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H₂ Measuring Instrument with Amperometric Micro-sensor

Very fast determination of dissolved hydrogen without streaming the sensor membrane, display of hydrogen in mg/l and temperature in °C



The microprocessor-operated measuring instrument has been developed for the fast and accurate *in-situ* determination of dissolved hydrogen without any sampling. The instrument is useful for the laboratory and for simple and fast measurements in the field (e.g. power plants, chemical industry). The instrument is equipped with an amperometric, membrane covered H₂-micro-sensor, which has not to be streamed and with a temperature sensor. The display shows the concentration of the measured dissolved hydrogen in mg/l and the temperature of the sample.

The measuring instrument is powered via the included power supply unit and can be operated also with batteries. The RS 232 interface allows to link the instrument to a PC or notebook. By exchanging the H₂-sensor tip against a galvanic oxygen micro-sensor tip, the measuring instrument could be changed fast and simply into a high performance oxygen measuring instrument.

Furthermore the instrument is useful to store the calibration coefficients of up to 10 different chemical micro-sensors and to calculate the concentration units by means of the measured raw data. This allows also the fast and simple exchange of sensors and measuring ranges, if required. Apart from the already mentioned micro-sensors for the determination of H₂ and oxygen, there are also micro-sensors available for the determination of dissolved H₂S/sulphide, hydrogen peroxide and ozone. All these sensors can be interfaced very simply to the measuring instrument.

The measuring system is delivered with a case for the transport and storage.

Advantages of the Hydrogen Measuring Instrument with amperometric Micro-sensor

Compared with the other commercially available so called macro-sensors for the amperometric determination of dissolved hydrogen and compared with the very expensive instrumentation systems like gas chromatography, the new measuring instrument has the following advantages:

1. No streaming of the sensor membrane necessary, very low analyte consumption
2. Membrane or electrolyte exchange is not necessary
3. Very fast response times of the sensor (only some seconds for $t_{90\%}$)
4. Determination is possible without sampling and without adding any chemicals
5. Very low detection limit of 0,2 $\mu\text{g/l}$
6. High accuracy
7. High economic efficiency (no consumption of chemicals)
8. Measurements also in turbid, coloured, muddy and salt containing samples
9. Online measurement (not only average values of a big volume)
10. High local resolution of the measurement (μm -steps)
11. Immediate display of the hydrogen concentration (mg/l)



Fig.: Amperometric H₂-Micro-sensor, complete with titanium housing, integrated electronics and exchangeable sensor tip

Technical Data of the Amperometric Micro-sensor:

- ☞ Measuring principle: amperometry, membrane covered sensor with redox catalyst
- ☞ 3 sensor electrodes
- ☞ Ready for measurements after polarisation time of 15...30 minutes
- ☞ Polarisation is realised by the integrated electronics
- ☞ No streaming of the membrane, no stirring of the analyte
- ☞ very low analyte consumption
- ☞ Concentration ranges: depends on customers request
standard: 0,2...500 (1000) $\mu\text{g/l}$ and others on request
- ☞ Accuracy of the sensor: better than 2% of the measuring value
- ☞ Measurements within a range of 0°C to 30°C
- ☞ Response time: $t_{90\%}$: 2 seconds
- ☞ Average life time: approx. 6...10 months
- ☞ No signal interferences caused by salt concentrations up to 40 g/l
- ☞ Cross sensitivities: H₂S (leads to errors and/or reduced life time)
- ☞ Unsuitable for measurements in strong alkaline solutions ($c > 0,02 \text{ mol/l OH}^-$)