



## BENEFITS OFFERED BY ESD FOOTWEAR OVER ANTISTATIC FOOTWEAR.

Under the safety footwear standard EN ISO 20345:2022/A1:2024, the fundamental difference lies in their electrical resistance thresholds & primary target of protection. While Antistatic footwear focuses on protecting the wearer from industrial static sparks, ESD footwear is a more rigorous subset designed to protect sensitive electronic products & components from low-voltage micro-discharges.

### HOW MUCH STATIC ELECTRICITY DO YOU GENERATE?

	10-20% Relative Humidity	65-90% Relative Humidity
Person walking on a synthetic carpet	35.000 Volts	1.500 Volts
Person walking on vinyl flooring	12.000 Volts	250 Volts
Person in a seated workplace	6.000 Volts	100 Volts
PVC bag lifted from a table top	20.000 Volts	1.200 Volts
Desk chair with a polyurethane seat	18.000 Volts	1.500 Volts

The lower the humidity, the more static electricity you will generate

## KEY TECHNICAL DIFFERENCES (AS PER EN ISO 20345:2024)

Feature	Antistatic Footwear (Marked "A" or S1-S7)	ESD Footwear (Marked with Yellow ESD Badge)
Electrical Resistance Range	$10^5 \Omega$ (0.1 M $\Omega$ ) to $10^9 \Omega$ (1000 M $\Omega$ )	$10^5 \Omega$ (0.1 M $\Omega$ ) to $3.5 \times 10^7 \Omega$ (35 M $\Omega$ ) (Strictly controlled via IEC 61340-5-1)
Primary Objective	Protects the worker from static shock hazards and prevents explosive sparks.	Protects delicate machinery, microchips, and micro-electronics from damage.
Dissipation Speed	Standard, steady static bleed to the ground.	Rapid, precision-controlled dissipation (roughly 10x faster).
Testing Scope	Tested strictly as an isolated product under clean laboratory conditions.	Tested as an integrated "Person-Footwear-Flooring System".



## 1. PRECISION COMPONENT & FINANCIAL PROTECTION

Antistatic footwear allows a resistance of up to 1000 MΩ. While this is safe for a human, it can still permit a slight voltage delay capable of destroying microscopic semiconductor circuits. ESD shoes cap the resistance strictly at maximum 100 MΩ, completely mitigating latent component defects & costly manufacturing failures (Financial).

## 2. GUARANTEED ENVIRONMENTAL INFALLIBILITY (EPA COMPLIANCE)

ESD footwear complies with international cleanroom & Electrostatic Protected Area (EPA) frameworks. Unlike standard antistatic shoes, which can lose effective conductivity in dry air, ESD footwear is built using continuous conductive stitching or specialized insoles that ensure grounding consistency regardless of localized climate conditions or sweat accumulation.

## 3. REAL-WORLD PERFORMANCE VIA SYSTEM INTEGRATION TESTING

Antistatic certification looks exclusively at the factory-delivered shoe. ESD footwear protocols ensure the shoe functions effectively while worn on real facility floors. This systematic check guarantees that no additional accumulation bypasses the safety loop during movement.



## WILL ESD & ANTISTATIC FOOTWEAR OFFER SAME DEGREE OF PROTECTION AGAINST HOUSEHOLD ELECTRICITY RANGE OF 110-220 VOLTS AS PER EN 20345:2024 ?

No, ESD & Antistatic footwear do not offer the same degree of protection against household electricity (110–220V); Antistatic footwear provides a significantly higher buffer of protection against electrical shock compared to ESD footwear. While both types are designed primarily to dissipate static electricity rather than act as true electrical shock barriers, their technical resistance windows differ under safety standards.

### THE CORE DIFFERENCE UNDER EN ISO 20345:2024

The harmonized European standard EN ISO 20345:2024 establishes strict electrical resistance limits. The lower the electrical resistance of a shoe, the more easily an electrical current can pass through it—and through your body—to the ground.

Footwear Type	Electrical Resistance Range	Shock Protection Level (at Household 110–220V)	Primary Purpose
Antistatic Footwear	100 kΩ to 1,000 MΩ	Higher Buffer: Higher upper limit restricts potential current flow.	Protects the worker from static sparks and accidental live currents up to 250V.
ESD Footwear	100 kΩ to 35 MΩ or 100 MΩ	<b>Lower Buffer:</b> Narrower, lower resistance threshold increases shock risk.	Protects sensitive electronics by discharging static as quickly as possible.

### WHY ANTISTATIC SHOES PROTECT YOU BETTER FROM 220V

To understand the danger of a 220 V shock, we look to Ohm's Law, which dictates that Current (I) equals Voltage (V) divided by Resistance (R):

$$I = \frac{V}{R}$$

- The ESD Risk:** Because ESD footwear limits its upper resistance to just 35 MΩ or 100 MΩ, its sole is made to be more conductive. If a shoe's resistance drops toward its minimum allowable threshold of 100 kΩ (0.1M Ω) due to wear or moisture, a 220 V circuit can send up to **2.2 mA of current** through your body. This is well within the range where you will experience a painful, involuntary muscle contraction shock.
- The Antistatic Advantage:** This allows a massive upper resistance limit of up to 1,000 MΩ (1GΩ). At this upper boundary, a 220 V shock would limit current flow to a micro-fraction of a milliamp (0.00022 mA), making shock entirely imperceptible & safe.



## **CRITICAL SAFETY WARNING**

Neither ESD nor Antistatic footwear are rated as true Electrically Insulating Footwear. They are designed to bleed electricity to the ground, not block it. If you are working directly with live household wiring 110—220 V, you should never rely on Antistatic or ESD shoes. Instead, you must use Electrical Hazard (EH) rated shoes or insulating boots certified under standards like EN 50321, which completely isolate your feet from the ground to prevent shock.