



Manual

HydroC™ / CH₄

Sensor for dissolved hydrocarbons, methane (CH₄)

© CONTROS Systems & Solutions GmbH



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Version History

Revision	Date	By	Comment
2.0	12.02.08	SWH	Update for 60mm sensor head, CH ₄ data sheet included
2.1-2.2	18.05.08	SWH, SJM	Membrane change procedure; Temperature stabilization
2.3	06.06.08	SWH	New case
2.4-2.6	18.07.08	SWH	Internal connector changed, updated specs for power etc., new FAQ, calibration and data signal differences explanation
2.7	13.08.08	DE, RB	General Review and update
2.8	09.09.08	SWH	Addition of internal connector picture according to CR standard
2.9	25.09.08	RB	General Review and update
2.10	11.10.08	SWH	Correct Data Protocol example and thermo stab. Graphic
2.11	15.10.08	SWH, CR	Correct pinout internal 8-pol connector
2.12	18.12.08	SWH	SD Card problem
3.0	18.03.09	SWH	New HydroC V3 Family
3.1	05.05.09	SWH	New NMEA ASCII data protocol, removed all binary items. New: DS4 HydroC ASCII Data Set
3.2	28.05.09	SWH, PF	Picture of typ. POM sensor holder
3.3	18.08.09	SWH, CR	Updated data protocol, new TS1 format
3.4	14.09.09	SWH	Temp. from TS1 is used for external DS4 calibration
3.5	06.10.09	SWH, SJ	Installation procedure for Sintermetal / Sealing
3.6	12.11.09	SWH, AL	Format update
3.7	24.11.09	SM, RB	General Update
3.8	12.12.09	SWH	Minor corrections
3.9	27.01.2010	RB	General Update
3.10	12.08.2010	SK, RB	General Update
3.11	15.10.2010	SK, PF, OG	General update, adding of pump issues

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In view of our continual improvement policy, the design and specifications of our products may vary from those illustrated in this brochure.



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1 Getting started

1.1 General information

This document should not be considered to be a replacement for formal training for the user or personnel. CONTROS cannot accept liability for any errors contained herein or consequences arising as a result of such errors. Feedback regarding any errors identified by the reader is appreciated so that immediate correction may be taken.

Corporate policy dictates that CONTROS products are continually evolving. Therefore the content of this document will likewise be updated from time to time without official announcements to that effect.

This manual should not be distributed to any third party without prior approval of CONTROS.

We encourage exchange of information and cooperation! If any queries or problems occur please contact us. To evaluate your concern, we do need as much detailed information as possible, for example:

- Serial number of the HydroC
- Hardware and software configuration of your PC or laptop
- Program version of our software DETECT
- Description of problem(s). When has it occurred? Is it repeatable?
- Data logs if available
- Can the equipment be returned to CONTROS or an authorized dealer if required?

1.1.1 Secondary Documents

All CONTROS manuals are available as PDF downloads from our server and accessible only with a special username and password – we encourage you to contact us for a username and password if you did not receive one at the time of receipt of your Contros system.

1.1.2 Limited Liability Statement

Extreme care should be taken when using or servicing HydroC™ equipment. It should be used or maintained only by personnel with knowledge and training in the use and maintenance of oceanographic and sub-sea offshore electronic equipment.

CONTROS Systems & Solutions GmbH disclaims all product liability risks arising from the use or maintenance of this system. CONTROS has no way to control the use of this equipment or choosing the personnel to operate it and therefore cannot take actions to comply with laws pertaining to product liability, including laws which impose a duty to warn the user of any dangers involved in operating this equipment. Therefore, acceptance of this system by the customer shall be conclusively deemed to include a covenant by the customer to defend, indemnify, and hold CONTROS harmless from all product liability claims arising from these or servicing of the system.

1.1.3 Manufacturer's Warranty

CONTROS™ guarantees that this product complies with the quality and specifications stipulated. We undertake to repair any defect from faulty design, material or workmanship for a period of one year after delivery of the equipment. This guarantee is not extended to underwater connecting cables supplied by CONTROS Systems & Solutions GmbH where breakage or malfunction occurs to the cable during installation or those caused by wear or other external forces. Expendable items, including but not limited to, the membranes, are also excluded from this warranty.



1.2 About CONTROS and HydroC™ Sensor



CONTROS Systems & Solutions GmbH (“CONTROS”) develops produces and markets submersible measuring systems for the determination of hydrocarbons and carbon dioxide in water. These systems are offered in combination with data management systems for risk management applications within the offshore sector, water and waste treatment market and oceanographic research. CONTROS systems are used in many applications such as underwater hydrocarbon and gas measurements, greenhouse gas monitoring, air- sea gas exchange, ocean acidification, carbon capture and storage and

also methane hydrate studies. Moreover CONTROS is involved in subsea oil & gas early leak detection, pipeline inspection as well as subsea oil & gas installation monitoring systems. CONTROS systems have been successfully attached to a wide range of platforms like AUVs, ROVs, floats, landers, water sampling rosette, gliders and buoys. Such systems can be further expanded via data management systems, data pre-processing, on-board data storage, and telemetry and data visualization/presentation to meet customer specific needs.

CONTROS also offers quality management, training courses and sessions, engineering services, ROV pilots, leak detection, water sampling rosette experts and international project management. With this system solution of measuring and data management techniques, CONTROS meets the special needs of the mentioned markets. The after sales service and technical support is a key feature of CONTROS corporate policy and has a significant positive impact on purchase decisions.



Image 1: HydroC™ Titanium Ultra-deep housing for 6000m, with the characteristic silicone membrane (left) and the optional biofouling as well as physical membrane protection (right).



1.2.1 Measuring Principle

CONTROS HydroC™ systems are optical, headspace-based underwater sensors for the measurement of the partial pressure of carbon dioxide, hydrocarbons and methane. Dissolved gas diffuses from the liquid through a patented thin film composite membrane into an internal gas circuit. Therein the concentrations are measured by non-dispersive infrared spectrometry.

The sensors measure in real time via cable or store data to an internal data logger (optional) at different operating depths with a maximum of 6000 m. The standard measuring range is 100nmol/l – 50μmol/l (others available) for dissolved CH₄ (methane). Every HydroC™ is calibrated individually and in situ within a special insulated water tank. Its titanium housing has a cylindrical shape with a diameter of 90 mm and a length of 526 mm. Due to its small size and weight (2.6 kg in water), integration of the instrument into various static as well as moving platforms can be easily achieved. In addition to many other features CONTROS has integrated a sleep mode function in for extended operation when power availability is limited. Energy consumption is one of the major challenges the company is capable to cope with. Moreover a flow head provided by an external pump attached to the sensor has decreased response time to less than 120s. All sensors are plug and play units which come with CONTROS designed software ready to use.

