

**GORE® Protective Vents**  
for Heavy-Duty Equipment



# HOW DO YOUR ELECTRONICS SURVIVE IN HARSH ENVIRONMENTS?

*Together, improving life*



# Partner with Gore to Protect Your Technology from the new Challenges Faced by Heavy-Duty Equipment

Interconnected technology — from telemetric data to the IIOT — is enabling heavy-duty agricultural, construction and material-handling equipment to be more efficient, productive and less labor-intensive. In these industries, failure is not an option as it will have a direct impact on costs and productivity. That means today's sophisticated and complex technology must be as robust and trustworthy as the equipment itself. It must withstand the same harsh operating conditions: dirt, water, humidity and high temperatures. And like the equipment, the technology must meet customers' expectations for reliable performance over many years.

That's where we can help. We can engineer a venting solution that can improve the reliability of your electronic components and systems, and help you address today's challenges:



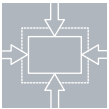
## Life Expectancy

The significant capital investment your customers make in heavy-duty equipment results in an expectation of reliable operation for many years, even in challenging environments. Exposure to these harsh conditions can compromise sensitive electronics in the automated systems, leading to system failure, increased warranty claims and dissatisfied customers.



## Reduced Design Costs

Ruggedized housings are often used to protect electronics from liquids, contaminants and condensation. However, these more expensive designs do not protect against the effect of pressure differentials, which can cause even the most rugged seals to fail.



## Limited Space

With the increase in amount of electronics in today's heavy-duty equipment, the size of each component is essential. Smaller housings are necessary for successful integration into the limited space available in these machines.



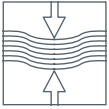
## Improve Integration

Automation technology is changing rapidly, which affects new product development and the production cycle. Quick prototyping, accessible performance testing and validation, and easy installation are essential for a successful process.

Gore offers a variety of designs, sizes and product forms that are easy to integrate into your housings.



# The Challenges: Internal Pressure Buildup, Contamination, Water Ingress and Condensation



## GORE® Protective Vents Equalize Pressure

Changing weather patterns directly affect the internal pressure of a sealed enclosure. When external temperatures change quickly, pressure differentials can occur inside the enclosure, sometimes as much as 200 mbar (3 psi). These pressure changes can put extreme stress on housing seals, eventually causing them to fail and allowing liquids and other contaminants to enter.

**GORE® Protective Vents equalize pressure by enabling air to pass through the membrane.**



## GORE® Protective Vents Prevent Contamination

Traditionally, engineers have protected against contamination by enclosing electronics in ruggedized housings. To equalize pressure they have used tortuous paths and open holes; however, these options cannot be used with heavy-duty equipment, because the wind-driven rain, dirt and other particulates can easily enter through these openings.

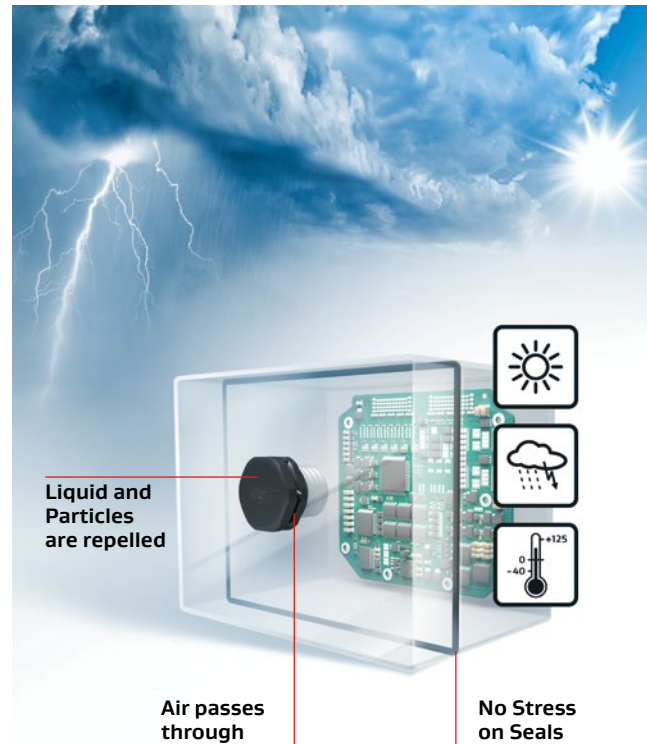
**GORE® Protective Vents provide a durable barrier against liquid, dust, dirt and other contaminants.**



