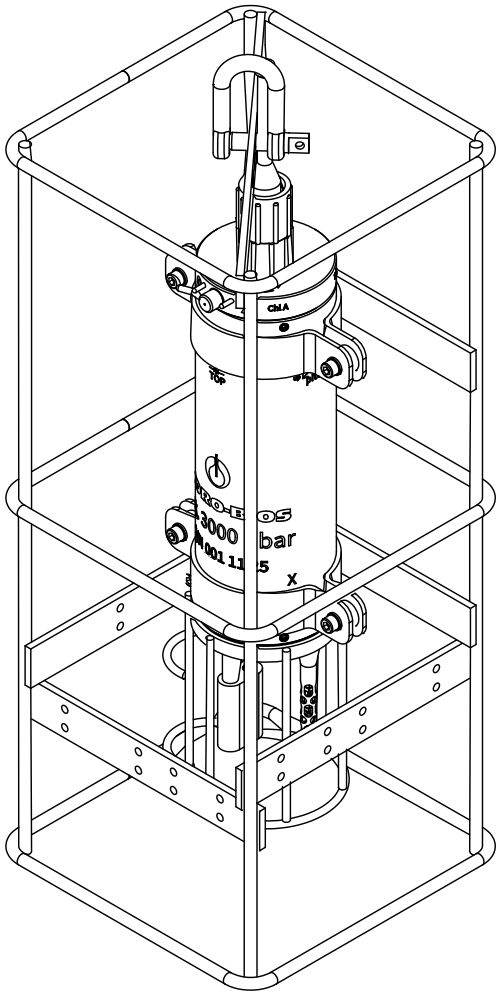


Multi Parameter Probe MPP

OPERATION MANUAL

Product ID 450 300

Edition 09/26

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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 follow this 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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TERMINOLOGY

underwater unit: underwater device with mounted motor unit

probe housing: pressure housing with electronics (instruments without motor)

GENERAL DESCRIPTION

The Multi Parameter Probe MPP is a compact precision CTD multi-parameter probe designed for the acquisition of a wide range of parameters for oceanographic and limnological applications. Standard depth range is 3000 meters. A deep sea version for 6000 meters is available on request.

In addition to the standard sensor package (conductivity C, temperature T and depth D) up to six more sensors for physical, chemical and optical parameters can be accommodated. Furthermore, an inclinometer is built into the unit for orientation measurement.

Calculated parameters such as salinity, sound velocity, density and specific conductivity (kappa 25) are displayed in OceanLab and the included Command Unit.

The MPP can optionally be equipped with two flow meters, suitable for use with limnological or oceanographic plankton nets. The flow meters can be mounted in single- or double-ring nets.

The MPP may be operated in online or offline mode (memory mode).

In online mode the Command Unit acts as an interface between the telemetry signal on the winch cable and the PC's USB port. In this mode live data will be transmitted from the MPP to the Command Unit via electromechanical cable at cable lengths of more than 10 km even at full 10 Hz[1] data rate. This bidirectional communication works with just 3.3 volts on the cable.

In offline mode the MPP may be deployed with any steel wire. Data will automatically be recorded to the internal 128 MB flash memory (eff. 120 MB). This memory may be read directly by OceanLab (Version 4 or later) on the PC or transferred to the PC using the Command Unit's data transport mode.

The MPP is powered by a rechargeable internal LiFePO4 battery.

[1] 10 Hz will be achieved with most configurations even for nine sensors (C, T, D + 6). However, depending on the type and number of sensors equipped, this value may be limited to e.g. 8 or 4Hz.

