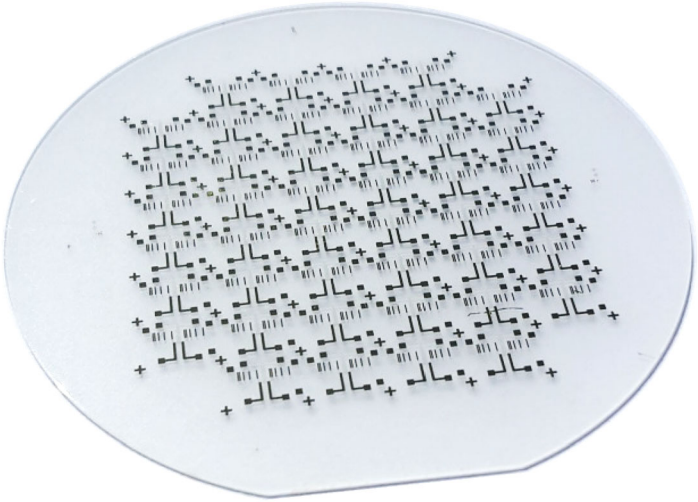
BLOCH LABS



Features & Benefits

Revolutionary	Detection based on oxygen adsorption
Dynamic range	Logarithmic response from < 5 x 10^{-7} to 1 mbar
Accurate	± 5% of reading over full range
Small footprint	Active area < 20 x 20 μm^2
Non-Ionizing	Compatible with sensitive measurement environments
Robust	> 250 °C operation, MEMS-free mechanical stability
Scalable	Full-wafer microfabrication
Chemically selective	Measure < 5 x 10^{-5} mbar oxygen in carrier gas
Easy-to-use	Available on industry-standard flanges with programmable electrical output and setpoints

Description

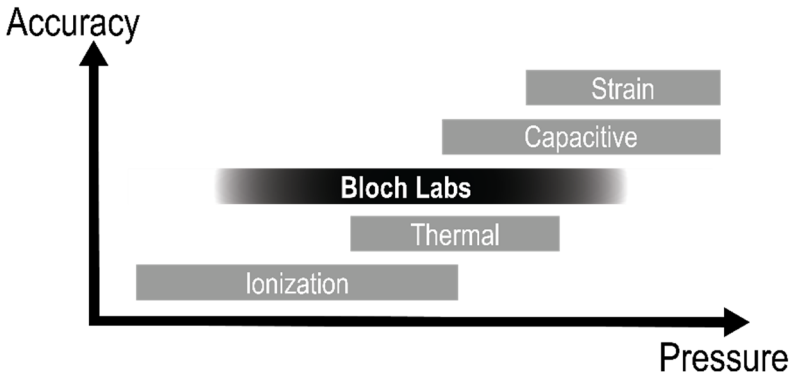
Patent-pending, chip-based vacuum sensor combines quantum engineering and semiconductor physics unique to gallium nitride (GaN) to deliver a truly novel vacuum metrology solution.

How does it work?

Gases stick to vacuum chamber surfaces. Oxygen adsorption changes the electronic properties of Bloch Labs' semiconductor vacuum sensor. The higher the pressure, the faster the adsorption. In gallium nitride, light can desorb oxygen from the surface. Increasing light intensity increases desorption. The combined sensor electronic properties and light intensity measure the oxygen partial pressure.

New physics delivers unprecedented performance

Conventional vacuum metrology solutions exhibit a trade-off between dynamic range and accuracy. Bloch Labs' sensor delivers a dynamic range extending from 5 x 10^{0} mbar to < 5 x 10^{-7} mbar due to the logarithmic physics relating the sensor electronic properties, sensor light intensity, and chamber pressure. Proprietary measurement algorithms profit from the microelectronic sensor's reproducibility to maintain device accuracy better than ± 5%, with a repeatability of ± 2%, over the full pressure range.



Can the sensor be used as a vacuum pressure gauge?

Bloch Labs' semiconductor vacuum sensor is chemically selective, meaning that the sensor specifically responds to oxygen. Because pressure is a physical property, Bloch Labs' solution cannot be classified as a "true" pressure gauge. However, the sensor could be used as a gauge in applications where the detected oxygen partial pressure is strongly correlated with the total pressure, such as in vacuum systems where air is used as a vent or purge gas.

Built on a better light bulb

As the material underpinning the solid-state lighting revolution, gallium nitride is the world's second most manufactured semiconductor behind silicon. Bloch Labs' vacuum sensor leverages industry standard processes to create a monolithically integrated vacuum sensor chip.

Tough, yet unobtrusive

Gallium nitride's wide bandgap equals tough material. Commercial LED lifetimes today exceed 100,000 hours. Bloch Labs' sensor has demonstrated continuous operation at temperatures exceeding 240 °C. Moreover, unlike ionization vacuum gauges, Bloch Labs' sensor does not produce ionized particles or stray magnetic fields, allowing placement inside analytical equipment, such as electron beam columns or mass spectrometers. Finally, because the chip does not contain any microelectromechanical systems (MEMS), the sensor is stable against mechanical vibration and shock.

Specifications*

Technical Data	Units	Value
Physical principle		Adsorption
Range (O_2)	mbar	< 5 x 10^{-7}…1 x 10^{0}
Accuracy (O_2)	% of reading	± 5% (± 2σ / 95%), full-range
Repeatability (O_2)	% of reading	± 2% (± 2σ / 95%), full-range
Operating temperature	°C	-20 – 220 with compensation
Maximum temperature	°C	> 250
Response time	ms	< 350, 10^{-6} to 10^{-3} mbar O_2
Background gases		N_2, He, Ar, H_2, CO_2
Calibration drift	%	< 1.5% over two weeks
Detection limit	mbar	5 x 10^{-5} O_2 in 1 x 10^{-2} N_2
Nonlinearity		Negligible for > 5% O_2 in N_2
Admissible pressure	bar	> 10
Admissible magnetic field	T	10
Humidity		Non-condensing
Power consumption	W	< 1
Materials exposed to vacuum		(Al,Ga,In)N, Au, Pt, SiO_2, 304 steel
Mounting position		Unrestricted
Available flanges		CF25/KF25 and larger
Electrical interface		Analog 0 – 10 V, RS-485, EtherCAT

Applications:

- Chemical vapor deposition
- Partial pressure gauge
- Residual gas analysis
- Charged particle instrumentation
- Leak testing
- Process gas verification
- Food packaging

*__DISCLAIMER:__ The given performance specifications represent preliminary laboratory test data. The supplied figures may change and do not guarantee final commercial sensor performance.