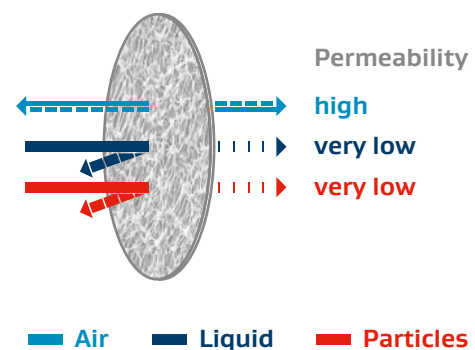
## GORE® Protective Vents Reduce Condensation

When a negative pressure differential occurs inside a housing, moisture can be drawn inside. If the pressure is not equalized, the moisture cannot escape, and it can lead to condensation. Third-party research has shown that condensation is more damaging than rain because it remains on the surface. Condensation leads to corrosion that can degrade sensitive electronics inside the housing leading to field failures.

**GORE® Protective Vents reduce condensation because water vapor molecules can pass through the membrane.**



GORE® Protective Vent with ePTFE membrane



# Trust the Experts at Gore to Engineer the Optimal Venting Solution for Your Heavy-Duty Application

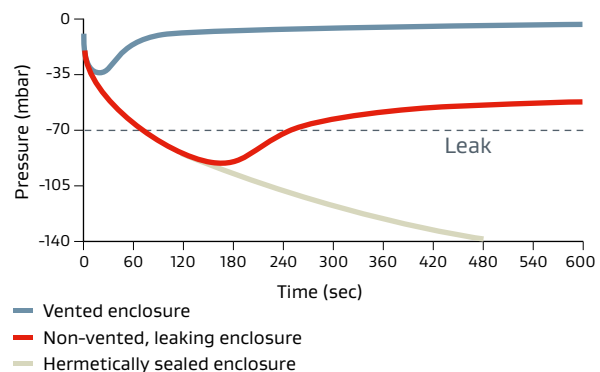
With proven expertise in the electronics industry for more than 15 years, Gore has set new standards for reliable and high-performance products. You can consider our application engineers to be an extension of your design team – from initial product concept through integration into the manufacturing process.

## Gore Responds to the Demands of the Heavy-Duty Vehicles Industry by Offering:

- Tailored venting solutions that increase your product reliability, durability and profitability
- Global R&D and engineering teams who work with you throughout the product life-cycle
- Rapid sampling to shorten the product design process
- Rigorous performance testing that improves product reliability
- Production flexibility with multiple installation options
- Venting products that integrate easily into any enclosure

**We offer you more than a venting product — we deliver a full-service solution.**

Pressure Impact on Vented and Non-vented Housing



In non-vented housings, 70 mbar (1 psi) of pressure can cause seals to leak after repeated temperature cycles. Vented housings equalize pressure and prevent stress on seals.



Typical Electronic Control Unit (ECU) for heavy duty applications rely upon a Gore screw-in vent to ensure longer product life, by minimizing condensation and protecting the product from challenging environmental conditions.



