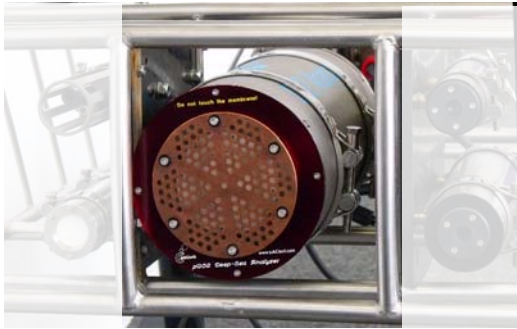


# OceanPack™ MK4 SUB

## Underwater Laser Gas Analyzer for CO<sub>2</sub> or Methane

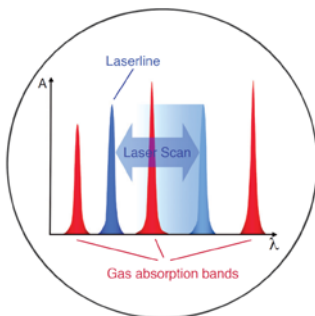


- Offshore Oil+Gas & CCS <sup>Note 1)</sup> monitoring
- ROV or AUV integration
- Aquaculture condition monitoring
- Profiling
- Deep-Sea
- Monitoring of biological processes
- Water quality control

Note 1): Carbon Capture and Storage

- Optical contact-less measurement
- Low detection limit
- Wide dynamic range
- Highest precision
- No calibration gases required
- Low maintenance
- Corrosion-free titanium housing
- Robust design
- Low power
- Expandable
- Highest production quality

### The technology:



Diode Laser based gas detection gains increased interest in the industry as it offers significant benefits in terms of selectivity, stability and low maintenance. Our Tuneable Diode Laser Spectrometer (TDLS), produced by a Swiss company, offers unique advantages like precise optical, contact-less measurements, excellent target gas selectivity and sub ppm-level detectivity. The analyser features a robust membrane to separate ambient water from the Laser spectrometer with a small cell volume. This allows a rapid gas exchange and thus very fast response times. The high sensitivity and the large dynamic range of the detection technology enable measurement from sub-ppm level to high percentage concentration without physical adaptation of the device.

### The features:

With the long experience SubCtech provides robust, versatile and compact submergible instruments for subsea applications such as Offshore Oil+Gas, CCS or scientific monitoring.

The instruments are ready to use without the need of user adjustments, complete, hands carry able and easy to maintain. Easy handling and intuitive overall design e.g. incorporates red and green LED signals for visual control under water.

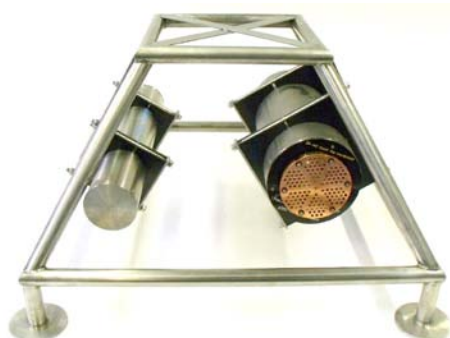
With the outstanding high stability long-time deployment and missions are perfect supported. The flat membrane equilibribrator conductor cassette system (patent pending) is protected against biological fouling. The titanium housing is corrosion free. Data is saved on the internal CF disk or transmitted in real time via our NMEA-0183 standard ASCII protocol.

