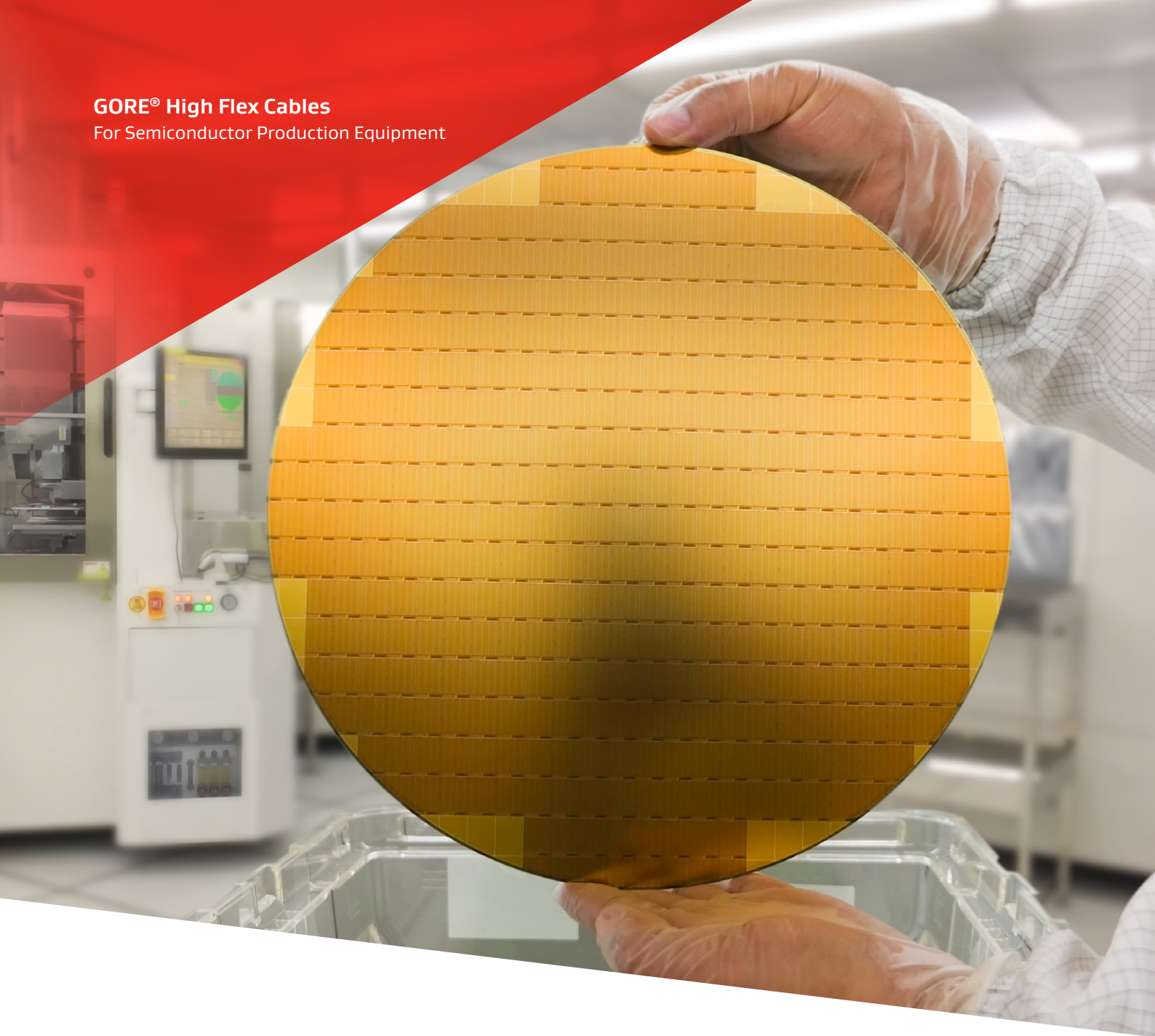


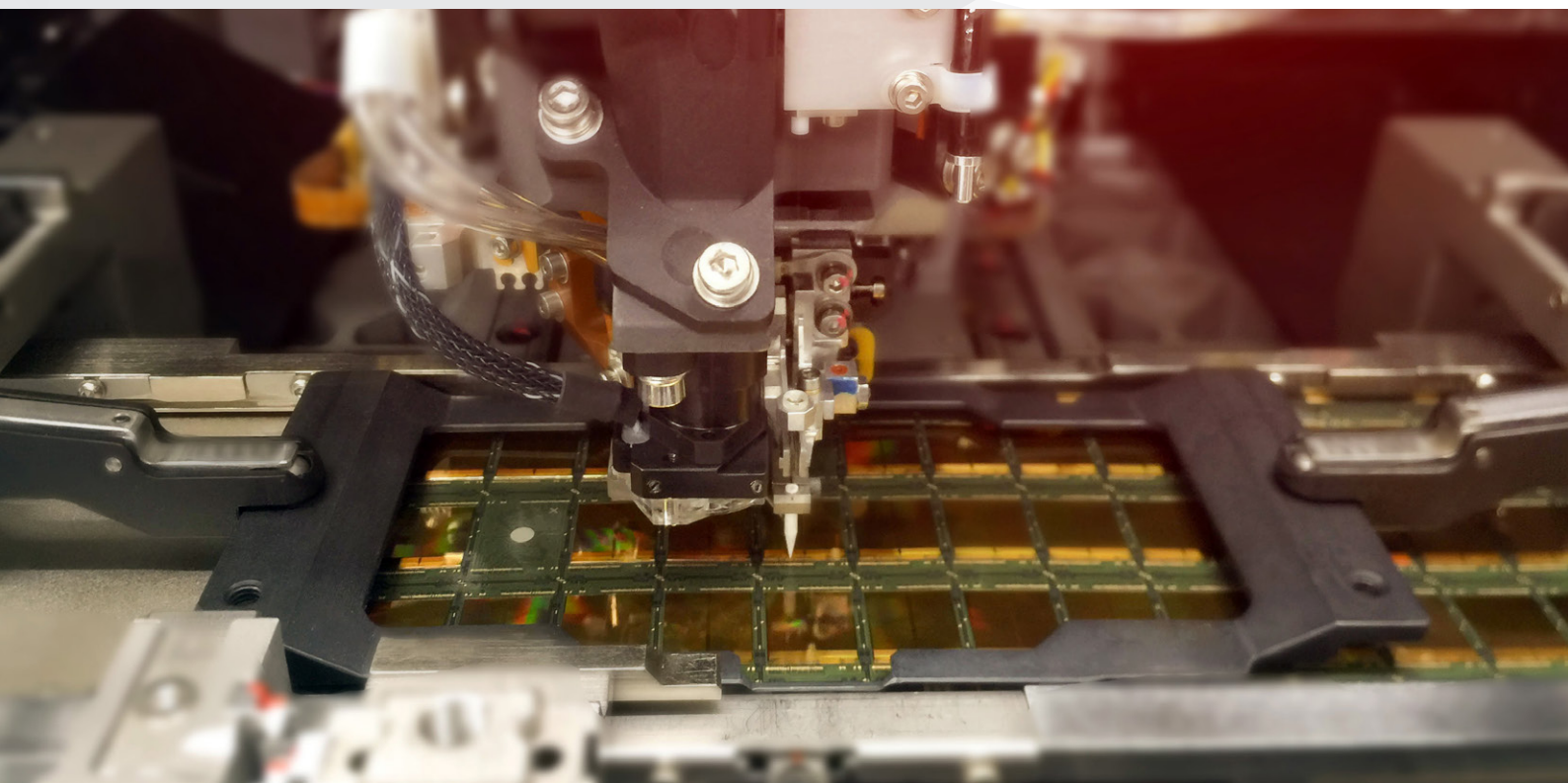
**GORE® High Flex Cables**  
For Semiconductor Production Equipment



