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## Membrane covered optical CO<sub>2</sub> sensor for aquaculture

### Online determination of the dissolved carbon dioxide in water

The measurement of the dissolved carbon dioxide gas (excluding HCO<sub>3</sub><sup>-</sup> and CO<sub>3</sub><sup>2-</sup>) in the water in fish farms is one of the most important parameters for the success in aquaculture. Until now the so called m-value method has been used, which has some disadvantages. Apart from the very time-consuming manual analysis, the m-value method is not only influenced by CO<sub>2</sub>, but also by all the other compounds with influence to the pH-value (e.g. phosphates, silicates, hydrogen carbonate, carbonate). Additionally, the m-value method requires sampling, which may lead to errors too. On the other hand, a direct reading sensor is required to allow the control of the conditions in the water.



AMT GmbH has developed now in a common project with the Research Centre of Mecklenburg/Vorpommern for Agriculture and Fishery, Institute for Fishery (Germany) a membrane covered optical sensor for the determination of carbon dioxide in shallow water.

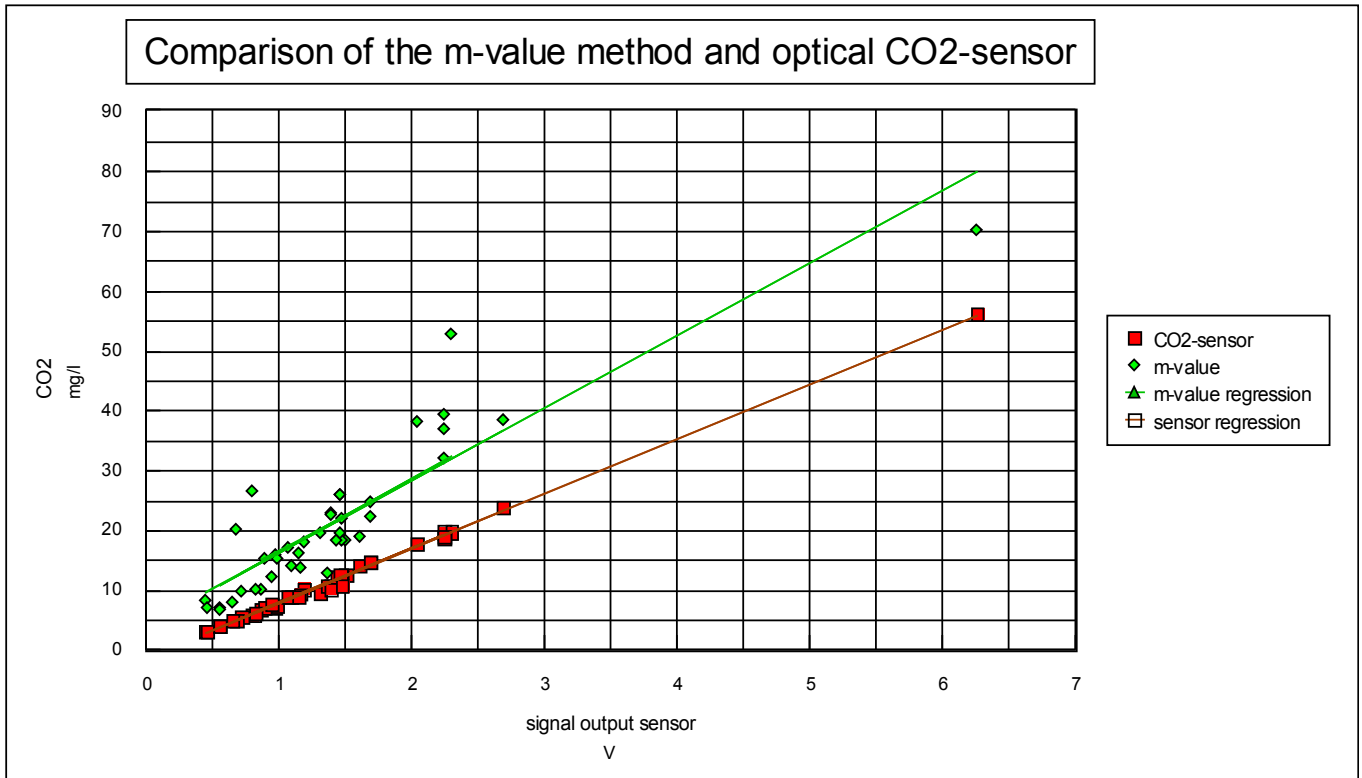
#### The measuring principle:

The inner sensor volume is separated from the sample by means of a gas permeable silicone membrane. Liquids and solids are not able to pass the membrane. If the sensor is dived into a sample, a CO<sub>2</sub> partial pressure equalisation is achieved between the inner sensor volume and the sample. Inside the sensor there is an optical sensor mounted. Its working principle is based on Single-Beam Dual Wavelength NDIR. This measurement of the CO<sub>2</sub> partial pressure has to be accompanied by the measurement of the temperature in the water and by the air pressure for calculating the carbon dioxide concentration.

#### Main features of the Carbon Dioxide Sensor:

- submersible direct reading sensor for water and air
- detects only dissolved CO<sub>2</sub> gas
- no signal interferences to silicate, phosphate, HCO<sub>3</sub><sup>-</sup> and CO<sub>3</sub><sup>2-</sup>
- built-in reference measurement for superior stability

*Fig.: Membrane covered optical carbon dioxide sensor.*



## Technical data of the membrane covered optical carbon dioxide sensor:

### Carbon Dioxide:

- ☞ Measuring ranges: 3 mg/l, 5 mg/l, 8 mg/l, 12 mg/l, 30 mg/l, 50 mg/l, 80 mg/l, 170 mg/l, 340 mg/l
- ☞ Accuracy (25°C): < ± 3% of reading
- ☞ Nonlinearity: < ± 1% FS
- ☞ Temperature dependence of output: 0.1% FS/°C
- ☞ Pressure dependence: 0.15% of reading/hPa
- ☞ Longterm stability: < ± 5% FS/2 years

### General:

- ☞ Dimensions: 240 mm length, 70 mm diameter
- ☞ Housing material: Nylon 6
- ☞ Connector: Subconn MCBH4M
- ☞ Power supply: 11-20 V DC or 18-30 V DC
- ☞ Power consumption: < 2.5 W
- ☞ Recommended external load: current output: max. 200 Ohm; voltage output: min. 1 kOhm
- ☞ Warm up time: < 15 minutes
- ☞ Max. Depth: 3 m
- ☞ Available analog outputs: 0...20 mA, 4...20 mA, 0...1 V, 0...2 V, 0...2.5 V, 0...5 V
- ☞ Temperature range for storage and measurement: 0...30°C