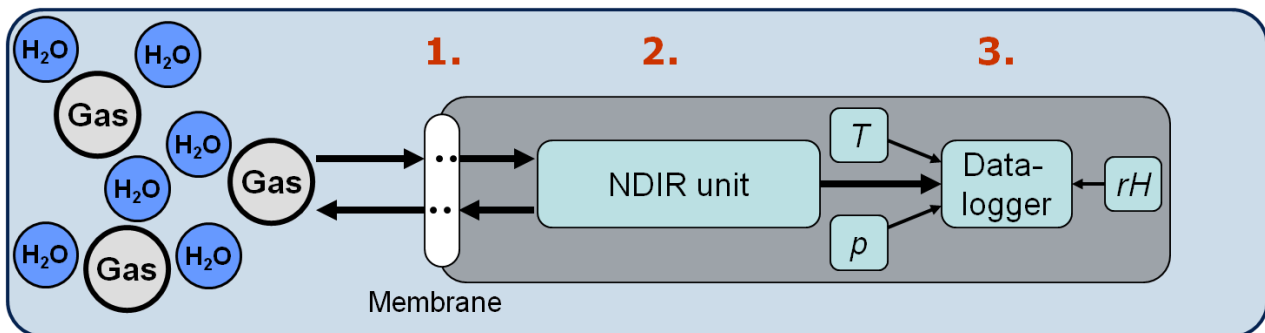


Image 2: HydroC™ function principle

- 1. Dissolved gasses and water vapor pass the hydrophobic membrane**
➤ Equilibration
- 2. Gas concentration measured by non-dispersive infrared spectrometry (NDIR) within a gas circuit**
- 3. Internal Data logger saves xCH₄ along with T, p and RH; optionally the data is transmitted by cable**



1.3 Set Up

1.3.1 Unpack and Check: HydroC™ Standard



Image 3: Packing list HydroC™

List of Parts

1. 1 x HydroC™ sensor with transport protection for the sensor head (yellow cap) and a Subconn dummy connector
2. 3 x Spare membranes
3. 1 x pigtail (0.5m or 5m) with Subconn female plug
4. 1 x CD ROM with documentation and software
5. 1 x Calibration certificate and additional papers (see next page)
6. 1 x Lab-cable with (e.g. RS-232 SubD9) connector and 4mm power “banana” plugs
7. 1 x USB-RS232 Adapter with driver disk (see next page)
8. 1 x Power Source

Optional:

9. SeaBird pump
10. Flow-head



Image 4: Sensor with flow head and SeaBird pump



Documents & Software



Manual & Certificates

USB-to-Serial-Adapter

CONTROS™ DETECT DAQ Software

Manual & Certificates

Sensor manual, DETECT Manual and certifications like calibration sheet, DETECT output file and on-line data transmission protocol.

CONTROS™ DETECT

Software for the visualization of data streams sent by the PC.

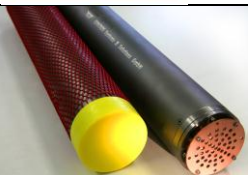
USB-to-Serial-Adapter

To connect your PC via lab cable.



1.3.2 Preparing the Sensor

The following instruction uses the lab cable and the power source. For pigtail use please see **2.2.1 UW Plug Connector** for the adequate pin set-up.

	1. Install the DETECT software on your PC. The software should find the sensor itself after a proper connection of all cables. The Software CD includes the .net Framework and an USB to RS232 driver.
	2. Remove the protection cap (yellow) and check the membrane. There should be no scratches and it should be as clean as possible! Remove dust and dirt by means of compressed air or a gentle stream of water.
	3. Remove the dummy connector (SubConn) and plug in the lab cable (SubConn). 4. Connect the DB9-Plug of the lab cable to a serial port of your PC. If you don't have any serial port, plug in the USB to RS232 adapter and install the driver first.
	5. Provide the sensor with power by using the banana plugs (the black ground first/ red second). Verify that the hardware and external fittings are secure and locked in place. 6. Connect the power source and apply power at least ½ hour (30 min.) before measurement takes place. Use a power supply with enough voltage and current, e.g. 12V DC / 2A. If properly installed you should hear a hum. The sensor is operating.
	7. Start CONTROS DETECT and wait until the sensor is recognized.

A simple reaction test can be made by using methane gas from a cigarette lighter. Let the gas flow against the membrane for a few seconds. The signal should increase sharply within 7 - 10 seconds. Be aware that too long exposures to such high gas concentrations (as those present in the lighter) might drive the detector into saturation, from which state it needs approx. 30 seconds to recover to background values.

- The sensor will only show true methane concentrations in water (not in air) due to the applied calibration procedure ranges.

To obtain a valid measurement, immerse the sensor completely in water for at least 30 min before acquiring data. Note that it is recommended to plug the power source to the HydroC™ system at least 30 minutes before any deployment to enable it to thermally stabilize.

- Opening the sensor without prior consultation and explicit authorization from CONTROS will invalidate the guarantee. (Membrane replacement does not require opening the HydroC™.)



1.4 Important notices / How to handle

- Remove the yellow transport cap on the sensor head before the deployment.
- Please connect the instrument to a suitable power supply (2A @ 12V) as the heater needs some power during warm-up.
- In case of failures / connection problems disconnect and reconnect your USB-RS232 adapter first. Then check if the **USB driver** is properly installed, which you will find on the software CD.
- Check if your PC uses the latest **.net-framework**, which is on the delivered CD as well.
- You need a warm-up time of 10- 30 minutes depending on the environmental conditions and the applied voltage. (Higher water temperature and higher voltages lead to a faster warm-up time)
- But please note that higher voltages increase power consumption.
- Avoid exposing the sensor to extreme temperature gradients during usage; especially if the sensor is not entirely warmed-up.
- After any deployment:
 1. Flush the sensor and the membrane with fresh water.
 2. Clean the sensor housing.
 3. Dry all components before storage. Never store the unit wet or with water (drops) on the membrane. The membrane can be dried by means of a soft tissue but please be careful, since a small hole or any kind of damage to the membrane could cause a flooding of the sensor!
 4. After drying have the instrument running for at least another 30 min with the membrane being in contact with ambient air giving the instrument time to equilibrate to ambient humidity conditions before it is switched off and internally cools down. This reduces the danger for internal condensation if the instrument is exposed to colder temperatures during transport or storage. This is especially important for deployment conditions in which the **water temperature is higher than the air temperature** around the sensor (in lab or on deck).