# SOLVING COMPLEX ISSUES IN AUTOMATED EQUIPMENT

*Together, improving life*





## Benefits of GORE® High Flex Cables

- Reliable signal transmission in challenging semiconductor environments
- Meet industry standards and protocols such as Ethernet, USB, InfiniBand, CoaXPRESS and more
- Proven repeated high flex life performance for long service life
- Improved durability due to low-friction, chemically inert, and temperature-resistant materials
- No particulation, outgassing, or electrostatic discharge
- Easy installation due to lightweight constructions with a tight bend radius
- Eliminate cable track or chain with self-supporting designs
- Decrease maintenance, downtime, and total costs over equipment lifecycle

# INCREASE THROUGHPUT AND YIELD, REDUCE TOTAL COST

As semiconductor miniaturization evolves and chips become more powerful, the need for higher levels of process cleanliness and higher data rates continues to grow for cleanroom and vacuum environments in the semiconductor and flat panel display industries. The emerging EUV lithography market is an example of how both equipment OEMs and semiconductor manufacturers are preparing for the future.

The microscopic circuitry on semiconductors can be contaminated by tiny particles, outgassing, and electrostatic buildup of cable materials that can damage components — particularly as cables move, flex, and rub against thick, heavy cable chains. In vacuum environments, cable materials can contaminate from hydrocarbons and water in the processing chamber. Today's automation equipment also requires cables to move at higher speeds without compromising signal integrity to meet new video interface protocols.

As a result, the semiconductor and flat panel display industries require higher data rate cables with more durability, flexibility, and reliability to solve these complex issues.

## Increase Cable Reliability

Gore offers a portfolio of proven high-performance solutions certified for ISO Class 1 cleanroom, low-pressure vacuum, and ESD-sensitive environments. GORE® High Flex Cables withstand repeated flex cycles, improve signal integrity, increase transmission speeds, reduce particulation and outgassing, prevent ESD-related failures, and eliminate the need for cable carriers.

Our solutions solve complex equipment issues so manufacturers can increase throughput and yield, reduce maintenance and downtime, decrease total costs, and prepare for the future.

## Reduce Particulation & Outgassing

Our solutions keep semiconductor processing pure with unique expanded polytetrafluoroethylene (ePTFE) materials that are low friction, chemically inert, and capable of enduring extreme temperatures. Using calculations outlined in VDI Guidelines 2083 and ISO 14644-1, the Fraunhofer Institute in Germany determined that GORE® High Flex Cables had less than 0.1% probability of emitting particulates. Details of the Fraunhofer Institute's study are available at [gore.com/particulation](https://gore.com/particulation).

Outgassing is also eliminated because of the inert characteristics of our materials that repel hydrocarbons and water that can severely compromise equipment, such as advanced lithography processes performed in vacuum environments.

## Improve Cable Management

Using GORE® High Flex Cables can substantially improve cable management and reduce costs. The flat construction eliminates the need for dividers and shelves in traditional cable chains, which reduces the cable system's total weight — or even enables a smaller cable chain to be used. The lightweight ePTFE used in the construction is 1/2 to 1/3 the thickness of most round cable materials and meets UL requirements for safety and flame resistance.

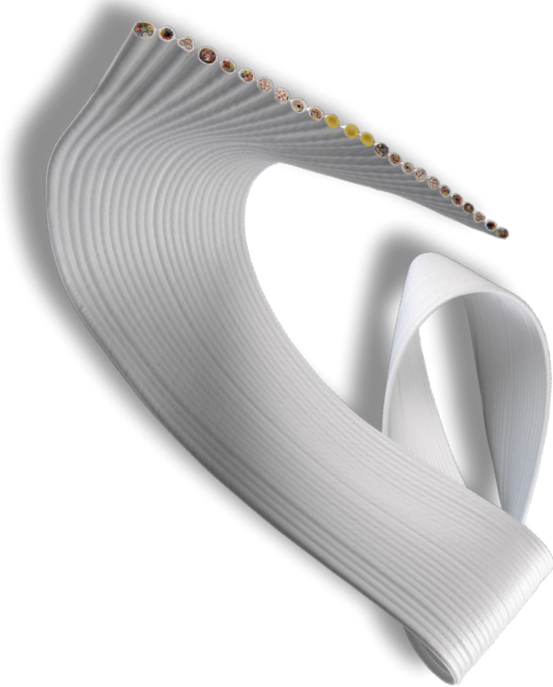
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**Gore's cable solutions with proven high flex performance and long reliability are ideal for cleanroom, vacuum, and ESD-sensitive environments.**

