GORE® Anti-Static High Flex Cables
For Semiconductor Production Equipment

Next-generation cable technology increases reliability & higher throughput by preventing electrostatic buildup

Evolving design and production technologies in semiconductor and flat panel display (FPD) equipment have made it possible for the semiconductor industry to move toward higher-density designs. This trend has enabled the development of multifunctional, high-speed devices in high demand from the global market. However, these higher-density designs also make FPDs and integrated circuits (ICs) more susceptible to damage from electrostatic buildup.

The electrostatic voltage that builds up over time attracts particles on the outer surface of a moving cleanroom cable system, causing uncontrolled particulation. These effects can be substantial with reduced yield, increased maintenance cycles, and higher overall costs.

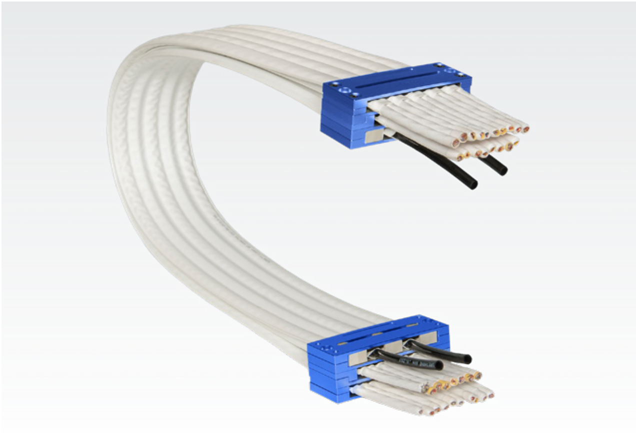
GORE® Anti-Static High Flex Cables feature an expanded polytetrafluoroethylene (ePTFE) composite jacket material with a non-carbon-based dissipative treatment designed precisely for use only in electrostatic discharge (ESD) environments (Table 1).

Our trackless cable consists of a flat jacket incorporating individual cores and a strength member that provides self-supporting rolling flex motion. Our flat cable incorporates individual laminated cores for a lighter and more flexible solution.

Both cables help prevent triboelectric charge and voltage buildup for improved protection against ESD events. They reduce particle attraction to eliminate surface charge buildup, uncontrolled particulation, and possible discharges.

An industry first, these cables can be used as a stand-alone system in an ESD-sensitive environment without any additional effort to install them. They do not require a complex grounding system or extra equipment to perform and are 100% compatible with our standard trackless and flat cables for easy retrofit.

GORE® Anti-Static High Flex Cables significantly reduce ESD-related failures and product damage for increased reliability, higher throughput, fewer maintenance cycles, and lower cost of ownership.



Features & Benefits

- Non-carbon-based, dissipative jacket material prevents electrostatic buildup
- No particle attraction or triboelectric noise interference
- Significantly reduce ESD-related failures and product damage
- Increased reliability, higher throughput, fewer maintenance cycles, lower ownership cost
- No complex grounding system or additional equipment is required
- Low-particulating material certified to ISO Class 1 up to 1 Mio flex cycle
- Easy retrofit with Gore's standard trackless and flat cables

Typical Applications

- Electronic component packaging equipment
- Advanced bonding equipment
- Pick & place mounter equipment
- Back-end manufacturing & inspection processes
- Lens manufacturing equipment
- Manufacturing equipment sensitive to ESD

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Table 1: Cable Properties

Electrical

Property	Value: Trackless Cable	Value: Flat Cable
Maximum Acceleration g (m/sec^2)	4.0 (40)	
Speed m/sec	4.0	
Surface Resistance Ohms (ASTM-D257) 45% rH, 23°C	</= 2 x 10^9	
Typical Charge Decay[a] msec (DIN-EN 1149-5; 2008-04) 45% rH, 23°C	≤ 4	
Voltage Buildup[a] V (PLFWI-2730 up to 1000 Cycles)	<< 100	
Operating Relative Humidity rH %	45 + 15	

