

**GORE® Performance Membranes**  
for Gas Sensors



# A PERFECT MATCH

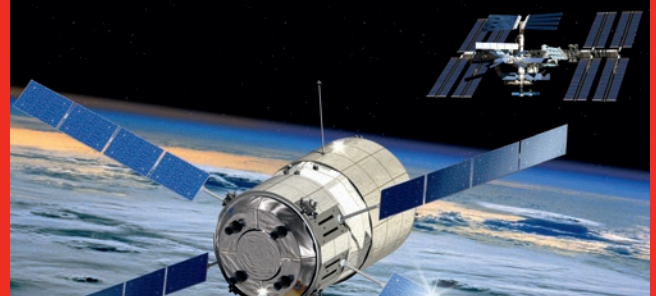
Gore Gas Sensor Solutions:  
Portfolio, Service and Partnership.

*Together, improving life*



# Why Work with Gore?

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



## Technology Footprint

Gore is the world leader in understanding expanded polytetrafluoroethylene (ePTFE) and its capabilities. For 60 years, our ability to engineer ePTFE to include specific physical properties has enabled us to develop high performance products for many challenging environments. Gore fabric technologies such as GORE-TEX Fabrics have revolutionized the performance of textiles. Gore automotive vents continue to set standards in terms of durability. Gore materials can be included in medical devices implanted in the human body. And our cable and wire solutions have been part of more than 100 spaceflight programs with a 100% failure-free flight record.

## Sustainability and REACH Compliance

We apply our deep scientific knowledge and passion for innovation to address urgent sustainability challenges. As part of this effort, we support the aim of the EU REACH legislation which is to “ensure a high level of protection of human health and the environment . . . while enhancing competitiveness and innovation”.

## Reliability and Partnership on a Global Scale

With short lead times and capacity sufficient for the largest programs and fastest production ramp ups, our global supply chain is robust and agile, as are our services and support. Rely on our experienced local sales and technical teams for smooth collaboration with OEMs and excellent results.

## Product and Application Leadership

With decades of experience in a wide range of applications, Gore provides premium solutions to OEM manufacturing chains in various industries. We are specialists at balancing the trade-offs between diverse challenges such as adverse environments, contamination prevention and performance. All our products are made to the highest standards of quality inspection and documentation.

# Gore Gas Sensor Solutions: Proven Performance to Design the Future

## Experience to Understand Your New Challenges


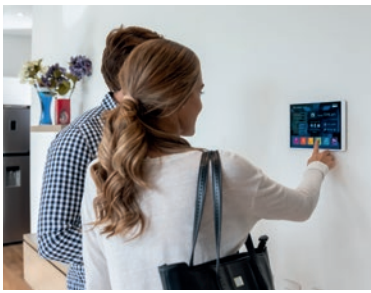
The gas sensor market is driven by the ongoing need for industrial safety and the new requirements for air quality monitoring. Gas sensors are increasingly integrated into IoT ecosystems such as wearable devices, HVAC safety, smart city projects and smart home electronics. These new trends and applications demand sensor innovations. Gore has been serving the gas sensor market for more than 25 years. We're still going strong and continue to innovate membranes for gas sensor types such as EC, NDIR and MOS.

Sensor manufacturers all across the globe know they can simply rely on Gore delivering membranes of consistent and uniform quality, which are easy to integrate and well-known for low shrinkage, good printability and reliable supply. They appreciate our availability and innovation power as a development partner when they are responding to new trends, and as problem-solvers when they are facing new challenges during development phases.

## Membranes to Meet Your Sensor Designs

From mechanical engineering and process technology to automation and numerous other sectors, deploying the right sensors has become a make-or-break factor crucial to a product's international competitiveness. Gore's ePTFE membranes come with outstanding performance as gas-permeable protective membranes and as functional membranes in electrochemical sensor cells and similar applications. They also prevent the ingress of dust and liquids, thus significantly adding to the quality and durability of the cell and sensing device.

Membrane characteristics are determined by, for example, accuracy of measure, type of gas and, of course, product type. Gore has the expertise to offer or develop the membrane which meets your requirements, plus the service and partnership you want: a perfect match for your gas sensor projects.

