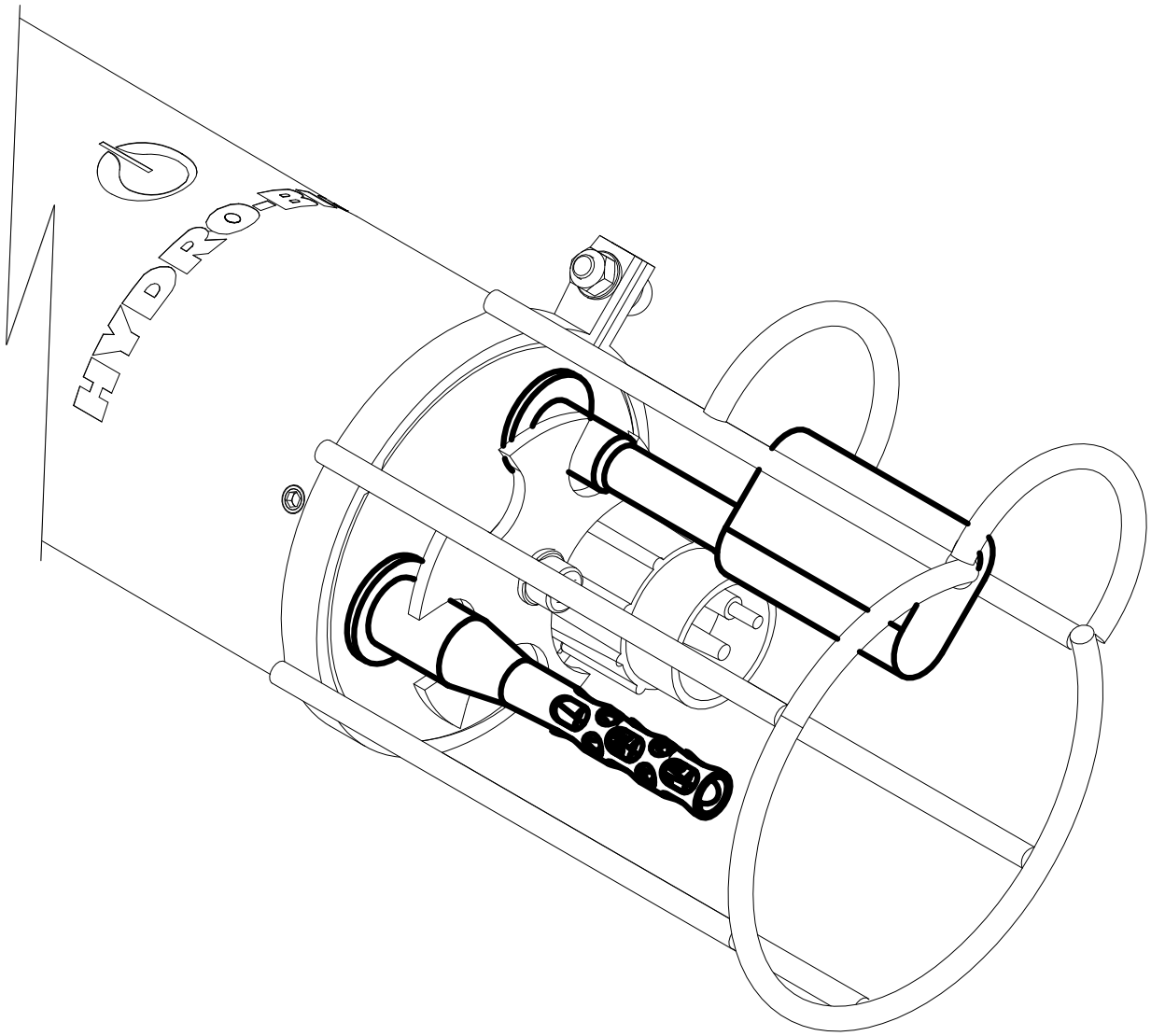


CT-SET

OPERATION MANUAL

Product ID 450 510

Edition 9/26

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NOTICE



Please read this manual carefully before operating or performing maintenance on the instrument. Pay special attention to all danger, warning and caution statements. Failure to do so could result in serious injury and/or damage to the instrument. Keep manual available at all times.

LAYOUT AND MEANING OF WARNINGS

All safety instructions found in this operation manual are composed in accordance with the following pattern (signal words):

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.
NOTICE may also indicate a situation which, if not avoided, may cause damage to equipment.

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GENERAL DESCRIPTION

The **CT-Set** enables full capability of an oceanographic multi parameter probe.

It consists of one conductivity sensor, one temperature sensor and an additional electronics board which are integrated into the motor unit. Together with the pressure sensor of the motor unit the CT-Set delivers precise standard parameters for oceanographic measurements of physical values.

The electronics board is the basis to connect up to two sensors for other physical, chemical and optical parameters (sold separately).

Long-term stability in combination with high accuracy 24 bit A/D converters and a wide range of options makes the CT-Set the ideal basis for an integrated sampling and measuring system.

The measuring data of the CT-Set are completely integrated into the Command Unit and the data acquisition software OceanLab. From the CTD data OceanLab computes salinity, density and sound velocity according to UNESCO formulae.