2 Technical Data

2.1 Specifications

Applications	In-situ measurement of dissolved CH ₄ motivated by: Climate Change Studies; Methane Hydrate Studies; Limnology; Profiling/ Moorings; Offshore Risk Management; Pipeline Inspection and Leak detection
Detector Principle	High-precision optical analysing NDIR system • Maintenance free Dissolved CH ₄ molecules diffuse through a silicone membrane into the patented detector chamber, where their number is determined by means of IR absorption spectrometry. Concentration dependent IR light intensities are converted into output signals.
Dimension/ Weight	90 d x 526 mm corrosion-free titanium/ 5,9 kg (2,6kg in water)
Operation depth	2000, 4000, 6000 m version available
Temperature range	3 ... +30°C (Arctic version: -2 ... +15°C)
Measuring range	100 nmol – 50µmol/l (other ranges available)
Equilibration time	first signal after 12s, T ₆₃ < 2min (with external pump)
Resolution	10 nmol
Accuracy	±3% reading (as the total sum of all the errors)
Calibration	Calibration unit is µmol/l • signal is derived considering internal sensors for pressure, temperature and humidity • Recalibration recommended every 12 months
Drift correction / Features	Dual channel NDIR unit
Connector	Connector SUBCONN® MCBH8-M Titanium 8-pin • Others on request
Power supply/ Consumption (@12 VDC)	Typ. 12 VDC (11 - 24 VDC) (Arctic version: 12 - 24 VDC) • warm- up phase 10- 30min (depending on water temp)/ Appr. 400mA (1300mA during warm- up) + max. 150mA small external pump (option) + max. 700mA big external pump (option)
Data Interface	RS-232C • Data format ASCII NMEA-0183
Software	Windows® Software DETECT™ included (real time data visualization, setting of sensor parameters, download data from internal data logger) • Adaption to user-software
Options	RS-485 • Analogue Output: 0 – 5/10 V (Range / Full-scale can be user-configured) • Internal or external data logger (µSD card/ CF card) • external Battery Pack (e.g. 36 Ah Alkaline) • Build-in water temperature probe for optimized concentration calculation • Ultra Sleep energy saving for long-term monitoring • ROV and AUV adaption packages • Profiling and mooring frames • HydroC™/CO ₂ (and/or CH ₄) FT sensor for underway (FerryBox) and lab applications • biofouling protection • external mounted pump with flow head for faster response time

Version 10/2010



Notes:

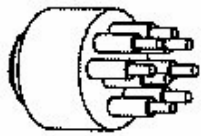
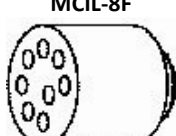
1. **Housing and protection:** Titanium is used as standard and is strongly recommended for all environmental conditions. A protection cap is provided for critical applications, where the membrane could be damaged. An anti-fouling cap can be used for shallow water deployments.
2. **Operational temperatures:** Temperatures below approx. +3°C requires a special thermo stabilization unit with approx. 4W (warm-up: 10W) extra power consumption (→ Arctic version).
3. **Resolution:** Is a fundamental electronic and measurement system value which is not connected to the accuracy. The resolution is not an indicator for the detection range.
4. **Accuracy:** Is the total sum of all the errors and better defined as a relative value.
5. **Response time:** T₆₃ is the time needed to reach 63% of the final equilibration between liquid and gaseous phase.
6. **Calibration:** Is not required after changing the membranes or leaving the sensor in a case for a longer time. A calibration or service is recommended after 12 months of usage.
7. **Power supply:** A thermal stabilization is used in order to get optimized results in case that the surrounding temperature changes. For deep temperatures below +2°C a special thermo stabilization unit is required, which needs approx. 4W of extra power consumption (10W during warming up). When warmed-up, the power consumption decreases to 4W. External Power-Modules can be used for autonomous applications.
8. **Connector:** Any type upon prior request. Additional connectors are supported for more inputs with the optional data logger or for the Power-Module unit to provide power to the sensor.
9. **Analogue output:** The output range can be factory adjusted to fit the user requirements upon request, e.g. to compensate electronically offsets from the wiring or external devices.
10. **Data logger:** Possibility to be configured with extra analogue inputs and can be delivered with any digital configuration / baud rates and ASCII or NMEA-0183 data protocols. Included micro-SD card 2 GB.
11. **Fittings:** Many engineering tools are supported. Please ask CONTROS or any authorized dealer for special adaptations for your application. Standard fittings are supported for ROV / AUV operations, CTD fittings, pipeline fittings or flow-through systems.

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2.2 Connection

2.2.1 UW Plug Connector

HydroC™ Connector		Interface Cable			Lab Connector	
Subconn MCBH-8M		MCIL-8F			Sub-D9 F + 4mm Banana	
						
Function	Pin	Code			Pin	Function
Power 0V	1	Black			A 5	Ground Power, black (banana plug 4mm) Ground
Power 12V (10-30V)	2	White			B	Power +12- 24V, red (banana plug 4mm)
RS232 Tx → Rx PC	3	Red			2	RS232 Tx → Rx PC
RS232 Rx ← Tx PC	4	Green			3	RS232 Rx ← Tx PC
Auxiliary Signal	5	Orange			-	
Auxiliary Ground	6	Blue			-	
CH ₄ Signal 0-5V	7	White/Black	optional	Yellow	Sig+	Banana 4mm Analogue +
CH ₄ Signal Ground	8	Red/Black	optional	Blue	Sig-	Banana 4mm Analogue -

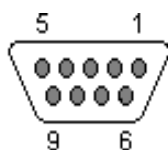
Notes:

Grounding

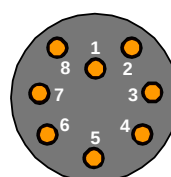
All grounds are connected together inside the sensor
No isolation for any input/ output

RS-232

Connect the RS-232 cable direct 1:1 to the host / PC.



SubD9 – Female at the cable end, front view



male face view
(view on sensor)
SUBCONN® MC BH-8M

The sensor will only show valid results in sea water (not in air) due to the calibration and measurement principle. Valuable results can only be produced if the system is connected in the right way.