APPLICATION AREAS	APPLICATION INDUSTRIES	GASES/ PHYSICAL UNIT
<p><b>ANALYTICAL MONITORING AND SAFETY</b></p>	<p><b>INDUSTRIAL</b></p> <ul style="list-style-type: none"> <li>• Oil &amp; Gas</li> <li>• Chemical Plants</li> <li>• Petrochemical Facilities</li> <li>• Power Generation</li> <li>• Water Treatment</li> <li>• Military</li> </ul>	 <ul style="list-style-type: none"> <li>▪ CO</li> <li>▪ CO<sub>2</sub></li> <li>▪ H<sub>2</sub>S</li> <li>▪ NH<sub>3</sub></li> <li>▪ NO</li> <li>▪ NO<sub>2</sub></li> <li>▪ Cl<sub>2</sub></li> <li>▪ SO<sub>2</sub></li> <li>▪ ETO</li> <li>▪ etc.</li> </ul>
<p><b>ENVIRONMENTAL MONITORING, HEALTH AND SAFETY</b></p>	<p><b>CIVIL RESIDENTIAL &amp; CONSUMER</b></p> <ul style="list-style-type: none"> <li>• Civil Gas Safety</li> <li>• HVAC</li> <li>• Smart Home</li> <li>• White Goods</li> <li>• Wearables</li> </ul>	 <ul style="list-style-type: none"> <li>▪ CO</li> <li>▪ CO<sub>2</sub></li> <li>▪ O<sub>2</sub></li> <li>▪ O<sub>3</sub></li> <li>▪ CH<sub>4</sub></li> <li>▪ NH<sub>3</sub></li> <li>▪ NO<sub>2</sub></li> <li>▪ VOC</li> <li>▪ Particle Matters</li> <li>▪ Humidity RH</li> </ul>

# A Broad Portfolio for Multiple Gas Sensor Functions and Design



Each gas sensor's particular design – as well as the materials used in it – depends on many different factors, most importantly the sensor's purpose and the environment in which it will be used. Gore is capable of delivering specific membranes for several functions in a gas sensor to match your particular design specifications.

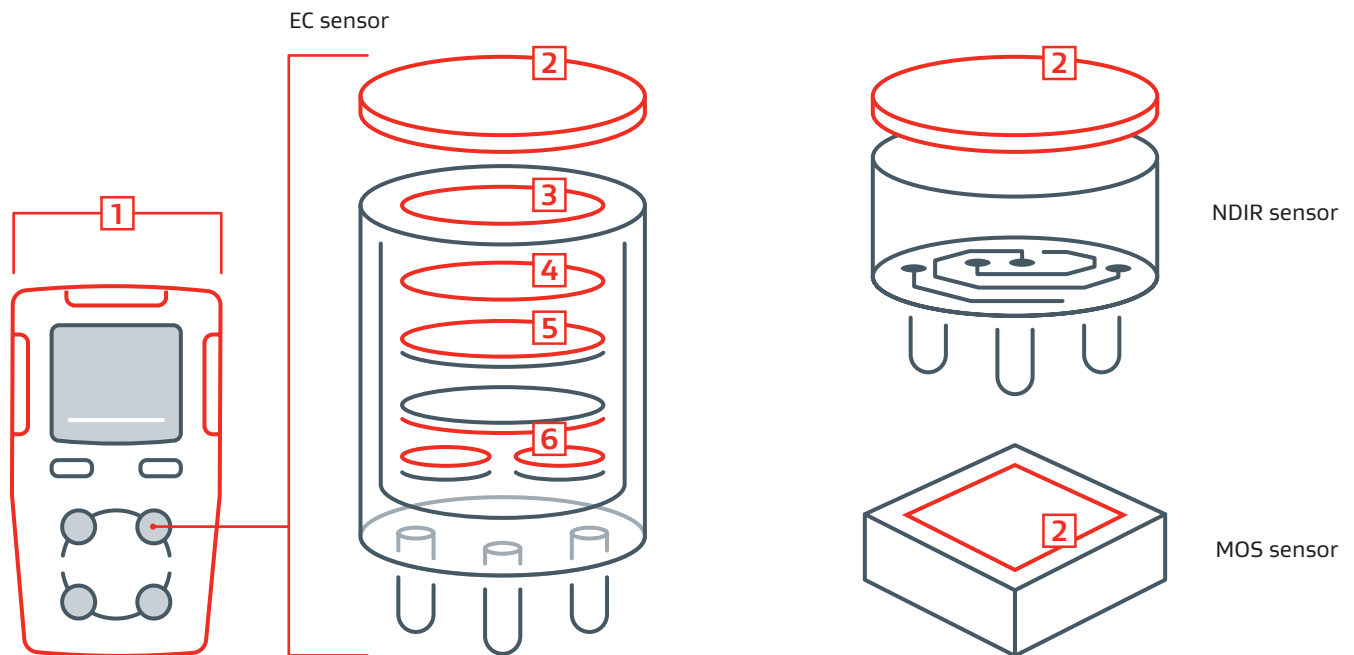
## Meet the Market's Demands

Gore membranes can help you meet increasingly demanding requirements in order to stay competitive:

- increased lifetime
- improved measurement stability
- reduced production costs
- better accuracy
- rapid response time

## ePTFE – at the Center Of Our Solutions

ePTFE (expanded polytetrafluoroethylene) continues to set standards, as it offers a wide range of highly desirable attributes (e.g. good uniformity of porosity and pore size) for gas sensors types like EC, NDIR and MOS.



