IDRONAUT OCEAN SEVEN 319 CTD PROBE

WITH REDUNDANT SENSOR CAPABILITY

The OCEAN SEVEN 319 multiparameter CTD probe, is the result of Idronaut's 20 years experience in the design and manufacture of high quality fast response marine instrumentation. The modular electronic design and probe mounting system facilitate the installation of an additional redundant sensor pair without the need for underwater connectors. The redundant sensors permit the gathering of extremely precise data with a verifiable data quality. Small size and "contained" measurement field allow verification of the calibration of the CT pairs with two ampoules of standard seawater. Although the 319 probe does not require pumps, water may be pumped through the whole sensor array if the optional transparent flow cell is installed. Data are output in a standard RS232 format, with ASK/FSK telemetry options available for on-line full ocean depth data gathering. The Ocean Seven 319 multiparameter probe can also optionally accommodate up to a maximum of 32 sensor channels, including 2 digital channels, which can if required be added retrospectively, making this Idronaut probe an investment for the future.

❑ **TEMPERATURE SENSOR**
Features a very fast platinum resistance thermometer (time constant: 50 ms).
Negligible self-heating effect.

❑ **FLOW CONDUCTIVITY SENSOR**
Features a large diameter, seven-ring quartz cell which does not require platinum black deposition and which can be cleaned without re-calibrating. No external pump is necessary even for high accuracy measurements.

❑ **OPTIONAL REDUNDANT PAIR OF TEMPERATURE AND CONDUCTIVITY SENSORS** More reliable operation at sea minimizing risk of data loss.

❑ **OPTIONAL SALINITY FIELD CALIBRATION CAPABILITY**
Once the calibration of the thermometer has been determined, then conductivity may be cross calibrated by using two ampoules of standard seawater. An Idronaut designed field calibration transparent cell supplied with a magnetic stirrer, permits checking of the conductivity calibration at a fixed salinity and several different temperatures. For a system with the optional redundant sensor pair, both sensor pairs may be immersed in the calibration transparent cell simultaneously.

❑ **OXYGEN SENSOR**
Features an innovative pressure-compensated polarographic sensor, with a replaceable cap for membrane support. Because stirring effects are negligible, no external pump is necessary.

❑ **pH GLASS SENSOR (7000 m operation)**
High-pressure glass membrane pH electrode in conjunction with a ceramic junction-less reference electrode and a differential amplifier system.

❑ **DATA TRANSMISSION**
Via RS232C interface and long distance FSK (10000 m) telemetry systems.

❑ **INTERNAL MEMORY**
Permits storage of up to 56000 data sets, for each of the CTD acquired parameters together with date & time.

❑ **DIMENSIONS AND WEIGHT**
75 mm diameter x 685 mm length; 4 kg in air (1500 m depth housing).

❑ **OPTIONAL PROBES**
The following sensors, probes and measurement systems have currently been interfaced:

- ☐ GENERAL OCEANICS - Rosettes mod. 1014,1016 and 1015.
- ☐ IDRONAUT - Oxygen, pH and Redox Sensors.
- ☐ WET Labs - ac-9 Dual Path Absorption and Attenuation Meter.
- ☐ WET Labs - SAF-16-25 SAFire Spectral Fluorescence Instrument.
- ☐ WET Labs - WETStar Miniature Fluorometer.
- ☐ SEA TECH - Fluorometer and Transmissometer.
- ☐ SEAPOINT - Fluorometer and Turbidity Meter.
- ☐ D & A INSTRUMENT COMPANY - OBS-3B Sensor.
- ☐ CHELSEA - Minitracka Fluorometer.
- ☐ BIOSPHERICAL INSTRUMENTS - Quantum Scalar PAR Sensor QSP-200L.
- ☐ NE SENSORTEC - UCM 60 DL - Current Meter.
- ☐ SATLANTIC - Ocean Colour Radiometer System.
- ☐ DATASONIC - Altimeter mod. PSA-900 / PSA-916.
- ☐ BENTHOS - Altimeter mod. 2110.
- ☐ IDRONAUT - Bottom switch.

TECHNOLOGY IN SEARCH OF NEW DEPTHS

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❑ **BATTERY OPERATION**
Internal or external submersible battery packs permit continuous probe operation, for 20 or 100 hours respectively. Moreover, the internal battery pack can be used as a backup energy system whenever the probe operates in the real-time data acquisition mode. This feature minimizes the micro-interruption of telemetry due to problems with slip rings and/or cable terminations thus avoiding spikes during real-time data acquisition. The internal battery pack consists of 10 (ten) batteries: 1.5 V, 1.8 A/h, type AA cells which allow continuous probe operation for about 20 hours.