STANDARD EQUIPMENT

1. 1 Conductivity sensor, mounted to the back lid of the motor unit
2. 1 Temperature sensor, mounted to the back lid of the motor unit
3. 1 Electronics board, integrated into the motor unit
4. 2 Spare O-rings 16 x 1.5 for sensor flange
5. 1 Protecting cage, mounted to the back lid of the motor unit
6. 1 Operation manual

TECHNICAL DATA

Conductivity sensor:

Measuring principle:	7-pole electrode cell
Response time:	approx. 150 msec. at a flow rate of 0.5 m/sec.
Maximum pressure:	6000 dbar
Salt water variant	
Range:	0 … 65 mS/cm
Initial accuracy:	± 0.007 mS/cm
Resolution:	0.001 mS/cm
Extended salt water variant	
Range:	0 … 70 mS/cm
Initial accuracy:	± 0.007 mS/cm
Resolution:	0.0015 mS/cm
Fresh water variant	
Range:	0 … 1 mS/cm
Initial accuracy:	± 0.005 mS/cm
Resolution:	0.00005 mS/cm

The conductivity sensor consists of a quartz glass cylinder with 7 platinum coated electrodes. The cell is constructed symmetrically. The central electrode is used as supply input (alternating current of 1 kHz) and both outer electrodes are used as return leads. The electrical field in a homogenous medium is symmetrically divided at both half cells. The respective inner pair of electrodes of each half cell measures the voltage drop.

Temperature sensor:

Measuring principle:	PT 100
Range:	-2° C … +40° C
Initial accuracy:	± 0.004° C
Resolution:	0.0007° C
Response time:	approx. 150 msec.
Maximum pressure:	6000 dbar

The temperature sensor is a platinum resistor PT 100 in a tiny ceramic carrier of 15 mm length and 0.9 mm diameter. It is fitted in a slender titanium tube of 1.2 mm diameter and a length of approx. 30 mm. The small diameter enables a very quick response time. The tip is surrounded by a perforated titanium shield tube which is mounted to the back flange of the motor unit.

NOTICE

The temperature sensor is extremely sensitive to any kind of mechanical stress.

The platinum resistor is connected in 4-wire technique.

NOTICE

The pressure rating for both sensors is 6000 dbar. However, the maximum permitted deployment depth for any instrument is determined by the lowest pressure rating of **all** components of the instrument to be deployed.

Power supply:

No extra power supply required. The CT-Set is powered by the motor unit's battery.

The CT-Set requires around 110 mW of power, tripling the power consumption of the base motor unit. E.g. a base MultiNet without CT-Set lasts 100 to 200 hours on a battery charge, while a MultiNet with CT-Set will last 33 to 66 hours.

MAINTENANCE

The best maintenance for the CT-Set is to handle it with care. Despite its sturdy construction and protection cage, extreme shocks should be avoided. Apart from that there are only few maintenance rules to be observed ensuring a long life-span and precise measuring data.

To avoid corrosion and salt incrustation the complete sampler / net, with special care for the motor unit and the sensors, should be thoroughly rinsed with fresh water after use.

CONDUCTIVITY SENSOR

The conductivity sensor is **not** maintenance free. A regular inspection for plant cover and electrolytic calcification is required because both effects influence the accuracy of the sensor.

Calcareous deposits originating from electrical current flow inside the sensor are easily removed when the cell is immersed in diluted acetic acid (10 %) for approx. 20 minutes. The quantity of rising CO_2-bubbles gives information on the rate of calcification. The sensor is completely decalcified when the bubble formation has ceased. Heavier incrustation may require a longer immersion. Afterwards the sensor has to be thoroughly rinsed with fresh water. After cleaning the sensor with diluted acid an increased conductivity reading may occur which will normalize within one hour. Depending on the operating durations and conditions this procedure has to be carried out every few months.

NOTICE

Particular care has to be taken that the metal components on the electrode surfaces are not scratched nor must they come in contact with any metals.

TEMPERATURE SENSOR

The temperature sensor is maintenance free. Dirt and plant cover will prolong response time but have no effect on the precision. When cleaning the sensor take special care of the sensitive tip inside the shield tube which must not be bent.

REPLACEMENT OF SENSORS

The C and T sensors generally do not have to be unmounted, unless they are to be replaced or during fault finding. They can be unmounted as follows:

1. Unscrew the central hexagon socket screw M 6 from the back lid of the motor unit and remove the fixing disc (tool: hexagon socket screw key 5 mm).
2. Carefully remove the respective sensor while gently turning it out of its fitting in the lid of the motor unit.
3. Take off the electrical tape and disconnect the plug contacts, being careful to minimize strain on the connector.
4. Make sure that the boring for the sensor inside the back lid of the motor unit is clean and undamaged.

> **NOTICE**
>
> If necessary use a lint-free cloth for cleaning.

5. Make sure that the O-rings of the new sensor are clean and uninjured.
6. Slightly grease the O-rings of the sensor with O-ring lubricant.
7. Connect the sensor to the plug contacts.
8. Carefully press the sensor into its boring inside the back lid of the motor unit.
9. Remount fixing disc and hexagon socket screw M 6 (tool: hexagon socket screw key 5 mm).

CALIBRATION

The CT-Set comes factory calibrated with the calibration data stored inside the motor unit. To read calibration data and raw data of the CT-Set from the motor unit use the CONTROLLING MODE inside the software OceanLab.

Recalibration, especially for the conductivity sensor, is recommended every one to two years depending on the use case and accuracy requirements. This can be done at HYDRO-BIOS or at any other calibration facility. In the latter case refer to the formulae shown in the OceanLab controlling mode on how calibration coefficients and the calculated conductivity and temperature values are related to each other.

It is recommended that the sensors be calibrated annually. In particular this should be done before each important deployment and whenever measured values seem to deviate significantly from your expectations.