STANDARD EQUIPMENT

1. 1 Underwater unit, consisting of:
   protecting cage AISI 316 (V4A) 23 x 23 x 54 cm
   titanium underwater unit with integrated rechargeable batteries,
   max. operational depth: 3000 m
   integrated conductivity sensor, temperature sensor and pressure sensor 3000 dbar
2. 1 Transport case 63 x 50 x 32 cm
3. 1 Command Unit
4. 1 Slip ring box cable, approx. 3 metres long Fig. 1 F
5. 1 Pig tail SUBCONN IL 2 F Fig. 1 C
6. 1 Adaptor cable: IL 5M – IL 2M, 80 cm long Fig. 1 B
7. 1 Full speed serial cable: SUBCONN IL 5 M – 2 m – Lemo Fig. 1 J
8. 1 PC to serial cable: SUBCONN IL 5 M – 2 m – USB Fig. 1 K
9. 1 LiFePO4 battery charger
10. 1 Spare O–ring no. 151 for pressure housing
11. 1 Spare O–ring no. 009 for switch shaft
12. 2 Spare O-rings 16 x 1.5 for C and T sensors
13. 1 Can O-ring lubricant
14. 1 Can pin lubricant
15. 1 Dummy connector DC 5 M
16. 1 Dummy connector DC 2 F
17. 1 Dummy connector DC 2 M
18. 1 Hexagon socket screw key 2.5 mm
19. 1 Hexagon socket screw key 5 mm
20. 1 Spare fuse (125 V~, 125 mA, Littelfuse 154.125) for long distance telemetry protection
21. 1 Operation manual
22. 1 USB flash drive OceanLab
23. 1 Shackle 6 mm, PG8306

TECHNICAL DATA

MPP including protecting case:

Dimensions:	23 x 23 x 54 cm
Material:	stainless steel AISI 316
Weight:	8 kg

MPP without protecting case:

Dimensions:	approx. 10 x 16 x 45 cm
Material:	titanium
Weight:	4.3 kg

Operational depth:

Standard:	3000 m
Option:	6000 m

NOTICE

To avoid damage do not exceed the maximum operational depth range of the instrument!

Pressure sensor:

Type:	piezo-resistive cell
Range:	0 – 3000 dbar
Resolution:	0.1 dbar (0.15 dbar for 6000 dbar version)
Accuracy (0..50°C):	typ. <0.02 % f.s.
Time constant:	10 ms

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

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

Inclinometer:

Type:	3 axis MEMS accelerometer
Static accuracy:	±1°
Resolution:	1°

Power supply:

Battery type: LiFePo4, 5000 mAh, 6.6 V, 33 Wh
UN 38.3 certified

Capacity sufficient for approx. 200 to 300 hours of operation at 1 Hz measurement interval. Optional sensors and measurement intervals > 1 Hz will reduce run-time.

Data transmission:

Connector: SUBCONN BH 5 F
Pig tail (included): SUBCONN IL 2 F
Full speed serial: USB 2.0, 2 meter cable
Short circuit and ESD protected
For programming and bulk data retrieval
Telemetry: 4.8 kbaud, 3.3 V
for cable lengths >10 km,
protected against overvoltage, short circuit and ESD
for online operation

Data memory for offline mode:

Effective 120 MB, sufficient for up to 2100 hours of recording @ 1Hz sampling rate and base configuration.

Operating temperature:

-40° C...+85° C

Telemetry cable connection requirements:

Single or multi conductor cable, negative pole may be in contact with sea water.
Resistance (go- and return line): max. 1 kOhm
The single or multi conductor cable is not included in our scope of delivery!