3 Maintenance

3.1 Maintenance and Calibration by CONTROS

Whenever a sensor is sent in to CONTROS for re-calibration, a full check of all components is carried out as well. Especially, components which are subject to mechanical wear and which usually have a reduced life expectancy (i.e. pumps) will be checked in greater detail.

A standard maintenance procedure consists of the following steps:

- Change of O-Rings
- Change of micro-pump
- Change of membrane
- Cleaning, if needed, replacement of conducting analytical system
- Cleaning, if needed, replacement of optical system
- Calibration with certificate
- Pressure test with certificate, if desired by the user

3.2 Maintenance by the User

It is not necessary to clean the membrane. Although the membrane surface is quite robust, please be extreme careful to not scratch its surface; it is advised to rinse it or carefully use a gentle flow of compressed air.

To replace the membrane, unscrew the screws to remove the flange. Be careful, because behind the membrane there is a sintered metal plate, which could fall out. *Note: bolts and threads use the metric system.*

If you place the sintered metal plate again into the sensor, make sure that the flat surface faces the back of the membrane and the rough surface the sensor head.

Handle the membrane with care by holding it only by the edge. The membrane should be placed with the shiny surface facing toward the water.

In case of any apparent damage (scratches, puncture) or heavy dirt/fouling replace the membrane immediately. Gouges left by the seal rings are normal, but it is advised to replace the membrane and seal ring whenever the sensor head is dismounted.

After replacing the membrane, tighten the flange screws, tightening opposing screws in a crosswise manner. For better handling, place the sensor upright to facilitate the centering of the membrane and to prevent the metallic support plate from falling out.



3.2.1 Assembling the Sensor Head

The HydroC™ sensor head as displayed in fig.4 consists of six different parts. For maintenance purposes the O-ring and membrane can be replaced.

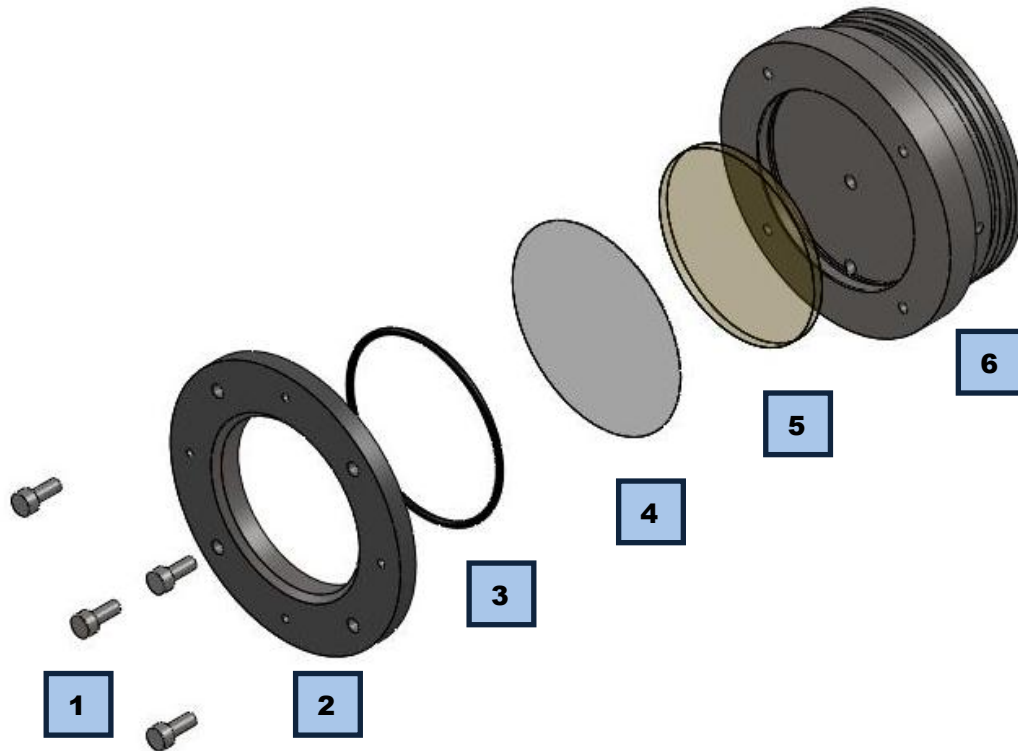


Image 4: Schematic construction of a HydroC™ sensor head

- 1 Screws
- 2 Sensor head clamping ring
- 3 O-ring
- 4 Membrane
- 5 Sinter metal plate
- 6 Sensor head housing

- ➔ Try not to touch the membrane- handle it by holding it only at the edge!
- ➔ Do NOT use any (silicone) grease or oil for lubrication purposes on the O-ring sealing the membrane!
- ➔ It is recommended to replace the membrane before deployment when the sensor has been stored unused for more than a few weeks. The sensor is delivered with a set of 3 spare membranes; this amount should be enough for one year of use.
- ➔ **Any damage to the membrane or the sensor head can lead to a leak - this may cause a total failure of the HydroC™ system.**



3.2.2 Procedure of membrane change



Image 5: The sensor with a new membrane and the 4 mm Allen key.

The protection cap is already removed in the picture above.



Image 6: Remove the clamping ring and O-ring sealing.



Image 7: Place the new membrane on the sinter metal.

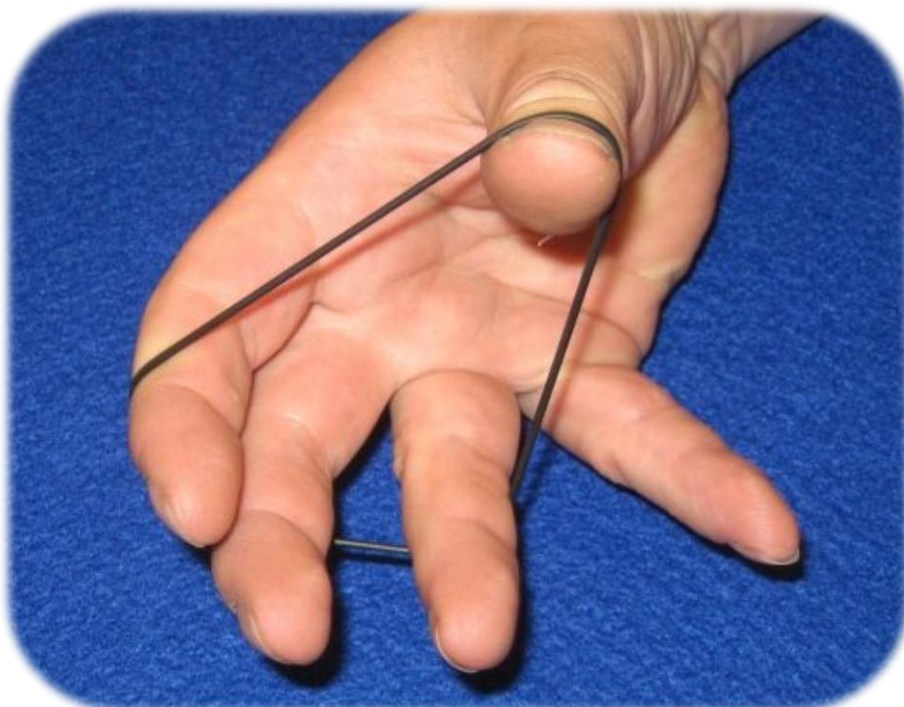


Image 8: To install a new O-ring 56x2 stretch it first.

