

# Static Charge Control

FOR FRONT-END SEMICONDUCTOR  
MANUFACTURING

Ionization Solutions

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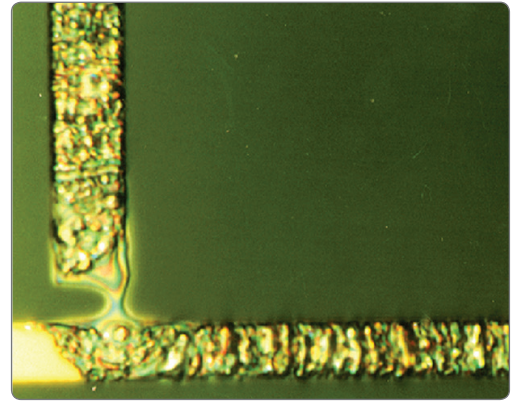


IN-TOOL &  
CLEANROOM



## Static Charge in Semiconductor Manufacturing

Static charge is generated throughout the semiconductor manufacturing process, caused primarily by the contact and separation of dissimilar materials. Static charge affects productivity and yield in three ways. Static charge electrostatically attracts (ESA) particles from the air causing potential yield loss on wafers and reticles. Electrostatic discharge (ESD) of voltages cause instant or latent defects on reticles, wafers, or packaged chips. Electrostatic discharges can also create electromagnetic interference (EMI), triggering microprocessor lockup and robotic malfunctions that lead to product flow interruptions and costly tool downtime.



*Reticle damage caused by ESD*

## Ionization & Process Monitoring

Air ionization maintains the integrity of cleanrooms and products by neutralizing statically charged particles in the air and on work surfaces. Our ionization products range from digital systems that manage and automate cleanroom and EFEM ionization to specialty ionizers inside tools that withstand extreme temperatures, fit into tight areas, or integrate into process gas lines to ionize air or nitrogen flows. Our Novx product line adds to our sensor capabilities with closed-loop integration to monitor the manufacturing environment while controlling the ionizer balance and performing automatic decay testing. Our worldwide experienced Applications Engineering Team ensures the selection of optimized ionization for your specific process applications. Simco-Ion has been the recognized leader in innovative semiconductor manufacturing ionization and monitoring technology and products for over thirty years.

### Static Charge Protection for Each Step of the Process

Our portfolio of static charge control solutions address all stages of wafer manufacturing from in-tool requirements and room environments to test, assembly, and packaging applications.

#### Wafer Manufacturing: In-tool

Inside tool mini-environments and EFEMs, the Digital AeroBar® Ionization System Model 5225 uses the IonMonitor Software to adjust, control, and regulate ion output for continual optimized performance. The state-of-the-art Model 5635 AeroBar MP meets ISO Class 1 for  $\geq 10$  nm particles, thereby providing the cleanest bar ionization available for leading-edge wafer technologies.

The Model 5635M Metal-free AeroBar MP provides the same performance for wet-clean and CMP tools where the presence of metals may adversely affect processes and yields. In tight areas where space is limited, the tiny QuadBar™ Ionizers Models 4630/4635 deliver ionization at close distances.



*The industry-standard Digital AeroBar system provides balanced, optimized ionization inside tools and mini-environments.*

## Typical semiconductor applications where ionization & monitoring solutions improve productivity:

### Wafer Manufacturing

#### In-tool

- Wet processes
- Thermal processes
- Implant
- Etch
- Deposition
- Wafer sort
- Metrology & inspection

### Cleanroom

- Photolithography
- Reticle storage
- FOUP wash
- Wafer starts

### Final Manufacturing

- Wafer mount
- Die attach
- Wire bond
- Packaging & test
- IC marking

Inside tools with high-temperature environments such as diffusion furnaces, the Extreme Temperature Ionizer Model 4612 eliminates charges as they develop with the 4062e Controller with a remote antenna for feedback and control.

In nitrogen or CDA gas flows, the In-line Gas Ionizer Model 4210u/un provides an ionized gas output in drying and chemically harsh environments. The Model 4214 In-line Ionizer provides ultra-clean ionization for leading edge processes using nitrogen.

### Wafer Manufacturing: Cleanroom

Cleanroom critical areas such as photolithography, reticle storage, FOUP wash, and wafer requires broad, overhead ionization for maximum defect reduction. Room System ionization (Model 5515 Emitter and 5582 Controller) provides protection for the entire areas. IonManager Pro Software manages the system with real-time monitoring to achieve maximum performance.

### Final Manufacturing & Test: In-tool

Inside test and assembly tools, ionizers used in combination with ESD event detection and field voltage monitors provide protection against costly ESD damage. The small Point-of-Use Blower Models 6422e-AC and 6432e direct ionized air to localized areas. For the most critical device requirements, Critical Environment Blowers Model 5822i In-tool Ionizer, the 5832 Benchtop Ionizer, and 5810i Overhead Ionizers in combination with our Novx monitors control offset voltages to as low as 1V for voltage-sensitive devices. For optimal protection against latent defects going to the field, the Novx MiniPulse ESD event Detection System provides leading-edge in-tool real-time monitoring.