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# GORE® High Flex Flat Cables (Cleanroom & Vacuum Environments)



## Typical Applications

- Cleanroom automation
- Advanced packaging equipment
- Front-end wafer inspection
- Wafer metrology equipment
- Semiconductor automated optical inspection (AOI)
- Semiconductor processing equipment
- Linear motion stages
- Pick & place equipment
- Wafer handling
- Flat panel display (FPD) manufacturing equipment
- CMOS image sensor (CIS) packaging equipment
- Lens manufacturing equipment

Gore's cables improve signal integrity in complex environments and can be reliably used in any energy chain or cable track. They are proven to maintain the lowest particulation levels for repeated flexing in cable chains (Table 1). Independent tests conducted by NASA (National Aeronautics and Space Administration) and ESA (European Space Agency) have also proven that these cables consistently have the lowest possible outgassing values of water and hydrocarbons in a vacuum.

In addition, our lightweight cables reduce the weight and stress of cables as well as eliminate dividers and shelves in a traditional cable chain. They also have a proven flex life greater than 20 million cycles with a small bend radius for ease of installation.

GORE® High Flex Flat Cables are the perfect choice for applications that require high flex life and excellent electrical performance over time in cleanroom and vacuum environments, such as lithography.

## Ordering Information

For more information or to place an order for GORE® High Flex Flat Cables for cleanroom and vacuum environments, visit [gore.com/products/gore-high-flex-flat-cable](https://gore.com/products/gore-high-flex-flat-cable).

Alternatively, Gore's cables can be configured using our step-by-step online design tool at [gore.com/design-high-flex-flat-cable](https://gore.com/design-high-flex-flat-cable).

**Table 1: Cable Properties**

## Mechanical / Environmental

Property	Value
Jacket Material	Expanded PTFE Composite
Jacket Color	White
Core Types	Signal, power, fiber optic, pneumatics
Maximum Self-Supporting Stroke Length mm (in)	500 (20)
Overall Width mm (in)	300 (12)
Minimum Bend Radius mm (in)	50 (2)
Maximum Acceleration <sup>a</sup> g (m/sec <sup>2</sup> )	4.0 (40)
Speed m/sec	4.0
Flex Life (Cycles) (BR. 50 mm up to 4G Accelerations)	> 20 million
Temperature Range °C	-40 to +200
Cleanliness Class (ISO14664-1)	1
Particulation <sup>b</sup> % (ISO14664-1 / VDI Guideline 2083)	< 0.1
Outgassing <sup>c</sup> mBar liter/sec cm <sup>2</sup> (AMU)	
H <sub>2</sub> O	< 6 x 10 <sup>-10</sup>
CxHyv	< 1 x 10 <sup>-11</sup> (< 100)
CxHynv	< 1 x 10 <sup>-12</sup> (> 100)

a. For applications requiring higher acceleration and speed, contact a Gore representative.

b. Details of the Fraunhofer Institute's study available at [gore.com/particulation](https://www.gore.com/particulation).

c. AMU = Atomic Mass Units.

# GORE® High Flex Flat Cables (High Data Rate Environments)



## Typical Applications

- High-speed data links
- Image scanning
- Machine vision

Our selection of cables delivers non-stop signal transmission for applications requiring high data rates while meeting or exceeding industry protocols and standards. With proven flex life performance greater than 10 million cycles, GORE® High Flex Flat Cables minimize bit errors or data loss in moving applications where long flex life reliability is critical for motion control and vision systems.