All the measurement sensors installed in the OCEAN SEVEN 319 Probe (see table for SENSOR SPECIFICATIONS) are manufactured by IDRONAUT and are exported all over the world. They are used by several other multiparameter probe manufacturers. All sensors have extremely low time constants: 50 milliseconds for physical parameters (CTD) at 1 m/s profiling speed and 3 seconds for chemical parameters. A high-precision resistor acts as a reference for the accuracy of the sensor electronic amplifiers which are temperature-compensated. There are no trimpot adjustments inside the probe.

The OCEAN SEVEN 319 is controlled by the internal advanced electronics (32-bit MCU) and can measure, store and transmit sensor data by various different methods, the most significant of these are:

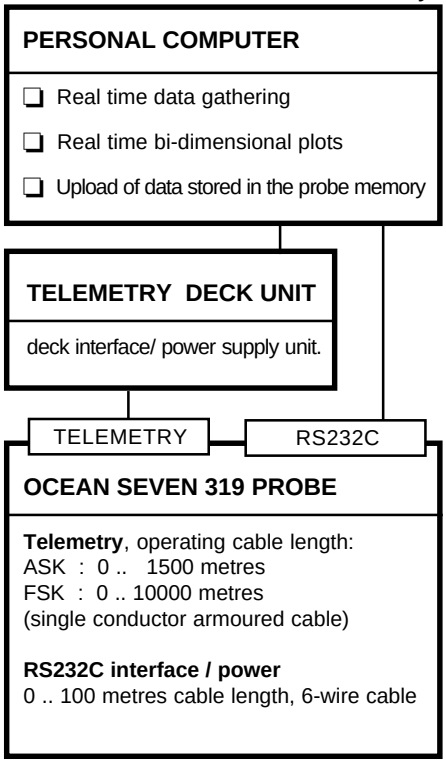
- Real time data acquisition.
- Unattended data acquisition as a function of time.
- Unattended data acquisition as a function of incremental depth.

The unattended acquisition can be activated by means of a magnetic switch. Acquired data is uploaded at the end of the measuring cycles. Extension of the internal battery life is obtained through an automatic power management procedure that switches the probe OFF between data acquisitions. The internal battery pack allows continuous probe operation for about 20 hours.Rechargeable or lithium batteries can also be used. The probe is equipped with an internal non volatile SRAM able to store up to a maximum of 56000 data sets, each data set being composed of date, time and measurement of the standard sensors. The probe can also integrate data from third-party sensors and perform data acquisition of up to 16 analog channels in less than 50 ms.

The OCEAN SEVEN 319 Probe can be configured to be directly interfaced to a personal computer by means of the RS232C serial port or by telemetry. The telemetry interface remedies the limitations of the RS232C serial interface (cable length and number of conductors). When using the FSK telemetry interface, the Portable Deck Unit is required to convert serial, RS232C type signals from a PC communication port, into telemetry signals (and vice versa) which must flow superimposed on the probe power supply along the armoured single conductor coaxial probe support cable.
Probe communication is achieved through one of the two male connectors installed on the top end cap of the probe. A six-pole connector is used for the RS232C interface and for the auxiliary power input, while, a two-pole connector is used for the telemetry interface and probe primary power.

IDRONAUT REDAS Windows Software

The REDAS (REmote DAta Software) software has been designed for real-time acquisition and graphics. It is a true Windows software, allowing changing of the graph parameters, printing of the current plot, display and print-out of sample information during acquisition. It automatically manages the beginning and end of a cast, bottle sampling, the selected alarms and the acquisition of cruise information through a geographical positioning system (GPS). The user can manage probe deployment without needing to trigger the acquisition software at the same time. During a cast, other users can look at the plots, print them or define the sampling depths in advance. Acquisition stops automatically when the probe is on board. The REDAS software allows the operator to set-up the probe before carrying out unattended data acquisition and to retrieve data stored in the probe internal memory once the probe is on board.