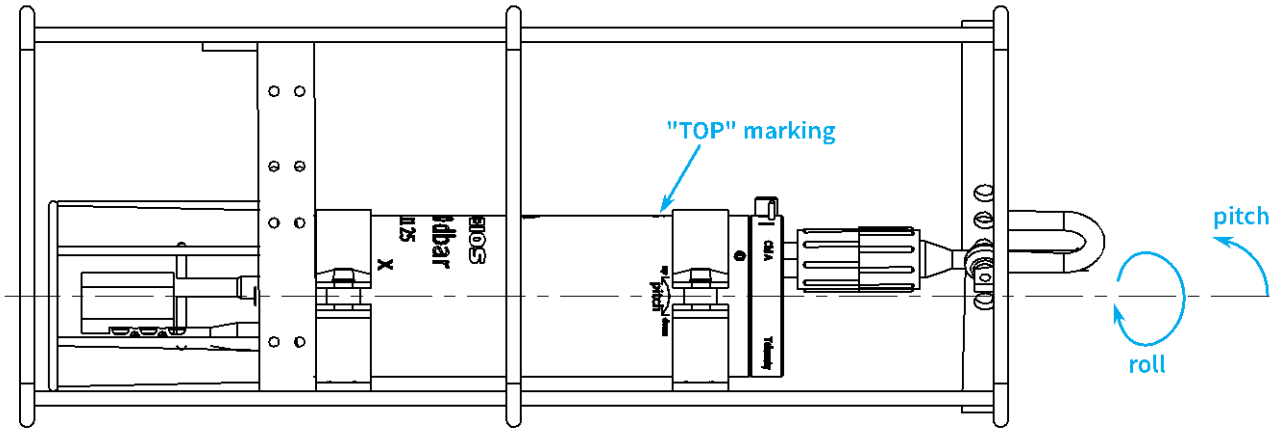
INCLINOMETER

Both the Command Unit and OceanLab will display the instrument's orientation either as

- both pitch and roll angles
  or
- a single tilt angle.

It will automatically switch between the two depending on the orientation of the instrument as described below. Make sure to mount the instrument in one of these orientations if angle measurements are of interest.

PITCH AND ROLL



Will be displayed if the instrument is within ± 60° of the following orientation (outside this range, the tilt angle will be displayed instead):

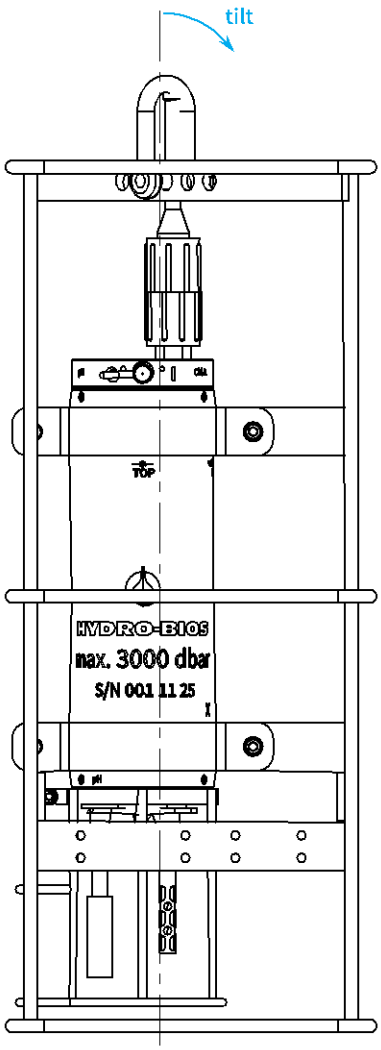
Marking "TOP" facing upward and tow direction to the right in the picture above

This orientation can be useful to determine whether or not a towed instrument is in a horizontal orientation (e.g. whether a net opening is facing the tow direction).

TILT

Will be displayed if the instrument is within ± 60° of the following orientation (outside this range, pitch and roll angles will be displayed instead):

The tilt angle is useful to determine whether or not an instrument is in a vertical position.



USER CALIBRATION (RESET FUNCTION)

The inclinometer is factory calibrated and there is usually no need to perform a field calibration. However, if the instrument is mounted to another instrument (e.g. a net or a water sampler) slightly outside one of the orientations above (i.e. displaying a small offset <5° when this other instrument is in its neutral position), this offset can be compensated:

- Put the instrument in a static neutral position
  i.e. do not perform this on deck of a ship, doing so will lead to angle measurement errors
  - for horizontal operations, make sure pitch and roll both do not exceed 5°
  - for vertical operations make sure tilt does not exceed 5°

Command Unit:

- Press the soft button next to the angle display in the main component window.
- Press **Reset**.