The O-ring must be stretched first. The unstretched O-ring it is too small to hold the membrane while parts are fixed by the clamping ring. Do not use grease to install it!



Image 9: The now stretched O-ring sealing can be pushed on the membrane to fix it. Do not press on the membrane surface; do not rub over the surface of the membrane. Be sure that the membrane has no folds on it.



Image 10: Place the clamping ring on its place above the membrane pressed by the O-ring sealing. Be sure that everything is properly placed; a constant pressure to the clamping ring is needed; be careful to not scratch the membrane surface with any tool/finger. Tighten the screws clockwise and make a final inspection to check if all screws are fixed.



Image 11: A small gap shows the non-constant pressure on the O-ring sealing. Check the O-ring to be well fitted and try again. Tighten the screws clockwise until they are completely fixed.

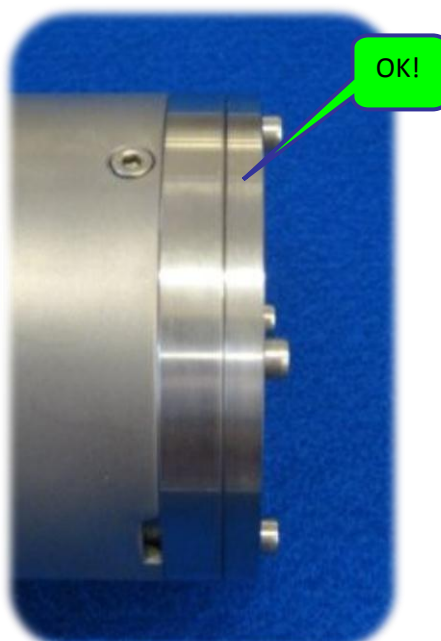


Image 12: Everything seems ok.

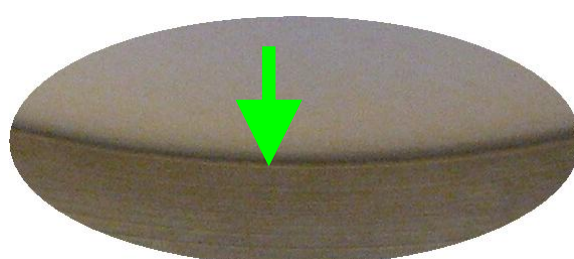
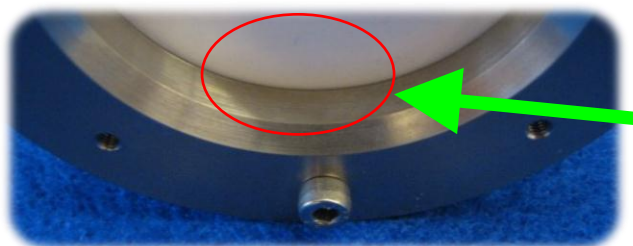


Image 13: Make a final inspection at the front face to check if the O-ring or membrane is not over-pressed or damaged. There should be always a small gap of ~0.2 mm between the retainer flange and the membrane.



4 Operating

4.1 Data logging with CONTROS™ DETECT Software

With the CONTROS DETECT Software (for Windows®) all the HydroC™ sensors can be directly connected over RS-232 or RS-485 (or via USB). As an online viewer, all data are logged and can be processed later with standard tools.