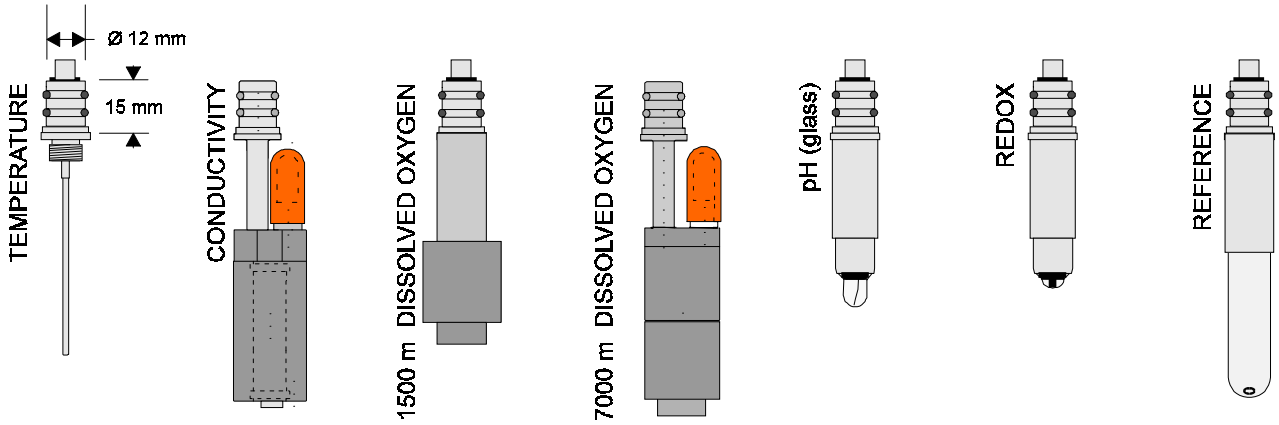
PROBE INTERFACING

OCEAN SEVEN 319 Telemetry Systems Performance Chart

Telemetry Type	Max cable length		Max transfer rate	
RS232C	10	metres	38400	bps
RS232C	50	metres	19200	bps
RS232C	100	metres	9600	bps
FSK	1500	metres	38400	bps
FSK	3000	metres	19200	bps
FSK	6000	metres	9600	bps
FSK	10000	metres	4800	bps

The above performances are obtained using the 6.4 mm diameter (1/4 inch) Rochester cable 1-H-255 which has an electrical resistance of 23 Ω/km and a capacity of 138 pF/m.

The Ocean Seven 319 Probe operates with the standard Rochester coaxial armoured cables (1/10, 1/8, 1/4, 1/2 inch) installed in oceanographic vessels and with sea cable having a total resistance 0 to 250 ohms.



IDRONAUT SENSORS

SENSOR SPECIFICATIONS

	Range	*Accuracy*	*Resolution*	*Time Constant*	
Pressure	0.. 7000 dbar[1]	0.05% full scale	0.03%	15 ms	
Temperature 1	-3.. +50 °C	0.003 °C	0.0005 °C	50 ms	
Conductivity 2	0.. 64 mS/cm	0.003 mS/cm	0.001 mS/cm	50 ms	(at 1 m/second flow rate)
Temperature 2[2]	-3.. +50 °C	0.003 °C	0.0005 °C	50 ms	
Conductivity 2[2]	0.. 64 mS/cm	0.003 mS/cm	0.001 mS/cm	50 ms	(at 1 m/second flow rate)
Oxygen	0.. 50 ppm	0.1 ppm	0.01 ppm	3 s	(in air)
	0.. 500 % sat.	1% sat.	0.1% sat.	3 s	
pH	0.. 14 pH	0.01 pH	0.001 pH	3 s	
Redox	-1000..+1000 mV	1 mV	0.1 mV	3 s	
Auxiliary inputs	0.. 5000 mV	0.5 mV	0.076 mV	50 ms	(6 auxiliary analogue inputs)

(1) other standard pressure transducers, immediately available, have: 10, 40, 100, 200, 500, 1000, 2000, 4000 dbar ranges.
(2) Optional.

The calculated parameters are:
SALINITY, SOUND SPEED, SEA WATER DENSITY (Sigma), PRESSURE TO DEPTH CONVERSION, POTENTIAL TEMPERATURE (Theta); according to: UNESCO 1983, "Algorithms for computation of fundamental properties of sea water".

ELECTRONIC SPECIFICATIONS

Sampling frequency:	20 Hz raw data.
Real time data output rate:	5 samples per second (derived variables), up to 10 Hz using REDAS software and fast binary communications.
Communication protocol:	proprietary byte-oriented message protocol.
Operator interface:	friendly menu-driven user interface.
Data memory:	1 Mbyte non volatile CMOS memory (data retention > 10 years).
Firmware memory:	256 Kbyte 5V flash memory, built-in automatic updating function allows easy, non intrusive, firmware upgrading.
A/D Converter:	16 bit 76 mV/bit successive approximation with built-in autocalibration capabilities.
Analogue inputs:	32 multiplexed analogue input channels allow interfacing of additional sensors.
Battery power supply:	9 .. 18 V, 95 mA @ 12 V.

Physical characteristics for		*1500 dbar*	*1500 dbar*	*4000 dbar*	*7000 dbar*
Dimensions:	housing diameter:	100 mm	75 mm	89 mm	89 mm
	total length:	710 mm	685 mm	685 mm	710 mm
Weight:	in air:	4,7 kg	4 kg	9 kg	7,5 kg
	in water:	1 kg	1,8 kg	6 kg	4,5 kg
Materials:		white POM	AISI 316L	black POM/AISI 316L	TITANIUM GR 5

Diameter of protective cage/s: 260 mm, titanium
Cable connectors: 2-pole connector (Brantner **SEACON**® RMG-2-FS) for telemetry output;
6-pole connector (Brantner **SEACON**® RMG-6-FS) for RS232C output and auxiliary power input.

