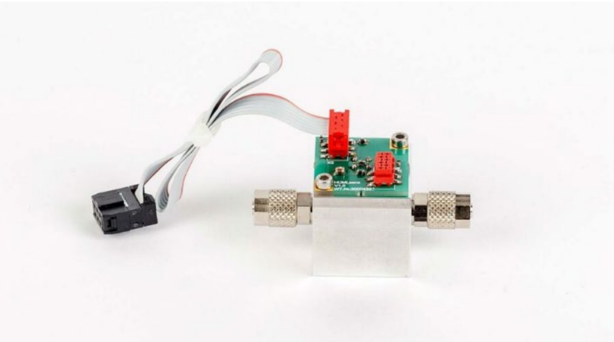
Technologies

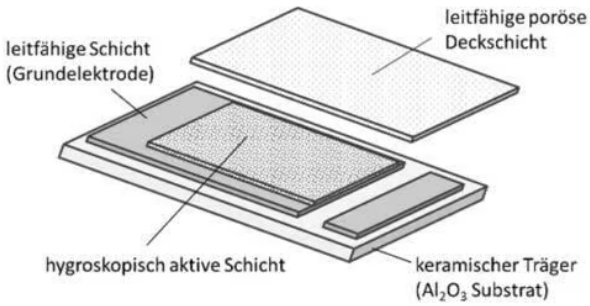
Humidity Sensor

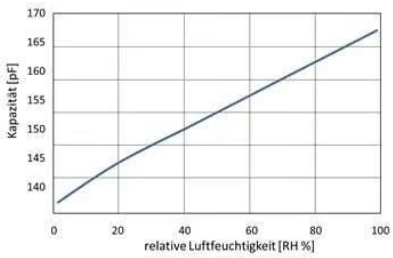


The HUMI.sens® is based on a capacitive humidity sensor. This sensor consists of a hygroscopic polymer material in which the water vapor from the measurement gas is stored. This incorporation changes the dielectric properties of the polymer material. The polymer material is located between the electrodes of an electrical capacitor and thus also changes the capacitance of the capacitor. The capacity increases almost linearly with the humidity. An equilibrium is formed between the moisture in the measurement gas and the moisture in the polymer, which reversibly adapts to the changing moisture.

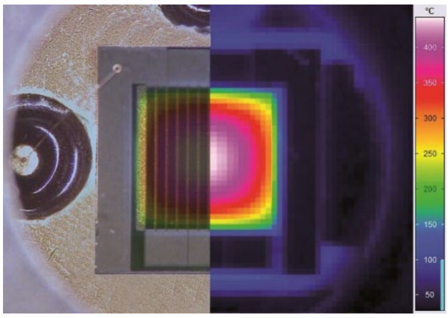
Basic structure:

The humidity sensor is built up in a layer structure. The bottom layer forms the carrier. This is made of ceramic. A base electrode is applied to this carrier. The hygroscopic polymer layer is applied over this base electrode. A gas-permeable layer must be applied as a counter electrode so that the water vapor can get into this sensitive layer from outside.