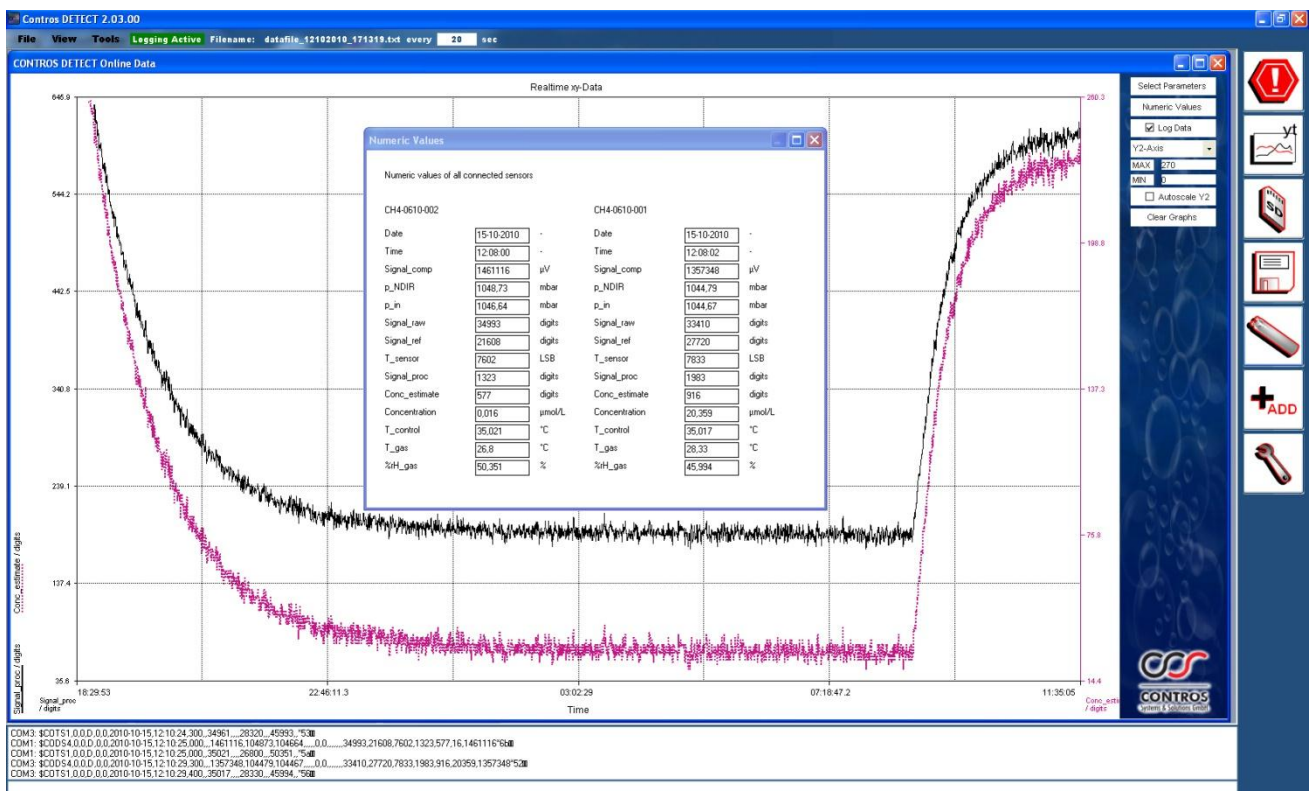


Image 14: Methane signal on the MS-Windows® CONTROS DETECT software package.

- The CONTROS DETECT package supports USB – RS232 converter and virtual COM-ports from COM1 to COM256.
- There is no need to set the configuration for the COM-port; the program will configure everything automatically.



4.2 NMEA Data Protocol

4.2.1 Introduction

The „CONTROS™ NMEA Data Transmission Protocol“ is a bi-directional data protocol for communication between different devices. It is suited for standardized communication, like commands and data transmission and complies with the NMEA-0183 specifications.

Features

- NMEA-0183 compatible protocol
- Length of data string up to 255 Bytes
- All data and parameters separated by commas
- Checksum marked by star *, may be omitted
- Bi-directional: data and commands in both directions
- Information is separated into address, format und data

4.2.2 Online Data Transmission

Live measurement data are auto-transmitted in a certain interval in NMEA-1083 format. See below for an explanation of the sample string.

- HydroC™ probes auto transmit measured data in a definable interval (≥ 1 sec).
- Transmission is according to EIA-232 standard (EIA-485 on demand) with 115200 bps,8,N,1.
- Baudrate is user-selectable.
- Auto transmission can be deactivated for command-driven data request.
- Data are transmitted as NMEA-compliant readable ASCII string.

The following parameters correspond to the standard version of the HydroC™. The Arctic version has an additional temperature value, as explained in the documents accompanying such an instrument.



DS4 (Data)

\$	CODS4,	Dest,	Source,	D,	Format, LDN, ...	(*Checksum)	CR	LF
	1	2	3	4	5...33 (comma separated)			

This Data Format DS4 Format 0 is used by all CONTROS HydroC™ Sensors.

Parameter:

1 Identifier	"CODS4"	
2 Destination	"0", not used	
3 Source	"0", not used	
4 Data	"D"	
5 Format	Not used yet	0 = this data format
6 LDN	Logical Device Nummer	0 = only one device
7 Date	Date YYYY-MM-DD	
8 Time	Time HH:MM:SS	specified in ISO8601:2000
9 MSec	Millisecond, 0..999	resolution of 10ms or 100ms
10	-	
11 Analog 0	-	
12 Signal_comp	Signal used for in-house comparison	(μV)
13 p_NDIR	Gas pressure in the NDIR cell	(mbar x 100)
14 p_in	Gas pressure behind the membrane	(mbar x 100)
15 Analog 4	-	
16 Analog 5	-	
17 Analog 6	-	
18 Analog 7	-	
19 State 1	-	
20 State 2	-	
21	reserved, always empty field	
22	reserved, always empty field	
23	reserved, always empty field	
24	reserved, always empty field	
25	reserved, always empty field	
26	reserved, always empty field	
27 Signal_raw	Raw detector signal	(digits)
28 Signal_ref	Raw reference signal	(digits)
29 T_sensor	Temperature of the NDIR unit	(digits)
30 Signal_proc	Sensor Signal	(digits)
31 Conc_estimate	Fraction of CH ₄ (estimate)	(digits x 10000)
32 Concentration	Concentration of CH ₄ in water	(nmol / l)
33 Signal_comp	Signal used for in-house comparison (repeat)	(μV)



TS1 (Data) Temperature Controller Data

\$	COTS1,	Dest,	Source,	D,	Format,LDN, Date,Time,MSec,Runtime, T-Meas1..4, TH-Temp1..3,TH-RH1..3	(*Checksum)	CR LF
1	2	3	4	5...33 (comma separated)			

Simplified data transfer of the “TempControl” board.

Parameter:

1 Identifier	“COTS1”	
2 Destination	“0”, not used	
3 Source	“0”, not used	
4 Data	“D”	
5 Format	not used yet	0 = this data format
6 LDN	Logical Device Nummer,	0 = only one device connected.
7 Date	Date YYYY-MM-DD	
8 Time	Time HH:MM:SS	specified in ISO8601:2000
9 MSec	Millisecond, 0..999	resolution of 10ms or 100ms
10	-	
11 T_control	Probe temperature for the temperature control	(1/1000 °C)
12	Temperature 2 (optional)	
13	Temperature 3 (optional)	
14	Temperature 4 (optional)	
15 T_gas	Temperature of the gas stream behind the NDIR unit	(1/1000 °C)
16	T/H Sensor: Temperature 2 (optional)	
17	T/H Sensor: Temperature 3 (optional)	
18 %rH_gas	Relative humidity of the gas stream behind the NDIR unit	(1/1000 %RH)
19	T/H Sensor: Humidity 2 (optional)	
20	T/H Sensor: Humidity 3 (optional)	

4.2.3 Commands

Command: CODPV,0,0,R\r\n

Answer: CODPV,0,0,D,0,BOARD-ID,SOFTWARE-ID,HARDWARE-ID,DEVICE-SERIAL\r\n

BOARD-ID: Unique ID-Number of the data collection board

SOFTWARE-ID: Firmware version running on the data collection board

HARDWARE-ID: Hardware version of the data collection board

DEVICE-SERIAL: Unique Serial Number of the device package



5 Trouble shooting

This chapter is made with the support of our clients and partners – your feedback is highly appreciated!

5.1 Communication

5.1.1 No data / communication failure

Problem:

A measurement was started and nothing happens: no curves are displayed; no actual values appear in the signal-legend windows.