In addition, these cables have lightweight, flexible constructions, enabling tight bend radius smaller than 50 mm (2 in) for easy installation. With proven reliability, they provide a more cost-effective cable management solution by reducing maintenance and downtime for as long as equipment remains in service.

## Ordering Information

For more information or to place an order for GORE® High Flex Flat Cables for high data rate environments, visit [gore.com/products/gore-high-flex-flat-cable](https://gore.com/products/gore-high-flex-flat-cable).

Alternatively, Gore's cables can be configured using our step-by-step online design tool at [gore.com/design-high-flex-flat-cable](https://gore.com/design-high-flex-flat-cable).

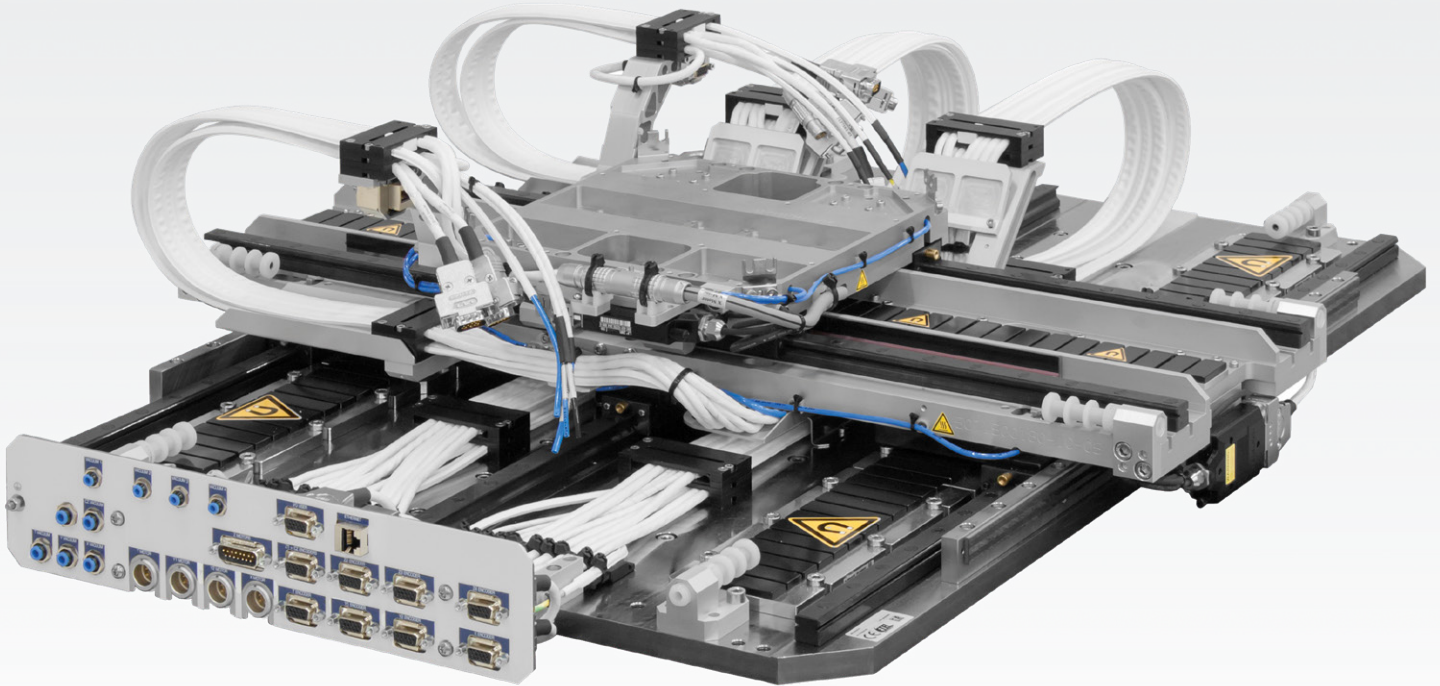


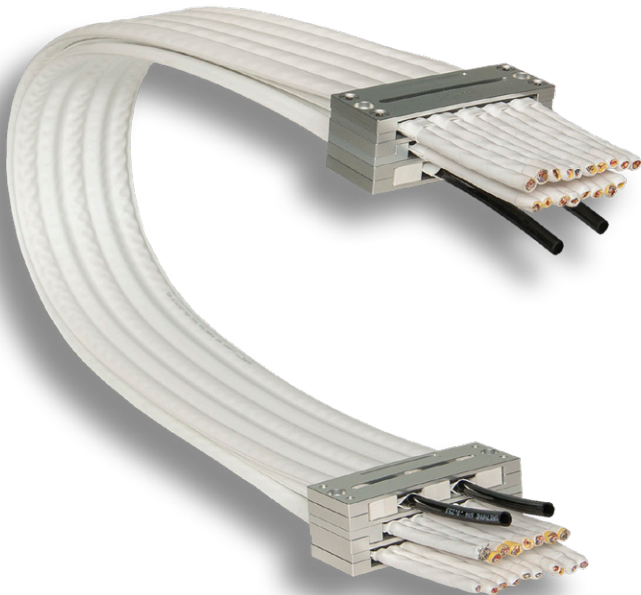
Image courtesy of ETEL S.A.

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Gore's proven high flex flat cables with high data rates minimize bit errors or data loss in moving applications where long flex life reliability is critical, such as motion control and vision systems.

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# GORE® Trackless High Flex Cables (Cleanroom Environments)



## Typical Applications

- Cleanroom automation
- Advanced packaging equipment
- Front-end wafer inspection
- Wafer metrology equipment
- Semiconductor automated optical inspection (AOI)
- Semiconductor processing equipment
- Linear motion stages
- Pick & place equipment
- Wafer handling
- Flat panel display (FPD) manufacturing equipment
- CMOS image sensor (CIS) packaging equipment
- Lens manufacturing equipment