Mechanical / Environmental

Property	Value: Trackless Cable	Value: Flat Cable
Jacket Material[b]	Expanded PTFE Composite with Non-Carbon-Based Dissipative Treatment	
Jacket Color	White	
Core Types	Signal, Power, Fiber Optic, Pneumatics	
Maximum Self-Supporting Stroke Length[c] mm (in)	1500 (60)	500 (20)
Overall Width[d] mm (in)	Up to 105 (4.1)	Up to 300 (12)
Minimum Bend Radius[d] mm (in)	50 (2)	
Flex Life Cycles (BR. 50 mm up to 4G Accelerations)	> 10 million	> 20 million
Temperature Range °C	-40 to +80	
Cleanliness Class[e] (ISO14664-1 up to 1 Mio Flex Cycle)	1	
Particulation[f] % (ISO14664-1 / VDI Guideline 2083)	< 0.1	

a. Results may vary under different conditions. Test method details available upon request.
b. Details of Gore's patent available at **patents.justia.com/patent/9534159.**
c. Baseplate required.
d. Standard configuration only. MBR can vary with specific configurations.
e. Based on Anti-ESD Trackless Cable, GKT-FTFH-01-A, Serial Number 14111802. Qualification report available upon request.
f. Details of the Fraunhofer Institute's study available at **gore.com/particulation.**

Improved Protection against ESD Events

External lab measurements generated a relationship between cable resistance and charge decay time. Considering the specific characteristics of Gore's anti-static jacket material, surface resistance is the most relevant parameter correlating to charge decay performance.

Using IEC 61340-2-3:2016 and ANSI/ESD S11.11-2022 test methods, we measured the charge decay performance of our jacket material with the standard concentric ring electrode (CRE). Results indicated that our jacket material has a surface resistance below 800 milliohms, showing charge decay performance at approximately 4 milliseconds (Table 2).

However, traditional jacket materials have a much higher surface resistance that cannot be measured using these test methods. As a result, our test results showed charge decay performance ranging in the 30s.

Table 2: Surface Resistance & Charge Decay Comparison[a]

Test Method	Conditions % rH	Electrode	Gore's Anti-Static Jacket Material	Traditional Jacket Materials
Surface Resistance	30	CRE	(790 ± 150) MΩ	> 10 TΩ
	30	SRB[b]	(680 ± 130) MΩ	> 10 TΩ
Charge Decay	30	—	Approx. 4 msec	Approx. 20 sec

a. Results may vary under different conditions. Test method details available upon request.

b. SRB = Surface Resistance Bars.

In addition, Gore's anti-static jacket material reduces electrostatic charge accumulation by up to one-third compared to traditional jacket materials under similar conditions (Table 3). Even when traditional jacket materials are grounded and subjected to the ionization flow, our jacket material still outperformed, demonstrating superior control over positive and negative charge buildup. The combination of our anti-static jacket material with ionization further enhances charge dissipation, delivering more effective electrostatic management.

Table 3: Triboelectrification & Ionization Comparison[a]

		Gore's Anti-Static Jacket Material		Traditional Jacket Materials	
Conditions	**Ionization**	**+ (nC)**	**– (nC)**	**+ (nC)**	**– (nC)**
Isolated Plates & Sample	Off	22	–21	73	–70
	On	14	–19	30	–47
Sample Grounded & Isolated Plates	Off	28	–9	76	–64
Left Plate Grounded & Sample Isolated	Off	11	–30	41	–89
Sample & Left Plate Grounded	Off	18	–4	52	–73

a. Test method procedure based on "Contact Electrification of Adhesion Films on Flat Panel Displays," by T. Viheriäkoski, et al., 2019, *Journal of Physics*: Conf. Ser. 1322 012004. Gore modified the test procedure with support from the author and incorporated an alternative ionizer under various conditions to highlight its impact on charge accumulation. Test conditions included RH = (30 ± 3) % rH and (23 ± 2) °C, and results may vary under different conditions. Test method details available upon request.

Ordering Information

For more information or to place an order for GORE® Anti-Static High Flex Cables for semiconductor production equipment in an ESD-sensitive environment, visit **gore.com/products/anti-static-high-flex-cables/contact.**

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