ACCESSORIES

❑ **TELEMETRY DECK UNITS**
The telemetry deck units power and interface, by cables up to 10000 metres long , the Ocean Seven 319 Probe with a Personal Computer RS232C. The deck units are equipped with a transceiver (modem) which allows half duplex communication with the probe. Power supply:
115 or 230 V AC +/- 10%, 47/63 Hz.

Portable Deck Unit
Housed in a waterproof plastic case, it is provided with an internal mains rechargeable lead battery (12V DC, 7 A/h) which permits probe operation even in the absence of the mains supply.
The battery guarantees up to 20 hours of continuous operation.
Telemetry power supply: 30V DC (generating 12 V DC at up to approx 300 mA in the underwater unit).
Dimensions: 340 x 300 x 160 mm. Weight: 6.5 kg.

MK Deck Unit
This is a 19" rack-mountable deck unit designed for on-board operation. It provides a high voltage telemetry power supply (220 V DC) to allow the CTD probe to interface and power several additional probes driving up to 1 A (15V DC).
Telemetry power supply: 220V DC (generating 15 V DC at up to approx 1 A in the underwater unit).
Dimensions: 480 x 160 x 90 mm. Weight: 3.3 kg.

❑ **MANUAL PORTABLE WINCH**. Includes slip-ring and up to 180 metres of 7 mm polyurethane armoured cable or 300 metres of 5 mm or 2.56 mm polyurethane armoured cable

❑ **COAXIAL ARMOURED CABLE - Ø 2,56 mm - STEEL**
Non-jacketed coaxial armoured cable type Rochester 1-H-100A, diameter: 2,56 mm - breaking strength: 450 kg - working load: 180 kg - weight per km: 28 kg.

❑ **COAXIAL ARMOURED CABLE - Ø 5 mm - POLYURETHANE**
A strain relieved 5 mm polyurethane jacketed armoured cable type Idronaut - breaking strength: 200 kg - weight per km: 40 kg.

❑ **COAXIAL ARMOURED CABLE - Ø 7 mm - POLYURETHANE**
A strain relieved 7 mm polyurethane jacketed armoured cable type Idronaut - breaking strength: 350 kg - weight per km: 65 kg.

❑ **STRAIN RELIEF CABLE CONNECTING KIT.** Composed of waterproof connector, deck unit connector, quick-connector system for the probe.

OPTIONS

❑ **REDUNDANT PAIR OF TEMPERATURE AND CONDUCTIVITY SENSORS**
More reliable operation at sea minimizing the risk of data loss. The redundancy principle allows better control of sensor drift during long field operations.

❑ **TELEMETRY OUTPUT**, in addition to the RS232C output. Real time data transmission to the Portable Deck Unit. Up to 5 sets of data per second can be transferred.

❑ **TITANIUM GR5 HOUSING** for 7000 m operation.

❑ **TRANSPARENT FLOW CELL**
Easily connectable to a pumped source of seawater (water volume 200÷300 ml) this option converts the Ocean Seven 319 Probe from a profiling CTD to a very accurate on-board thermosalinograph.

❑ **EXTERNAL SUBMERSIBLE BATTERY PACKS**
The following battery packs are available:
- External battery pack (Ø34 x 600 mm), 15V (no. 10 C cells), 8 Ah, 1500 m max depth operation.
- External battery pack (Ø100 x 440 mm),15V (no. 10 D cells), 18 Ah, 7000 m max depth operation.

The external battery pack is fixed to the probe by means of two POM flanges.

MS-DOS SOFTWARE, IN ADDITION TO THE WINDOWS ONE

❑ **SOFTWARE FOR DATA TRANSFER AND MANAGEMENT**
The IDRODAC software allows display, printing and recovering of data received from the probe. It controls manual, linear and timed profiles. Data can be displayed on the PC and exported in ASCII format.

❑ **REAL-TIME GRAPHIC SOFTWARE**
This software is an extension of the above package and allows creation of real-time bi-dimensional plots of up to six parameters versus depth or time.

❑ **GENERAL OCEANICS ROSETTE INTERFACE**
This option enables the user to interface and manage General Oceanics Rosettes mod. 1014, 1016 and 1015 (Tone or Voltage Firing) in order to perform attended and unattended bottle firing in function of time and/or depth variations. The latter is obtained through user's configurable depth profiles or depth steps. Futhermore, bottle firing can be accomplished in real-time whenever the probe operates with the telemetry system.

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