Gore's self-supporting design offers a simpler cable management system with lower total costs by eliminating the need for a cable carrier track or chain. They deliver increased positioning accuracy with faster speeds, smooth linear motion, easier installation, and cleaner operation (Table 2).

In addition, GORE® Trackless High Flex Cables are lightweight with a proven flex life greater than 10 million cycles under a tight bend radius of 50 mm (2 in) for improved installation. Automated equipment manufacturers can even stack multiple layers of these cables to reduce the overall system footprint.

Our cables solve many challenges associated with particulation, vibration, size, weight, and costly maintenance caused by traditional cable chains and tracks.

## Ordering Information

GORE® Trackless High Flex Cables for cleanroom environments offer standard and custom configurations with mounting clamps. For more information or to place an order, visit [gore.com/products/trackless-high-flex-cable](https://gore.com/products/trackless-high-flex-cable).



**Table 2: Cable Properties****Mechanical / Environmental**

Property	Value
Jacket Material	Expanded PTFE Composite
Jacket Color	White
Core Types	Signal, power, fiber optic, pneumatics
Maximum Self-Supporting Stroke Length <sup>a</sup> mm (in)	1500 (60)
Overall Width <sup>b</sup> mm (in)	Up to 105 (4.1)
Minimum Bend Radius <sup>b</sup> mm (in)	50 (2)
Maximum Acceleration g (m/sec <sup>2</sup> )	4.0 (40)
Speed m/sec	4.0
Flex Life (Cycles) (BR. 50 mm up to 4G Accelerations)	> 10 million
Temperature Range °C	-20 to +80
Cleanliness Class (ISO14664-1)	1
Certifications <sup>c</sup>	UL, CE
Particulation <sup>d</sup> % (ISO14664-1 / VDI Guideline 2083)	< 0.1