- 1) **Protective vents** – Protects portable or static device from ingress of moisture, particles or other contaminants as a result of condensation, high-pressure cleaning, shocks, vibration or other factors, but allows for gas to go through.
- 2) **Dust cover** – Prevents ingress of dust and liquid, but allows for gas to go through. Provides mechanical protection for exterior of sensor cell.
- 3) **Flow or diffusion control** – Reduces pressure peaks due to rapid change of outside pressure or controls the diffusion of defined gases to measure higher concentrations

- 4) **Sealing ring** – Used as an additional seal within the sensor stack.
- 5) **Membrane at working electrode** – Barrier prevents electrolyte from escaping and allows for gas to go through. Lets gases diffuse at the desired rate and balances pressure differences. Carries the catalyst of the electrode. Chemical resistance required.
- 6) **Membrane at reference and counter electrode** – Carries the catalyst of the electrode. Chemical resistance required.



Gore Gas Sensor Solutions are available in different forms depending on function.

## GORE® Protective Vents

for sensing device protection

Adhesive Series	Typical Airflow (ml/min/cm <sup>2</sup> @ 70 mbar)	Membrane Type/Characteristic	Membrane Color	IP Rating	Product Form	Thickness (mm)	Dimensions* (mm)	Description	Used as
VE7	290	ePTFE/Oleophobic	Black	IP66 IP68	Adhesive	0.34	2.0 × 5.0** 3.3 × 7.6 5.5 × 10.2	high durability PTFE tape	1
VE8	3,300	ePTFE/Oleophobic	White	IP64 IP67	Adhesive	0.26	8.0 × 14.0 8.9 × 19.1	high flow laminate	1
VE9	1,150	ePTFE/Oleophobic	White	IP66 IP68	Adhesive	0.32	12.5 × 21.5 20.0 × 29.0	high flow high WEP PTFE tape	1

\* Standard sizes. Available in various designs and dimensions upon request.

\*\* VE7 & VE8 only

For further information please check the GORE® Protective Vents Adhesive Series Datasheet

for sensor cell protection

Dust Cover	Typical Airflow (ml/min/cm <sup>2</sup> @ 70 mbar)	Membrane Type/Characteristic	Membrane Color	IP Rating	Product Form	Thickness (mm)	Dimensions* (mm)	Description	Used as
GDC001	4,310	ePTFE Laminate/hydrophobic	White	IP6X	Cut Part	n.a.	standard dimensions upon request	high flow membrane laminate	2
GDC002	4,310	ePTFE Laminate/hydrophobic	White	IP6X	Adhesive	0.25	standard dimensions upon request	high flow membrane laminate	2
GDC003	> 4,000	ePTFE Laminate/hydrophobic	White	IP6X	Cut Part	0.26	standard dimensions upon request	high flow membrane with grid backer	2

\* Available upon project request

## GORE® Performance Membranes

for inner sensor cell functions

New Part#		Avg Gurley (s)	Avg Airflow (ml/min/cm <sup>2</sup> @ 70 mbar)	Avg Thickness (µm)	Avg Width (mm)	WEP (bar)	Largest Pore Size (µm)	Shrinkage (%)	Used as
Large Roll	Short Roll								
GPM5600422-L	GPM5600422-S	4,650	1.15	396	140	> 4	n.a.	n.a.	3
GPM4500274-L	GPM4500274-S	3,500	1.5	257	137	> 8	0.03	< 7	5 6
GPM3000165-L	GPM3000165-S	2,300	2.3	156	150	> 3	0.08	< 8	5 6
GPM2400165-L	GPM2400165-S	1,960	2.7	157	156	> 4	0.06	< 10	5 6
GPM2200117-L	GPM2200117-S	1,450	3.7	107	180	> 2	0.12	< 7	4
GPM0070229-L	GPM0070229-S	40	134	191	210	> 1	1.98	< 6	5 6