SubCtech GmbH • Wellseedamm 3 • D-24145 Kiel • Germany  
 T +49 431-22039-880 • F +49 431-22039-881 • [www.subctech.com](http://www.subctech.com) • [info@subctech.com](mailto:info@subctech.com)



Specification	
<b>Sensor Principle</b>	Optical high performance Tuneable Diode Laser Spectrometer (TDLS) for Carbone dioxide - CO <sub>2</sub> or Hydrocarbon methane CH <sub>4</sub> • Silicone flat membrane equilibrator cassette (patent pending) • Aging compensated • External sea-water pump for high response times (T <sub>66</sub> : 3min) supported
<b>Range</b>	Standard: 0...1000 ppm CO <sub>2</sub> • 0...100/1000 ppm CH <sub>4</sub> • Higher levels up to 300.000 ppm can be measured <i>Very low detection limits are combined with very high concentration ranges</i>
<b>Precision</b>	0.4 ppm CH <sub>4</sub> and NH <sub>3</sub> • 4ppm CO <sub>2</sub> <sup>Note 2)</sup>
<b>Accuracy</b>	< 1.5% incl. zero & span drift, linearity, repeatability (full scale)
<b>Detection limit</b>	0.4 ppm CH <sub>4</sub> and NH <sub>3</sub> • 4ppm CO <sub>2</sub> • Defined as precision 2σ <sup>Note 2)</sup>
<b>Sample Rate</b>	Physical 1 Hz with optionally averages for storage (e.g. 30s, 10min,...) and real-time output
<b>Calibration</b>	Factory calibration with traceable gases • User correction supported
<b>Auto Calibration</b>	CO <sub>2</sub> only: automatic offset zeroing on programmed intervals • Zeroing reference included for >1 year operation time • Optional manual or automatic gas calibration supported
<b>Temperature</b>	Operating temperature range 0 to +40°C • Optional -30 to +65°C (note: for CH <sub>4</sub> min. -15°C)
<b>Analogue Out</b>	0...5V or 4...20mA • Range can be adjusted • Other on request
<b>Interface</b>	RS-232 / RS-485 • Data output ASCII NMEA-0183 • Easy integration into existing systems <i>SubCtech is member of the NMEA society for best compatibility</i>
<b>Data logger</b>	Optional SmartDI <sup>®</sup> data logger • 2GB CF card for approx. 5 years storage (depending sample rate) Quality and event flagging • PLC Controller for auto-calibration and external component control (pumps, lights, sensors etc.) • Real time processing with 180+ calibration formulas • Optional alarms
<b>Software</b>	NEW Windows <sup>®</sup> PC Software <i>OceanView™ 4</i> for logging and online real-time data • Diagnostic screen
<b>Anti-fouling</b>	Anti-fouling design for the equilibrator sensor head
<b>Housing</b>	Titanium Ø168mm x 430 mm length (300m) • Approx. 12 kg at air, 2.2 kg in seawater Titanium Ø180mm x 430 mm length (3000m) • Approx. 15 kg at air, 6 kg in seawater
<b>Water depth</b>	Buoy / Shallow water 50m • Estuary 300m • Subsea up to 6000m on request
<b>Power</b>	10...30 VDC • typ. 7W • Warming up max. 15W • Optional Li-Ion PowerPack™ e.g. 45-140-280Ah, 14.4V Optional low-power version <5W operating and Power-Manager-Module for sleep-modes
<b>Service</b>	Recalibration & Service recommended every 12 months • Membrane lifetime up to 10years

Notes: 2) specification for 10s integration time and FS ranges. Lower specs for concentrations up to 300.000ppm (30 Vol.%)



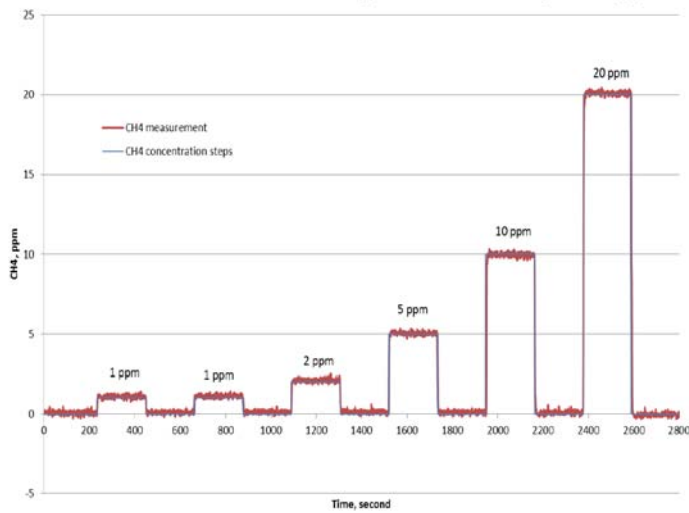
Subsea monitoring frame with Li-Ion battery and OceanPack™ subsea gas analyzer



