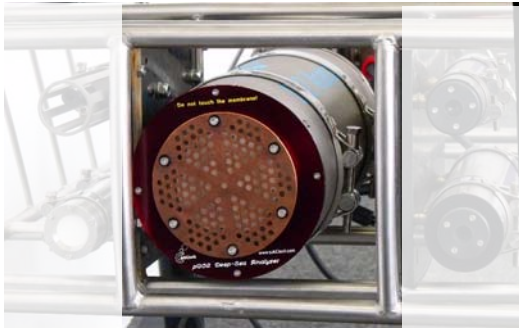


OceanPack™ MK4 SUB

Underwater Laser Gas Analyzer

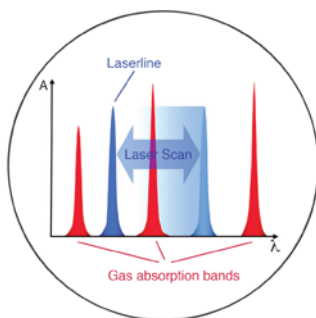


- Offshore Oil+Gas & CCS ^{Note 1)} monitoring
- ROV or AUV integration
- Aquaculture condition monitoring
- Profiling
- Deep-Sea
- Monitoring of biological processes
- Water quality control

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:

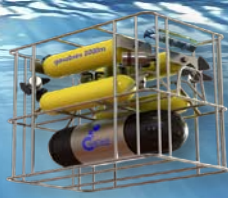
With the long experience SubCtech provides robust, versatile and compact submersible instruments for subsea applications such as Offshore Oil+Gas, CCS or scientific monitoring.

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 equilibrator 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.

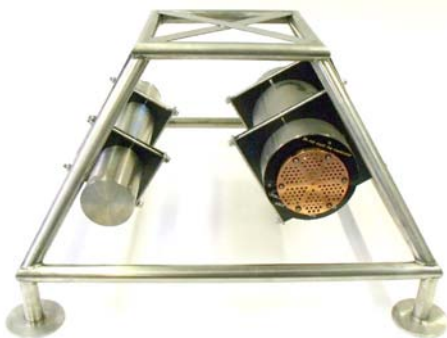
SubCtech GmbH • Wellseedamm 3 • D-24145 Kiel • Germany
T +49 431-22039-880 • F +49 431-22039-881 • www.subctech.com • info@subctech.com





Specification	
Parameter	Carbone dioxide - CO ₂ • Natural gas / Hydrocarbon methane - CH ₄ • Other on request
Sensor Principle	Optical high performance Tuneable Diode Laser Spectrometer (TDLS) • Silicone flat membrane equilibrator cassette (patent pending) • Aging compensated
Range	Standard 0...1000 ppm CO ₂ • 0...100 ppm CH ₄ • high levels up to 300.000 ppm can be measured
Precision	0.4 ppm CH ₄ and NH ₃ • 4ppm CO ₂ ^{Note 2)}
Accuracy	< 1.5% incl. zero & span drift, linearity, repeatability (full scale)
Detection limit	0.4 ppm CH ₄ and NH ₃ • 4ppm CO ₂ • Defined as precision 2σ ^{Note 2)}
Sample Rate	Output rate typ. 1 Hz with optionally average • User configurable • Storage rate configurable
Calibration	Calibration stored internally • User correction supported
Auto Calibration	Automatic testing for offset zeroing on programmed intervals • Zeroing reference included for >1 year operation time • Manual Span gas calibration supported
Temperature	Operating temperature range 0 to +40°C • Optional -30 to +65°C (note: for CH ₄ min. -15°C)
Analogue Out	0...5V or 4...20mA • Range can be adjusted
Data Interface	RS-232 / RS-485 • Data output ASCII NMEA-0183 • Easy integration into existing systems
Memory	Optional: 2GB CF card • Storage capacity approx. 5 years (depending sample rate)
Software	NEW Windows® PC Software OceanView™ 4 for logging and online real-time data • Diagnostic screen
Anti-fouling	Anti-fouling design for the equilibrator sensor head • Automatic quality flagging of the data
Housing	Titanium Φ168mm x 400 mm length (300m) • Approx. 12 kg at air, 2.2 kg in seawater Titanium Φ180mm x 400 mm length (3000m) • Approx. 15 kg at air, 6 kg in seawater
Water depth	Buoy / Shallow water 50m • Estuary 300m • Subsea up to 6000m on request
Power	12...30 VDC • typ. 7-10W • Warming up max. 15W • Optional Li-Ion PowerPack™ Low-power version <5W with Power-Manager-Module for sleep-modes
Service	Recalibration & Service recommended every 12 months • Membrane lifetime up to 10years
Certifications	CE, SoC • Low voltage: 2006/95/EG • EMC compatibility: 2004/108/EG • Laser products: EN/IEC 60825-1 On request: Shock & vibration MIL-STD 810G • Subsea production systems: ISO-13628-6 On request: Production & test: IPC-A-600 class 3, IPC-A-610 class 3, IPC-J-STD

