



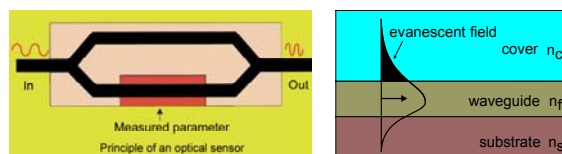
**New advanced technology
for measuring multiple
atmospheric gasses**

The SIOS is an all-weather sensor for the measurement of atmospheric gasses. The sensor configuration is suitable for incorporating multiple gas detectors in one housing. Its primary purpose is the measurement of water vapor, carbon dioxide and ozone. The sensor is compatible with most common data logging systems has a low power consumption and a fast response time.

Measurement Principle

The SIOS incorporates a new optical chip, containing multiple Mach-Zehnder Interferometers. The sensing volume on the Integrated Optical Circuit contains a gas-specific absorbent, which acts as a detection material. The absorbents index of refraction is a function of the gas concentration.

This principle has inherent advantages of very high sensitivity and low temperature dependence. The traditional problems with this kind of technology have been solved; the stability of the absorptive detection material, and making a design with matched electrical and optical components.



Interferometer geometry and optical chip configuration

Applications

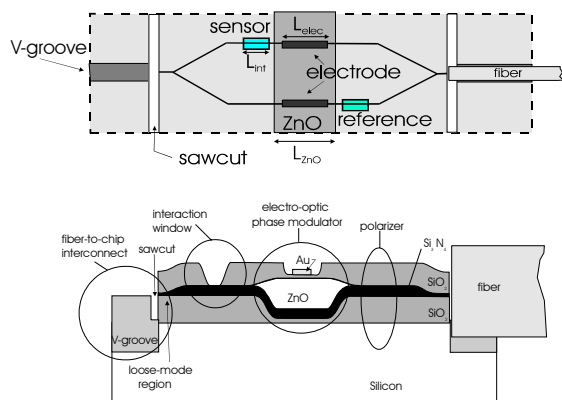
Main applications are found in meteorology, particularly in field experiments and environmental monitoring networks. Other application areas of SIOS are detection of chemical and biological agents in process- and military industry, environmental- and agricultural control and medical research.

Features

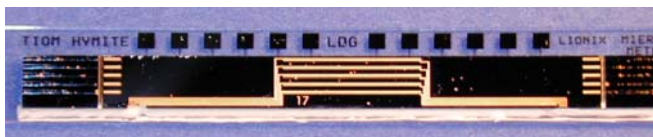
- **Multiple gas detection with one sensor**
- **On-line measurement**
- **Linear sensor output**
- **Compact package**
- **Fast response (approx. 1Hz)**
- **Large dynamic range (>10⁶)**
- **No temperature correction required**
- **Low power consumption**
- **All-weather performance**
- **High accuracy**
- **Extreme insensitivity to EMI**
- **Low cost technology**

Chip Design

The Integrated Mach-Zehnder Interferometer is connected to chip mounted fibers. The measurement essentially determines the index of refraction of a gas specific absorbing material. This material is deposited on the sensor branch of an Integrated Optical Circuit. It is in contact with the ambient air through a weatherproof membrane. In order to compensate for various errors, the secondary branch, also called "reference" is also coated, but not in contact with the ambient air.



The absorbent is highly gas-specific and reacts to one gas only. The difference between the various gas detectors is the chemical composition. The integrated electronics take care of further signal processing.



The sensor can be configured to carry more than one detector on one and the same circuit. The photo shows a sensor with five gas channels visible as lines on the central part.

Package

The sensor consists of the Integrated Optical Circuit, incorporated in a weatherproof housing. A permeable membrane keeps the sensor protected against the environment, while letting gasses pass.



Reference

The SIOS is developed in a Dutch Innovative Research Program (IOP Electro-Optics) in close cooperation with the University of Twente and TNO Research Centers and is patented and manufactured by Mierij Meteo B.V. in De Bilt. The sensor chip is produced in close cooperation with LioniX BV.

Mierij Meteo is a company that specializes in developing, manufacturing and selling meteorological instruments and systems. We have our own Research & Development department, a MET office specified windtunnel and have comprehensive service facilities for calibration, certification and maintenance.

The TIOM consortium (sponsored by the EU) made available the reliable and cheap packaging of the multiplexing device.

Typical application fields

Gas sensing		liquid sensing	
Selective chemo-optical interface layer		Without interface layer	
"polymers"	Specials (anti-body protein)	2-component mixture	
%RH, O ₃ , CO ₂ , NO _x , SO _x ,	Toxic gasses, incapacitating gasses, biological agents, ...	Pesticides, disease research, etc...	C ₂ H ₅ OH – CH ₃ OH, C ₂ H ₅ OH – C ₆ H ₃ (CH ₃) ₂ , etc...
Meteorology Environmental control	Defense industry	Agriculture Medical diagnostics Health control	Process control