces, electronic device handling trays, cleanroom windows and enclosures, conveyor parts in sensitive manufacturing (to reduce static dust attraction and ESD damage). Ideal for protecting sensitive electronics and preventing static sparks in moderate-risk areas. | Grounding pads, ESD flooring tiles, EMI/RFI shielding components, anti-static brushes, fixtures in explosive environments (to eliminate any spark risk). Used when instant charge dissipation or electrical conductivity is required (e.g. to ground equipment). |
| **Example Materials** | ESD Acetal (POM) — static dissipative acetal copolymer; Anti-static UHMW-PE — static dissipative polyethylene with ~$10^5$—$10^9$ Ω surface resist.; ESD Polycarbonate/Acrylic — clear sheets with dissipative coating for windows; ESD PEEK — static-dissipative high-performance plastic for semiconductor parts. | Carbon-Filled POM — conductive acetal with carbon (e.g. POM-C ELS black); Carbon Fiber PEEK — conductive PEEK composite; Conductive PTFE — PTFE loaded with carbon for static bleed; Carbon-Loaded PVC or Polycarbonate for ESD-safe flooring and panels. |

*Note: Both static dissipative and many conductive plastics are used as "antistatic" materials, meaning they provide a path for charges to escape. The main difference is how quickly they conduct the charge. However, not all conductive plastics are automatically ESD-safe for sensitive electronics; suitability depends on formulation and surface resistivity. Verify the specific material against applicable ESD standards (e.g., ANSI/ESD S20.20, IEC 61340) for your use case.*



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# FAQs: Static Dissipative vs. Conductive Plastics

**What is the difference between static-dissipative and conductive plastics?**

Static-dissipative plastics drain charge gradually and predictably to avoid sudden discharges. Conductive plastics provide a low-resistance path that moves charge to ground quickly.

**How do I choose between static dissipative vs conductive plastic for my project?**

Static dissipative plastics are usually the best choice for protecting sensitive electronics or preventing sparks in moderate-risk scenarios. They allow a gentle bleed-off of static, which is safer for microelectronics and helps avoid sudden discharges. Conductive plastics, on the other hand, are chosen when you need rapid elimination of charge and can ground the part effectively. Use static dissipative plastics for controlled ESD protection (prevention of damage to devices), and use conductive plastics for maximal conductivity (fast charge drain or shielding).

**Where can I buy anti-static plastic?**

Interstate Plastics supplies anti-static, static dissipative, and conductive plastics in sheet, rod, and tube, cut-to-size with nationwide service. Contact our team for help with ESD plastic selection and a quick quote.

**What are the typical resistivity ranges for static dissipative vs. conductive plastics?**

The resistivity (or surface resistance) ranges distinguish the two categories. Static dissipative plastics generally have a surface resistivity in the range of about $10^5$ to $10^{12}$ ohms per square unit. A commonly cited sub-range is $10^6$—$10^9$ ohm/sq. as the core static dissipative region. This means they aren't as conductive as metals but will allow charge to leak away slowly. Conductive plastics have much lower resistivity, usually below 1 x $10^5$ ohm/sq. In practice, many conductive compounds fall in the $10^3$ to $10^5$ ohm/sq range. If the material's resistivity is in the millions of ohms, it's likely static dissipative; if it's down in the thousands of ohms, it's considered conductive.

**Does "anti-static plastic" mean the same thing as static dissipative plastic?**

Antistatic is a loose term (sometimes even encompassing both dissipative and conductive products as long as they combat static), whereas static dissipative is more specific, referring to that mid-range resistivity classification (105 to 1012 ohms per square unit). When sourcing materials, it's best to look at the resistivity spec to know if something is truly static dissipative or just minimally antistatic.

**What products and forms can I get ESD-safe plastics in?**

Interstate Plastics can supply electrostatic discharge materials in virtually all standard forms. Commonly, we provide sheets/plates (for panels, machine guards, tabletops), rods (for machining into parts like spacers or rollers), and tubes. Many static dissipative plastics (like ESD acetal, ESD PEEK, etc.) come in rod and plate stock that we cut to size. We also have thin films or foils for some materials (useful for lining or wrapping). Additionally, machined parts or custom-fabricated shapes are available through our CNC services. Our product lineup covers everything from thick plates for milling, down to thin flexible sheets for lining trays — just let us know what form factor you need.



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