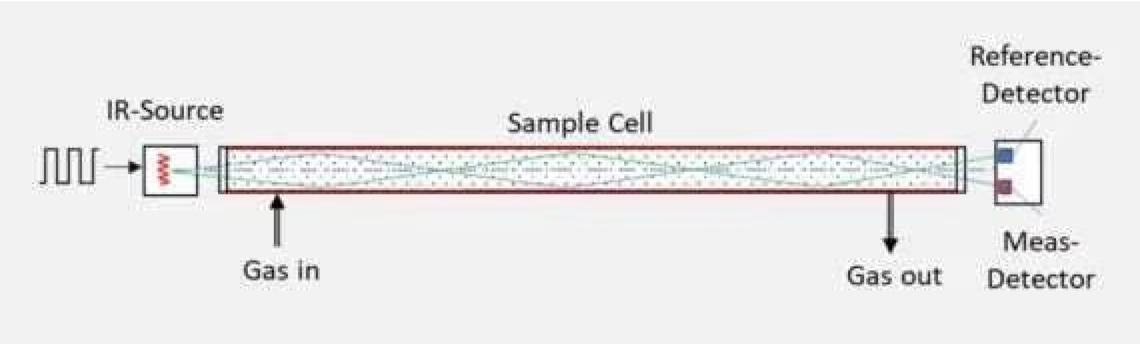
IR-Photometry



Within the infrared spectral range between 2 µm to 12 µm or 14 µm the IR photometry can detect different gases. This spectral range is much larger than the UV range, so that many more gases can be measured there. However, the cross-sensitivities to other gases that may be part of the measurement gas to be analysed are disadvantageous here. Interference of steam and carbon dioxide can partially make these measurements nearly impossible so that selective compensation must be performed. Since a spectrometer is not used with this measurement method it is also known as NDIR, analogous to the NDUV.

Basic structure:

Compared to the NDUV gas sensor the INFRA.sens® uses broadband radiation sources (thermal emitters). This radiation immediately reaches the measuring cuvette in which specific spectral ranges are absorbed from the broadband spectrum of the radiation source. The measuring detector which contains at least 2 separate channels is located at the end of the measuring cuvette. In the simplest case the measuring channel has an interference filter placed in front of the detector. Afterwards a detector measures the specific radiation absorption. The reference detector has an interference filter in front of the detector, too but with a spectral transmission range (approx. 4 µm) where no absorption takes place.
The evaluation electronics use the two signals to calculate the gas concentration in the measuring cuvette. Alternatively, a detector with several measuring channels can be placed at the end of the measuring cuvette so that 3 components to be recorded simultaneously.



The following gases can be measured with the INFRA.sens®:

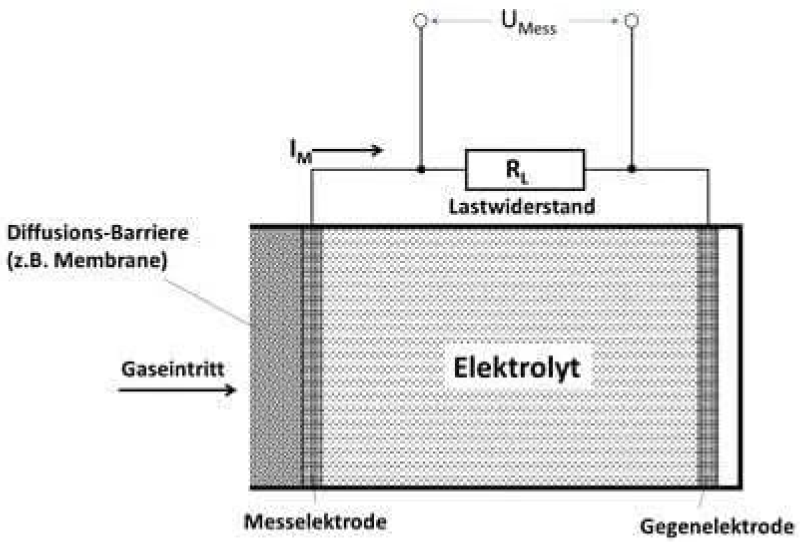
Carbon monoxide CO
Carbon dioxide CO_2
Methane CH_4
Ethane C_2H_6
Propane C_3H_8
Butane C_4H_{10}
Sulfur Hexafluoride SF_6
Dinitrogen Monoxide N_2O

Oxygen Sensor

The O_2.sens from Wi.Tec is based on an electrochemical process. In this process, a chemical reaction takes place with the oxygen to be measured and a liquid electrolyte. In this reaction, 4 electrons are released per oxygen molecule. The resulting sensor current IM or the measurement voltage UM increases proportionally with the number of reacting O_2 molecules. This results in a sensor characteristic that increases linearly with increasing O_2 concentration.