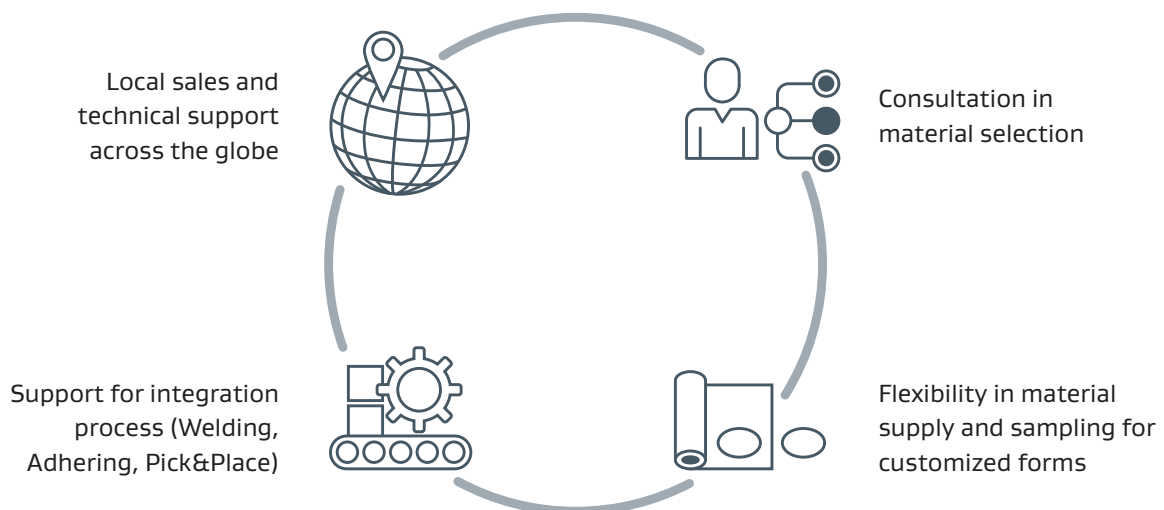
We partner with you with a passion for innovation, commitment to service excellence and proven membrane expertise.



## By Your Side from Design to Manufacture



At Gore, we are committed to support you with any design challenges you might face. Our consultation for the right material will accelerate and simplify your development process. From the initial design to production up until the finished product, you can benefit from our service to ensure efficient integration and reliable products.



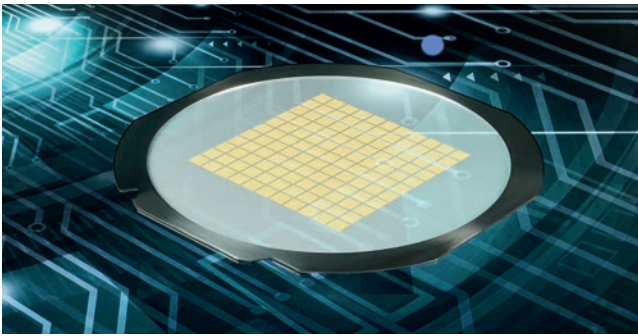
# Design Greater Success. Together.



The gas sensor market is evolving: new trends and applications are a great opportunity for experienced as well as new players in the market. But these changes also come with challenges for gas sensors and their components.

## We Can Be Your Membrane Engineers

We bring our proven innovation capabilities and membrane engineering experience to the table and work side by side with you, the manufacturer. In this way, we develop new materials that smoothly integrate into both your development and production process.



Proven expertise in MEMS microphones – ready to match with gas sensor needs

## Helping You Meet Today's Gas Sensing Challenges

Two of the greatest challenges we are currently observing in the gas sensor market are miniaturization and selectivity. At Gore, we have answers to both these challenges – and more.



MINIATURIZATION



SELECTIVITY

There are many ways in which we can help find the most efficient solution when it comes to material as well as process optimization:

### Material-related

- New functionalities
- Consistent membrane quality
- Small form factors down to 1.1 mm OD, 0.7 mm ID
- Membrane thickness 1  $\mu\text{m}$  to > 100  $\mu\text{m}$
- Different adhesive systems

### Process-related

- Different options for system and process integration
- Delivery form on reel or wafer ring
- Capable of multiple reflow processes at high temperatures

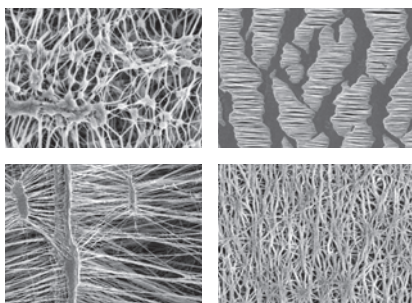
## Team up for Innovation, Team up with Gore

Innovation is in our DNA and we want to contribute to your success by making our membrane engineering abilities available for you, making us the perfect match for innovators.

If you have a new design, a new project or an unsolved challenge, get in touch.

We'd Love to Hear from You!





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 Membrane Benefits for Your Gas Sensors

- high to low permeability can be engineered to the requirements
- chemical inert (e.g. high acid resistance)
- high temperature tolerance (-180 °C to +260 °C)
- non-flammable, dissipates heat into its microenvironment
- water, oil and dust repellent
- high mechanical resistance
- low shrinkage, good printability and weldability

## Gore's Gas Sensor Expertise at a Glance

- Many 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

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