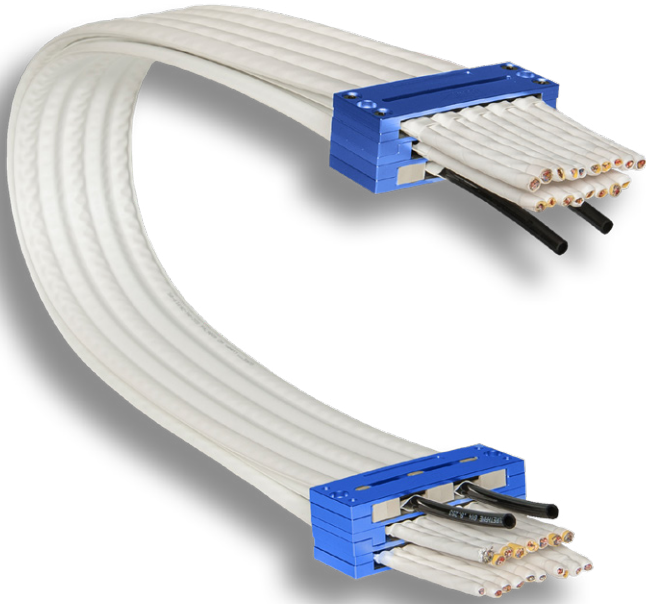
a. Baseplate required.

b. Standard version only.

c. UL Style 21090: 80°C, pneumatic tubes are not UL recognized.

d. Details of the Fraunhofer Institute's study available at [gore.com/particulation](https://www.gore.com/particulation).

# GORE® Low Charging Trackless Cables (ESD-Sensitive Environments)



This version helps prevent triboelectric charge and voltage buildup that attract particles over time in semiconductor and flat panel display equipment (Table 3).

GORE® Low Charging Trackless Cables are engineered with a new non-carbon based, dissipative material that prevents surface charge buildup and eliminates uncontrolled particulation by effectively reducing particle attraction. They help to significantly reduce ESD-related failures and product damage for increased reliability, higher throughput, and fewer maintenance cycles, resulting in lower cost of ownership.

In addition, our next-generation cable technology is the first of its kind in the industry and can be used in an ESD-sensitive environment without any additional installation effort. This unique technology does not require any additional equipment or complex grounding system to perform. It also eliminates the need for ionizers that are costly to calibrate and maintain.

## Typical Applications

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

## Ordering Information

GORE® Low Charging Trackless Cables are 100% compatible with our standard trackless high flex cables for easy retrofit. For more information or to place an order, visit [gore.com/low-charging-trackless-cables](https://gore.com/low-charging-trackless-cables).

**Table 3: Cable Properties****Electrical**

Property	Value
Surface Resistance Ohms (ASTM-D257) 45% rH, 23°C	$\leq 10^9$
Typical Charge Decay <sup>a</sup> Seconds (DIN-EN 1149-5; 2008-04) 45% rH, 23°C	
Standard	$\leq 4$
Typical	$\ll 1$
Voltage Buildup <sup>a</sup> V (PLFWI-2730 up to 1000 Cycles)	$\ll 100$

**Mechanical / Environmental**

Property	Value
Jacket Material	Expanded PTFE Composite
Jacket Color	White
Core Types	Signal, power, fiber optic, pneumatics
Maximum Self-Supporting Stroke Length <sup>b</sup> mm (in)	1500 (60)
Overall Width <sup>c</sup> mm (in)	Up to 105 (4.1)
Minimum Bend Radius <sup>c</sup> mm (in)	50 (2)
Maximum Acceleration g (m/sec <sup>2</sup> )	4.0 (40)
Speed m/sec	4.0
Flex Life (Cycles) (BR. 50 mm up to 4G Accelerations)	> 10 million
Operating Relative Humidity rH %	45 $\pm$ 15
Temperature Range °C	-40 to +80
Cleanliness Class <sup>d</sup> (ISO14664-1 up to 1 Mio Flex Cycle)	1
Particulation <sup>e</sup> % (ISO14664-1 / VDI Guideline 2083)	< 0.1

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

b. Baseplate required.

c. Standard version only.

d. Based on Anti-ESD Trackless Cable, GKT-FTFH-01-A, Serial Number 14111802. Qualification report available upon request.

e. Details of the Fraunhofer Institute's study available at [gore.com/particulation](https://www.gore.com/particulation).

## **GORE® High Flex Cables**

For Semiconductor Production Equipment

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