Basic structure:

The liquid electrolyte is located in a closed chamber, which is sealed on the gas side with a permeable membrane. The oxygen reaches the electrolyte through this membrane and then leads to the measuring effect described. The anode material is consumed during this reaction, so that the service life of this sensor is limited. A membrane with a high permeability leads to a high and rapid signal change (= short response time), but also to a shorter service life, since more chemical reactions take place over time. Membranes with a low permeability therefore show the opposite behaviour.

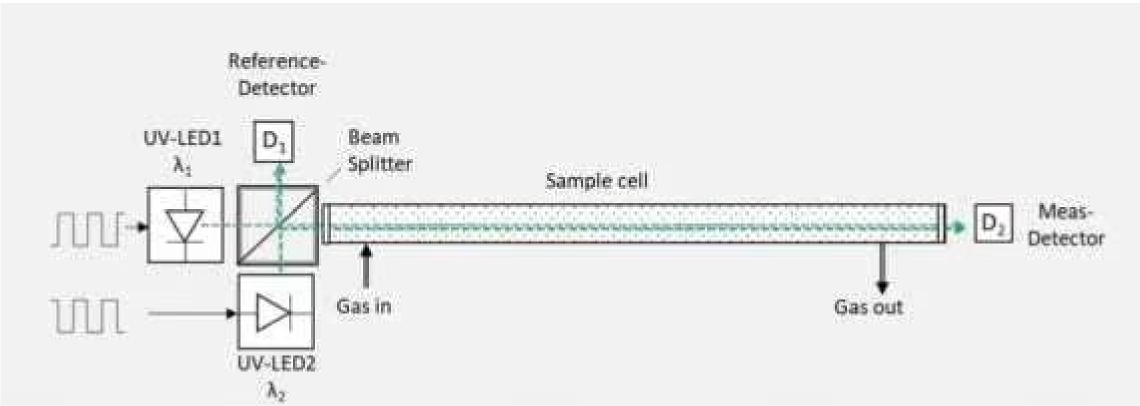


UV-Photometry

The UV photometry is based on the absorption of radiation in the spectral range between 200nm and 400nm. In this area, some important technical gases have a pronounced absorption band. The advantage of this type of gas analysis is that the measurement is not disturbed by steam and carbon dioxide. Furthermore, these absorption bands show a high absorption behaviour so that very low gas concentrations (<< ppm) can also be detected reliably. In the Wi.Tec photometers of the ULTRA.sens® series UV light-emitting diodes are preferably used which emission wavelengths correspond spectrally to the respective absorption band. This means that no additional optical spectrometers or filter elements are required. This type of UV photometry is known as the non-dispersive UV method, also called NDUV.

Basic structure:

The radiation of the UV-LED is splitted into a measuring and reference path via a beam splitter. The reference beam arrives a detector directly which converts it into a reference voltage value. With this reference signal aging effects of the UV-LED can be almost completely compensated. The measuring beam enters the sample cell in which the radiation is absorbed by the gases located there. The absorption behaviour is recorded by the measuring detector and is used to calculate the gas concentration within the measuring cuvette. The ULTRA.sens® is designed in such a way that radiation components from several UV LEDs can also be coupled into the photometer. This means several gases can be determined simultaneously by the ULTRA.sens®.



The following gases can be measured with the ULTRA.sens®:

- Hydrogen Sulphide H2S
- Carbon Disulfide CS2
- Sulphur Dioxide SO2
- Nitrogen Dioxide NO2
- Chlorine Cl2
- Ozone O3
- Chlorine Dioxide ClO2

The measurement of nitrogen monoxide (NO) requires a selective UV radiation source in the spectral range around 226nm. For this purpose, a gas discharge lamp filled with NO is used, which emits precisely the radiation that is required for the NO measurement. In this context, one speaks of resonance absorption. The process also referred to as UVRAS (UV resonance absorption spectrometry.