Control panel inside the analyzer with diagnostic signals, adaption for PC monitor and keyboard. Additional connectors are used for external sensors or external signal lights.

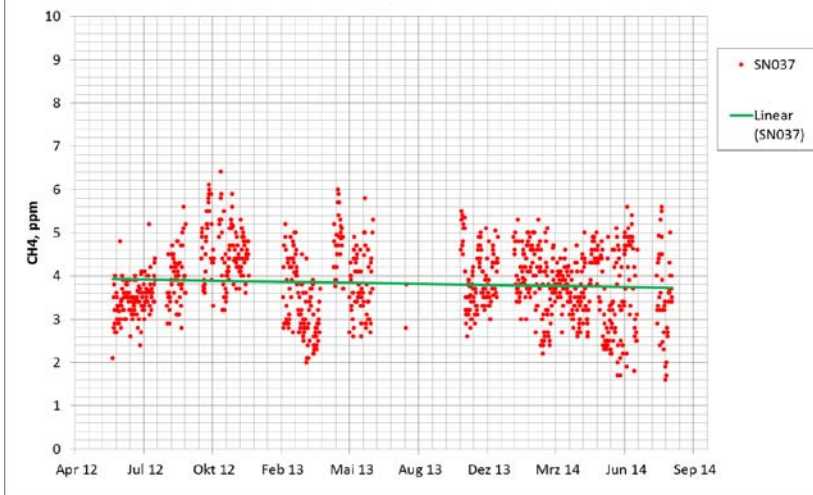


CH4 - 1ppm Concentration steps / 1 - 20ppm



Performance test for low methane gas concentrations between 1 to 20ppm, using industrial gas mixtures.

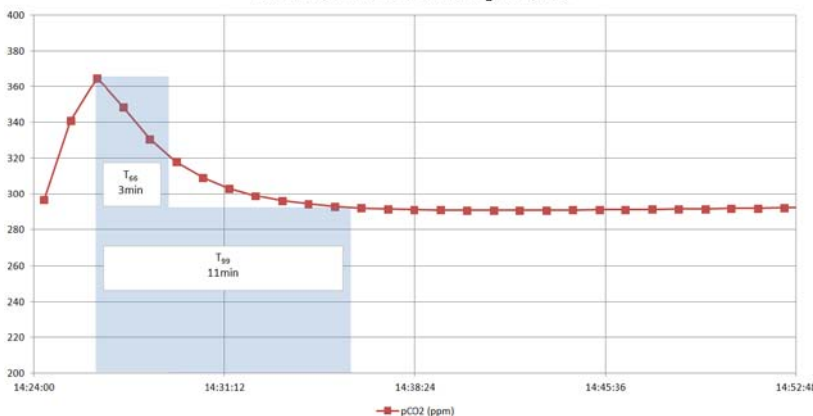
Long Term Data



Performance test for long time measurements.

*Note: for this test, the analyzer was not temperature stabilized, and no calibration was performed. Under temperature stabilized conditions the noise should be approx. < 1ppm.*

Real response time test (CO<sub>2</sub> analyzer)



Performance test incorporates the complete sensor in water checking T66 and T99 response time.

*Note: test with flow-through head (so called underway or FerryBox system) and a water flow of 5 l/min. For subsea sensors in calm water, an external switchable sea water Seabird SBE-5 is provided for comparable high response times.*