# Venting Solutions for a Variety of Heavy-Duty Applications

## Equipment Types



### Material Handling Equipment

- Cranes
- Forklifts
- Warehouse equipment



### Construction Equipment

- Earth-moving equipment
- Road construction equipment
- Mining equipment



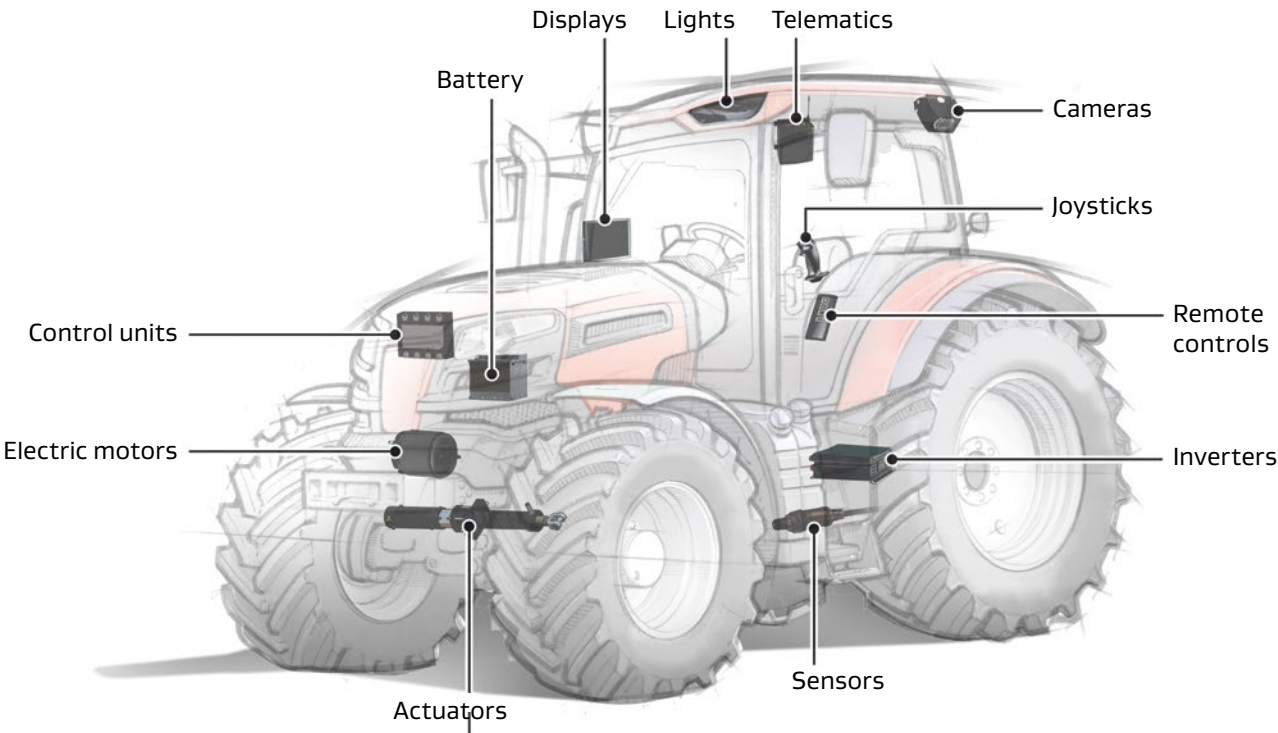
### Agricultural Equipment

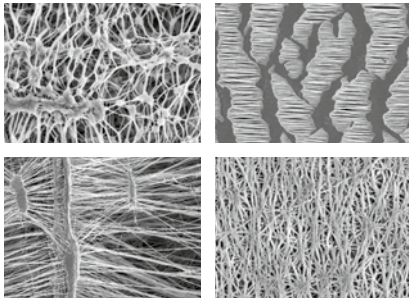
- Tractors
- Harvesting and cultivating equipment
- Forestry equipment

## Application Types and reliable Products

	GORE® Protective Vents	GORE® Acoustic Vents for Industrial Applications
Electronic Control Units	X	
Human Machine Interface	X	X
Motors, Drives, Gears	X	
Data Collection, Asset Tracking	X	

## Protection of multiple electronic applications





Our knowledge of fluoropolymers and our advanced engineering capabilities are at the heart of a wide range of remarkable materials.

## The Gore Membrane: The Heart of Our Technologies

What gives our solutions their superior performance qualities is the remarkably versatile polymer expanded polytetrafluoroethylene (ePTFE). Gore is the world leader in understanding ePTFE and its capabilities. For each implementation, we use the Gore Membrane to engineer an ePTFE membrane structure, with a variety of different properties, tailored for various challenging applications.

## Gore's Electronic Protection Expertise

- Barely more than 30 years of experience and innovation in the market
- A unique and comprehensive portfolio of reliable products
- Service and support from design to manufacture
- Proven innovation partner

Learn more at [gore.com](http://gore.com).



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GORE® Protective Vent(s) are manufactured under the generic industrial ISO 9001 quality system. No other certifications can be provided by Gore for this GORE® Protective Vent. All technical information given is based on Gore's previous experiences and/or test results. Gore gives this information to the best of its knowledge, but assumes no legal responsibility. Customers are asked to check the suitability and usability in the specific application, since the performance of the product can only be judged when all necessary operating data are available. The above information is subject to change and is not to be used for specification purposes. Gore's terms and conditions of sale apply to the sale of the products by Gore.

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GORE® Protective Vents

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