Notes: 2) specification for 10s integration time

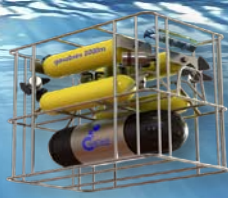


Subsea monitoring frame with Li-Ion battery and OceanPack™ subsea gas analyzer

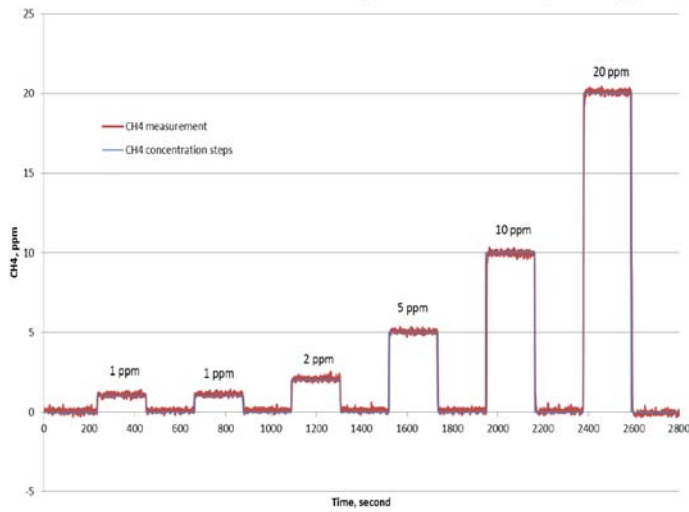


Control panel inside the analyzer with diagnostic signals, adaption for PC monitor and keyboard. Additional connectors are used for external sensors or external signal lights.



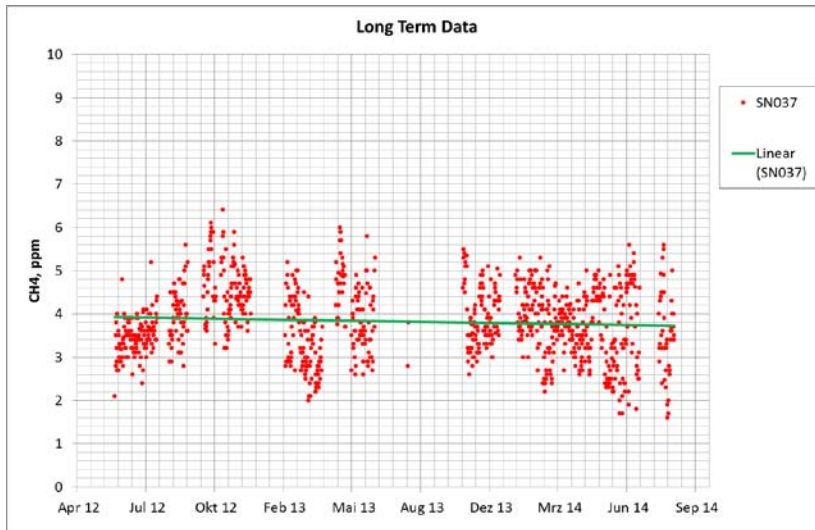


CH4 - 1ppm Concentration steps / 1 - 20ppm



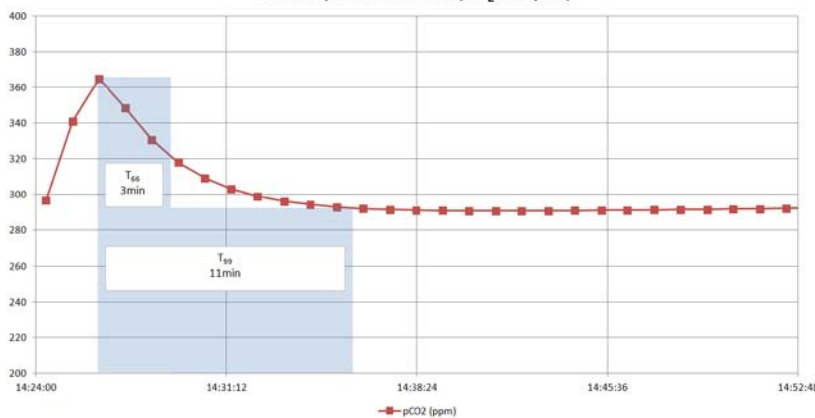
Performance test for low methane gas concentrations between 1 to 20ppm, using industrial gas mixtures.

Long Term Data



Performance test for long time measurements with industrial gas mixtures. The analyzer was not stabilized, no calibration was performed. For temperature stabilized conditions the noise is < 1ppm.

Real response time test (CO₂ analyzer)



Performance test under real water conditions with air bubbles, for T66 and T99 response time. Incorporates the flat membrane equilibrator module.