The system reports a communication failure with the sensor

Solution:

- Disconnect and connect again an USB-RS232 adapter.
- Check the function of the USB or RS232 COM port in the Windows® "Device Manager"
- Data transmission problem through the RS485/RS232-USB converter: the red LED should flash when the transmission runs. If no transmission happens, the LED is glowing continuously and the sensor gives a signal (voltage output measured at the connector), check for loose connections. Pull out the energy supply cable and connect it after a few seconds. This will reset the sensor.
- Check your baud rate and change the sensors baud rate (it is pre-configured with 115200):
 1. Use DETECT terminal window to **change the baud rate**:
To activate the DETECT terminal window, please go to -->"view" --> "show/hide communication" and type in the line below the string:
COMXX:\$COSCP,0,0,W,19200
(where XX is the com-port number you are currently using)
 2. Use DETECT on another computer.
 3. If not, please try to use another terminal program (e.g. Hercules™) that you can download and type in the following string:
\$COSCP,0,0,W,19200<CR><LF>

5.1.2 Peaks in the data

Possible Problem:

Wrong or loose connector

Solution:

- Try to disconnect and connect again at every connector.
- For internal adapters, please contact CONTROS.



5.2 Hardware problems

5.2.1 Seabird pump does not pump water after turn-on – coupling of magnet and impellor

Please keep in mind that the Seabird pump is an underwater unit and has to be fully submerged in water during usage!

Problem:

Seabird pumps (SBE-5T) sometimes don't start running underwater when they get power.

Cause:

Due to Seabird the pump needs a resistance mainly on the suction side to start correctly.

Effect:

There will be nearly no water exchange in front of the membrane, so the sensor will not deliver reliable readings.

Solution / Advise:

CONTROS is working on a permanent solution. For a short term solutions CONTROS recommends after consultation with Seabird to mount a 20cm long hose of rubber at the suction side of the pump.

Additionally has the outlet of the pump to fit exactly into the flowhead, so that it is sealed. CONTROS recommends the use of heat shrinkable tubing.





5.2.2 SeaBird pump does not pump water after turn-on – air trapped in the pump

Problem:

There can remain air inside the pump, when it is lowered into the water (please see pictures below). This will prevent it from working properly. If the HydroC with pump is already full functionally under water, it can be mounted in every way.



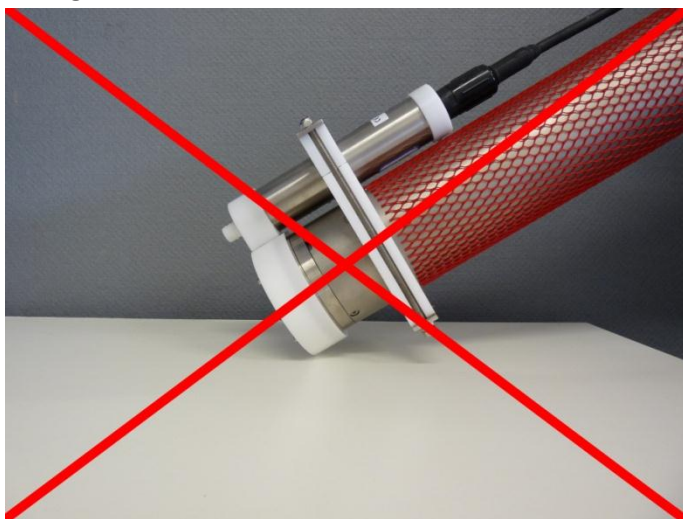
Effect:

There will be nearly no water exchange in front of the membrane, so the sensor will not deliver reliable readings.

Solution/ Advise:

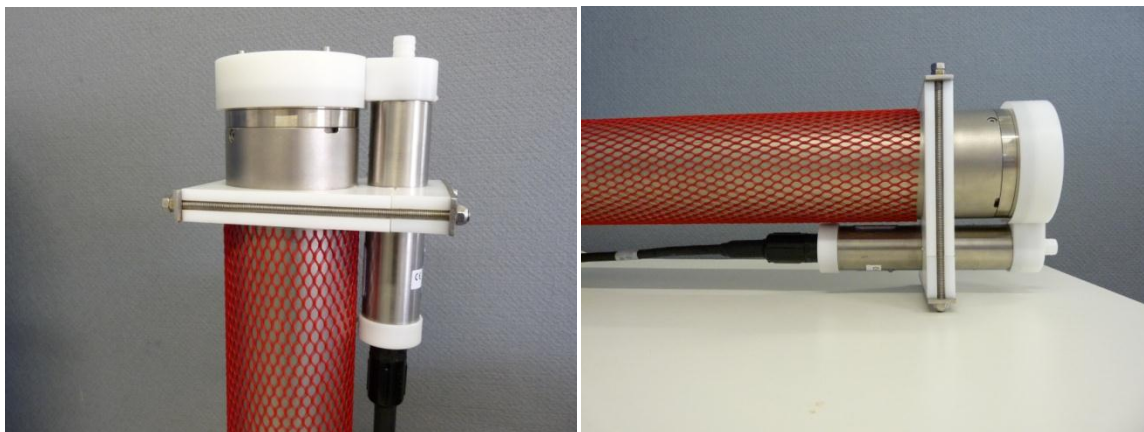
Normally some movements of the pump while lowering it into water will solve the problem. To be sure the pump should be mounted as it is shown in the pictures below.

Wrong:



Inlet and outlet of the pump are pointing down. Air can be trapped inside the pump.

Right:



To avoid the problem it is recommended to mount the sensor vertically or horizontally with the pump below it.



6 Attachments

6.1 Spare Parts

6.1.1 Connector

Connector:	SUBCONN [®] MCBH-8M	male
Cable jack:	SUBCONN [®] MCIL-8F	female pigtail

6.1.2 Sealing Material

O-Ring Membrane:	56 x 2.0 mm	Viton
O-Ring Membrane module lid		

6.1.3 Screws

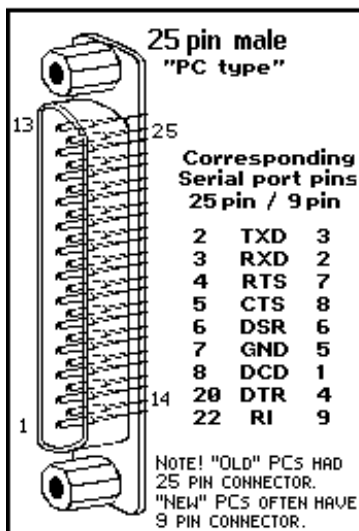
Screw housing	M6 x 6 mm	DIN 912 Ti Gr. 2
Screw Sensor head	M4 x 6 mm	DIN 912 Ti Gr. 2
Protection cap:	M4 x 15 mm	DIN 912 Ti Gr. 2



