FREQUENTLY ASKED QUESTIONS

ABS-ESD7

1. What is ABS-ESD7?

It is a new FDM material based on ABS-M30 with static dissipative properties for applications where a static charge can damage products, impair performance or cause an explosion.

Unlike the vast majority of thermoplastics, ABS-ESD7 prevents a buildup of static electricity, so it can't produce a static shock and won't cause other materials (e.g., mists, powders, dusts, and other fine particles) to stick to it.

The combination of ABS-ESD7 material and Fused Deposition Modeling technology will enable engineers to quickly and inexpensively produce parts for static dissipative jigs & fixture applications as well as functional prototypes for product validation testing.

2. What does "ESD" mean?

It is an abbreviation for electrostatic dissipative, which means that a material will "bleed off" (dissipate) a static charge. This is an industry term, not a Stratasys creation.

Note that ESD is also an abbreviation for electrostatic discharge, which is the "static shock" that a dissipative material is formulated to avoid.

3. What is the difference between electrostatic and static?

There is no difference. Use them interchangeably.

4. What is static electricity?

Static electricity is an electrical charge caused by an imbalance of electrons on the surface of a material that produces an electric field.

Electrostatic discharge is the transfer of this charge between bodies at different electrical potentials.

5. What's the problem with electrostatic discharge and static charging?

An electrostatic discharge (i.e., static shock), can degrade or destroy an electrical circuit or component. It can also alter the operation of an electronic system, causing equipment malfunctions or failures. Anything that holds a static charge and contacts the electrical device (e.g. fixtures, jigs, assembly tools, transportation trays), can cause problems.

The little spark from a discharge can be hazardous when around flammable substances. It can start a fire or set off an explosion. Containers, (gas) caps, manufacturing tool and assembly aids are all possible culprits.

If there is no discharge or dissipation, static electricity will attract and hold contaminants and foreign bodies that may degrade product performance or create product defects. Just imagine a production line with "static cling" issues where parts stick to sorting funnels or transportation bins.

6. What is triboelectric charging?

As soon as you start poking into the topics of static electricity and electrostatic dissipative, you are bound to hear this daunting term. But it is actually quite basic and boils down to a buildup of an electric charge by the action of rubbing (tribo is Greek for "to rub") two materials together. So, a static charge is the outcome of triboelectric charging.

7. Can you tell me more about static dissipative?

Static dissipative materials fall between insulators and conductors. Most plastics are great electrical insulators; they don't transmit electricity very well. Metal, on the other hand, is a great conductor; electricity freely flows through it.

Static dissipative materials act a little like both. You wouldn't use them when you want an electrical conductor or electrical insulator. But you do want to use them when the material needs to shed/bleed/drain/dissipate an electrical charge.

By the numbers, here is how they rank in terms of surface resistance:

Insulator:	$\geq 10^{12}$ ohms
Static dissipative:	10^{4} ohms to 10^{11} ohms
Conductor:	$\leq 10^{3}$ ohms

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8. Is anti-static the same as static dissipative?

No. They are two different things that have no correlation.

Anti-static, now called "low-charging," is a characteristic with no test methods or direct measurements. It is a statement of a material's susceptibility to build a static charge when rubbed against another material.

9. What is ABS-ESD7's surface resistance?

The target is 10^7 ohms. Typical parts built on the FDM system will have a range between 10^6 ohms to 10^9 ohms.

When an application calls for an ESD material, specs will usually call out a surface resistance at or below 10^{10} ohms, so ABS-ESD7 should work for most projects. And note that the "three decade" range—that's the lingo for the range of the exponent—is more than acceptable; thermoplastic often have a five decade range that is much looser.

10. What is surface resistance?

It is a measure of how easily an electrical charge can flow across a single surface, not through a part. Surface resistance is measured in ohms, and it is the ratio of DC voltage to the current that flows across the surface.

11. Is surface resistance the same as surface resistivity?

No, but you will often hear them incorrectly used interchangeably because they are very similar. Surface resistivity is a calculation of the resistance of an area—not the point-to-point measurement used for surface resistance.

An important difference is that surface resistivity, measured in ohms/square, will be 10-times (a factor of 10) higher than surface resistance, which is measured in ohms.

The confusion traces back to the standards, test methods, and intent. Surface resistivity is used to evaluate insulative materials where high resistance is desirable. Surface resistance is used to evaluate static dissipative materials where lower resistance is needed.

12. How is surface resistance measured?

A surface resistivity/resistance meter measures the value. Electrodes are placed on the surface (same side) of the test sample. The meter reports the DC voltage-to-current ratio between the electrodes.

13. What is volume resistivity?

It is a measure of how readily a charge flows through the bulk of a part, not over its surfaces. Volume resistivity is measured in ohms/centimeter (or ohms/inch), and it is an expression of the ratio of current flow to DC voltage drop (over a distance). Static dissipative materials have a volume resistivity of 104 Ω-cm to 1010 Ω-cm.

Like surface resistivity/resistance, there is also a volume resistance that is measured in ohms.

14. What makes ABS-ESD7 a static dissipative material?

Carbon is compounded (blended) with our ABS plastic. This is a common method used for ESD thermoplastics (there are only a few polymers that are inherently dissipative).

15. What are the target applications for ABS-ESD7?

There are three broad categories:

- Protecting electronics from ESD damage (static shock).
- Preventing fire/explosion (static spark).
- Preserving equipment/product performance (static cling).

In terms of AM application areas, ABS-ESD7 will be beneficial for:

- Product validation testing.
  – Cases, enclosures and packaging.

Fixtures and assembly tools.

  – Carriers and organizers for electrical components.
  – Fixtures for electronic component assembly.
  – Production line/conveyor parts.

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16. What are the target industries for ABS-ESD7?

As you may have guessed from the target applications, every industry that uses additive manufacturing may have a need for ESD properties. So keep your eyes and ears open.

The most likely industries to have many applications are:

- Electronic products—consumer electronics, business machines and medical devices, for example. If it has a PCB (printed circuit board), ESD will be needed.
- Electronic components—PCBs, chip (computer) manufacturers, et al.
- Transportation—items used in or around fuel storage and delivery systems.
- Medical products—any applications where product contamination is a problem.
- Industrial equipment—high-throughput conveyance lines/machines or sorting/funneling equipment.

17. Where do applications for ABS-ESD7 exist?

You'll be surprised to learn that the answer is "everywhere" or more accurately, anywhere an ESD-sensitive device is handled. Look for opportunities to make ABS-ESD7 prototypes, parts, fixtures, carriers and containers in the following areas:

- Receiving
- Inspection
- Stores and warehouses
- Assembly
- Test and inspection
- Research and development
- Packaging
- Field service repair
- Offices and laboratories
- Cleanrooms

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HEADQUARTERS

7665 Commerce Way, Eden Prairie, MN 55344
+1 800 801 6491 (US Toll Free)
+1 952 937 3000 (Intl)
+1 952 937 0070 (Fax)

2 Holtzman St., Science Park, PO Box 2496
Rehovot 76124, Israel
+972 74 745-4000
+972 74 745-5000 (Fax)