### Final Manufacturing & Test: Cleanroom

In the test assembly and packaging areas, benchtop blowers Model Aerostat® PC2 and wide coverage Model Aerostat XC2 provide protection at the workbench. Overhead Blowers Guardian and CR2000 models protect products from above the workbench or table, providing large area coverage.

The lightweight, ergonomic Ionizing Model 6115 AirForce Gun and the Top Gun™ provide handheld blow-off ionization. For voltage sensitive applications, Critical Environment Blower models provide ionization at 3V and down to 1V when used with Novx Instrumentation.



Ultra-clean AeroBar for ISO Class 1



In-line Ultra-clean 99.999% Nitrogen Ionizer



Room Ionization System



Ionizing Blowers for Device Protection in Test and Assembly



Novx 3352/3362 MiniPulse Monitors

## Standards for Static Charge Control

Several standards have been developed as guides for controlling the costly effects of static charge in fab environments. Ionization has shown to be effective and necessary in implementing these standards.

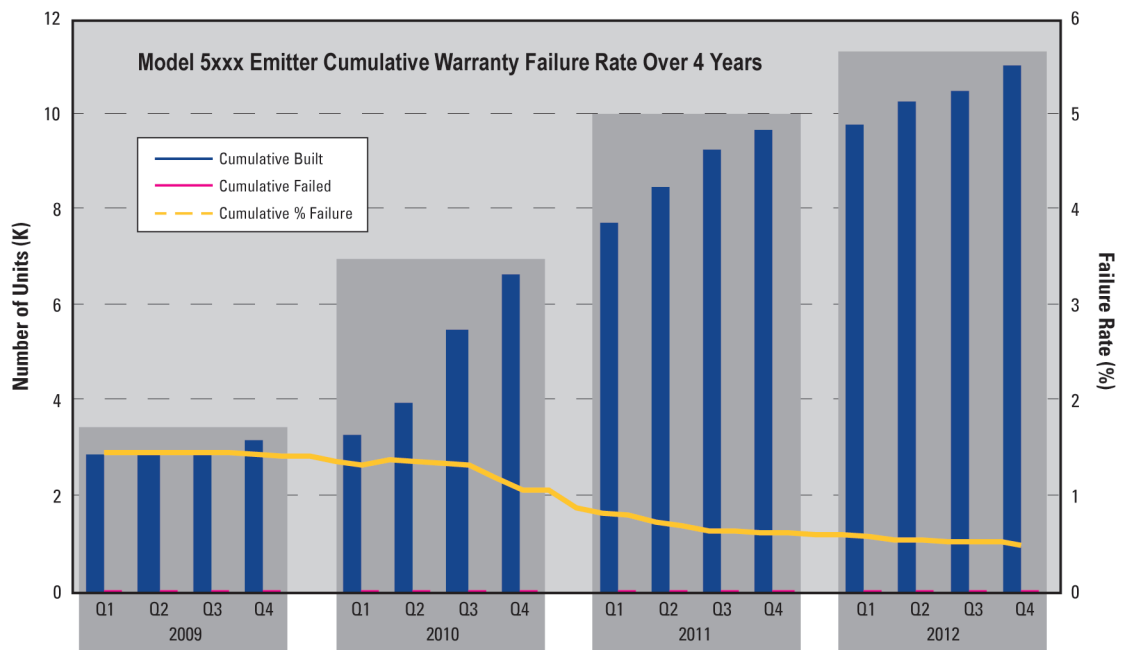
- The International Technology Roadmap for Semiconductors (ITRS) makes recommendations for maximum allowable voltages on devices, wafer/photomasks and facility surfaces.
- The Semi E78 guideline helps tool manufacturers and fab owners assess and determine safe, allowable static charge levels inside their tools.
- The ESD Association's ANSI ESD S20.20 standard outlines the development of a fab-wide static charge control program.

## Further Information

Implementing ionization and continuous monitoring ensures that static charge is controlled before it becomes a barrier to new technology introduction or slows the ramping of new factories.

Visit our web site at [www.simco-ion.com](http://www.simco-ion.com) to download general technical notes on ionization continuous monitoring, technical articles and papers relating to semiconductor manufacturing, and datasheets for all the products mentioned in this brochure. Our Applications Engineering Team is available for process development/product selection and qualification support.

*The probability that the product will operate for 4 years without a failure is 98.68% or that 98.68% of the units in the field are still working at the 4 years point.*



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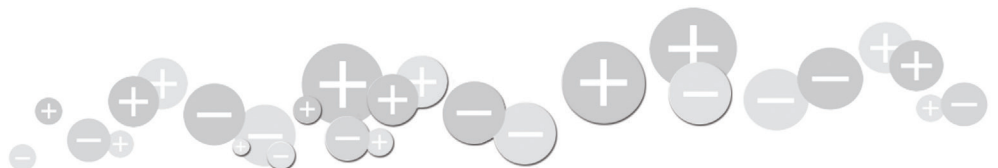
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STATIC CONTROL SOLUTIONS

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