6.3 Serial Interface

JALKANEN ALBUM - PC TCECF
SERIAL PORT
COM1, COM2
THIS PAGE WAS CREATED USING ALBUM & QUICKPAGE.
ASK FOR THEM, WHEN YOU NEED
PERFECT ELECTRONIC CATALOGUES.
EMAIL: ALBUM@PRESSE.PP.FI

Signal Ground..... GND --- 5
Ring Indicator..... RI IN --- 9
Data Terminal Ready. DTR OUT --- 4
Clear To Send..... CTS IN --- 8
Transmit Data..... TXD OUT --- 3
Request To Send..... RTS OUT --- 7
Receive Data..... RXD IN --- 2
Data Set Ready..... DSR IN --- 6
Carrier Detect..... DCD IN --- 1

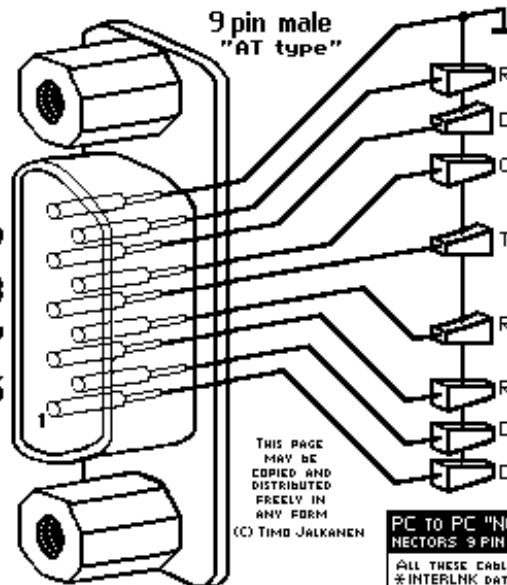


MODEM TO PC "STRAIGHT-THROUGH" CABLES					
25 PIN MALE	2-2	25 PIN FEMALE	2-3	9 PIN FEMALE	3-2
FOR PC	3-3	FOR PC	3-2	FOR PC	4-7
MODEM CON-NECTION	4-4	MODEM CON-NECTION	4-7	MODEM CON-NECTION	5-8
(DTE)	5-5	(DTE)	5-8	(DTE)	6-6
	6-6		6-6		7-5
	7-7		7-5		8-1
	8-8		8-1		20-4
	20-20		20-4		22-9
	22-22		22-9		

DTE = DATA TERMINAL (OR TERMINATING) EQUIPMENT
DCE = DATA COMMUNICATION (OR CIRCUIT TERMINATING) EQUIPMENT

NOTE! IN MODEMS YOU ALWAYS HAVE A 25 PIN FEMALE CONNECTOR, COMPATIBLE TO "STRAIGHT-THROUGH" CABLES ABOVE.

COM1:
I/O ADDRESS 3F8H-3FFH
INTERRUPT IRQ4
COM2:
I/O ADDRESS 2F8H-2FFH
INTERRUPT IRQ3

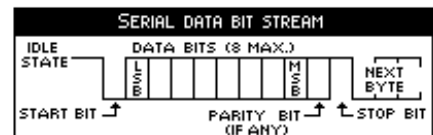


PRACTICAL SIGNAL DESCRIPTION

- ▲ "RING INDICATOR" INDICATES THAT MODEM DETECTED RINGING SIGNAL
- !! "DATA TERMINAL READY" TELLS TO MODEM THAT PC IS "READY"
- ?? "CLEAR TO SEND" INDICATES THAT MODEM IS READY TO RECEIVE DATA FROM PC
- ⬇ "TRANSMIT DATA" IS SERIAL BIT STREAM TO MODEM
- !! "REQUEST TO SEND" TELLS TO MODEM THAT PC WANTS TO SEND DATA (OR THAT PC IS "READY")
- ⬆ "RECEIVE DATA" IS SERIAL BIT STREAM FROM MODEM
- ?? "DATA SET READY" INDICATES THAT MODEM IS "READY"
- ?? "DATA CARRIER DETECT" INDICATES THAT MODEM HAS PROPER REMOTE CONNECTION

PC TO PC "NULL-MODEM" CABLES (ALL THE CONNECTORS 9 PIN FEMALE)		3 WIRE (WITH LOOP-BACKS)	
ALL THESE CABLES WORK WITH *INTERLNK DATA TRANSFER		DCD 1	1 DCD
7 WIRE (WITH HANDSHAKING)		RXD 2	2 RXD
DCD 1	1 DCD	TXD 3	3 TXD
RXD 2	2 RXD	DTR 4	4 DTR
TXD 3	3 TXD	DSR 6	6 DSR
DTR 4	4 DTR	CTS 8	8 CTS
GND 5	5 GND		
DSR 6	6 DSR	3 WIRE (MINIMUM LINKS)	
RTS 7	7 RTS	RXD 2	2 RXD
CTS 8	8 CTS	TXD 3	3 TXD
RI 9	9 RI	GND 5	5 GND

*INTERLNK/INTERIOR IS PC TO PC DATA TRANSFER FEATURE OF MICROSOFT DOS 6.0 OR GREATER.



From: www.tec.sci.fi/tecref



6.4 CE Certificate



Konformitätserklärung Declaration of Conformity



gemäß DIN 45014 und ISO/IEC Leitfaden 22
in accordance with DIN 45014 and ISO/IEC guide 22

Die Firma: **CONTROS Systems & Solutions GmbH**
The company: **Wischhofstr. 1-3 Bld.: 2**
24148 Kiel

Erklärt, dass das Produkt: **HydroC™ / CH₄**
declares that the product: **HydroC™ / CH₄**

Verwendungszweck: **Methan Sonde für Seewasser und Offshore**
Product description: **Methane probe for seawater and offshore**

den folgenden Richtlinien der Europäischen Union entspricht
complies with the following EC guidelines

73/23 EWG Niederspannungsrichtlinie
73/23 EEC Low voltage directive

89/336 EWG EMV-Richtlinie
89/336 EEC EMC directive

Das Gerät erfüllt im Einzelnen die folgenden Normen
The instrument meets the requirements of the following norms

DIN EN 55022
DIN EN 55024

Kiel, 25.06.2010



Daniel Esser, CEO