



UNIVERSITÄT ZU LÜBECK



University of Applied Sciences

**Program: Biomedical Engineering**

## **Master's Thesis**

**Title:**

**Integration of two electrochemical gas sensors into a patient gas module**

**Summary:**

The standard modular platform for clinical gas measurement at the company Dräger is the MiniModule Multigas. This module combines the capability to measure the concentrations of oxygen, carbon dioxide, nitrous oxide and volatile anesthetic agents. Nevertheless, there is a request for an upgrade of the MiniModule in order to combine two further sensors with the MiniModule.

This work describes the approach to substitute the existing paramagnetic oxygen sensor by a new sensor module, that combines two electrochemical sensors in a frame size not larger than the original oxygen sensor. Consequently, an appropriate hardware for the mechanical adaption of the sensors had to be constructed. In addition to that, a printed circuit board was designed, including all necessary electronics, to drive and read out the sensors and to communicate with the host device. Altogether the new sensor module resulted in a suitable design, that showed good performance according signal amplitude, signal noise, rise times and response times. Furthermore, applicable external and internal standards and requirements were fulfilled according the named sensor characteristics. Apart from this, some degrading effects to the sensor signal of one electrochemical sensor could be detected, depending strongly on the hardware configuration.

Future research should thus be focused on minimizing these degrading effects. Moreover, the software integration to the host device still needs to be implemented. To characterize the sensor performances in terms of cross-sensitivities, dependencies on environmental influences and aging, further experiments should follow.

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