OceanLab:

- Click on Controlling mode > Tilt.
  Tilt, pitch and roll all have the identical reset function included in their Controlling mode. It does not matter which one is accessed to press **Reset**.
- Click **Reset**.

INTERNAL BATTERY

The lithium ion battery built into the instrument use lithium iron phosphate (LiFePO4) chemistry. This chemistry inherently is the **safest** currently available on the market with highest thermal and chemical stability and highest tolerance to abuse. In contrast to other lithium ion batteries, the LiFePO4 battery does **NOT** tend to thermal runaway, gassing or explosion.

LiFePO4 batteries have **no memory effect**, thus a partial charge is possible with no adverse effects. They can be partially charged or discharged with no adverse effect on cycle life.

NOTICE

Do not store the device with fully depleted battery for extended periods – this will reduce the life span of the battery. Instead, charge to approx. 80% state of charge (according to item 5. at page 10) and keep cool for storage.

The battery is fully integrated into the underwater unit of the MPP. A replacement by the end user is not possible.

The underwater unit of the MPP has to be returned to our factory for battery replacement when it has reached its end of life.

The expected life time of the battery is typically 2000 charging cycles / 10 years.

CHARGING

⚠WARNING

Keep the charger in a dry place (indoor use only)!

The charger should be disconnected from mains supply when not in use.

Do not plug in the charger in case of damaged case, power plug or cable.

Do not use the supplied charger for other batteries than rechargeable double cell LiFePO4 packs!

1. Bring the MPP in a dry room.
2. Remove dummy connector (DC 5 M) or communication cable (IL 5 M) from the MPP.
3. Connect the charger to the MPP.
4. Connect charger to mains supply (100 ... 240 V AC). Select appropriate primary plug for your mains supply. The charging process will start automatically.

   A **fast flashing green** LED indicates the rapid charge process. Depending on state of discharge, the rapid charge process will last up to 1.5 hours.

   A **fast flashing yellow** LED indicates that the battery is defective or connected with wrong polarity.

   Having completed the rapid charge process (leading to approx. 80% state of charge), the charger switches over to maintenance charge (indicated by **slow flashing green** LED). The maintenance charge process will last up to an additional 2.5 hours.

Having completed the maintenance charge process, a **permanent green** LED indicates that the battery has been fully charged.

5. Disconnect charger from mains supply.
6. Disconnect instrument from charger.
7. Slightly grease the contacts of the dummy DC 5 M with pin lubricant, plug the dummy connector to the instrument and secure it with the locking sleeve.

NOTICE

In no case must the underwater unit be submerged without the appropriate cable connections resp. dummy connectors attached!

SELECTING OPERATING MODE (ONLINE OR OFFLINE MODE)

Selection of the operating mode is made **before switching on the MPP.** The MPP will detect whether a Command Unit or PC is connected or not and switch to the respective mode.

- PC or Command Unit connected (and powered on):
  - Online operation enabled
- Dummy connector (or no connector):
  - Offline operation enabled

When switched on in **online mode** the MPP will wait for a connection request from OceanLab or the Command Unit and will transmit data as soon as this happens. While in online mode sensor data can only be logged on the PC side using OceanLab. Refer to the separate online mode section for more details.

When switched on in **offline mode** the unit will start recording sensor and status data to internal memory after approximately 5 seconds. Refer to the separate offline mode section for more details (page 17).

It is recommended to switch off the MPP using the main switch before plugging or unplugging cables. If contrary to this cables are plugged in or unplugged while the motor unit is switched on, it will also change between on- and offline mode every time. i. e. when the serial cable is pulled first and the motor unit is switched off some seconds later, the device will save a short offline file.

Recorded data of previous offline operations will not be deleted. The MPP will stop recording automatically when the internal data memory is full or when the main switch is turned off.

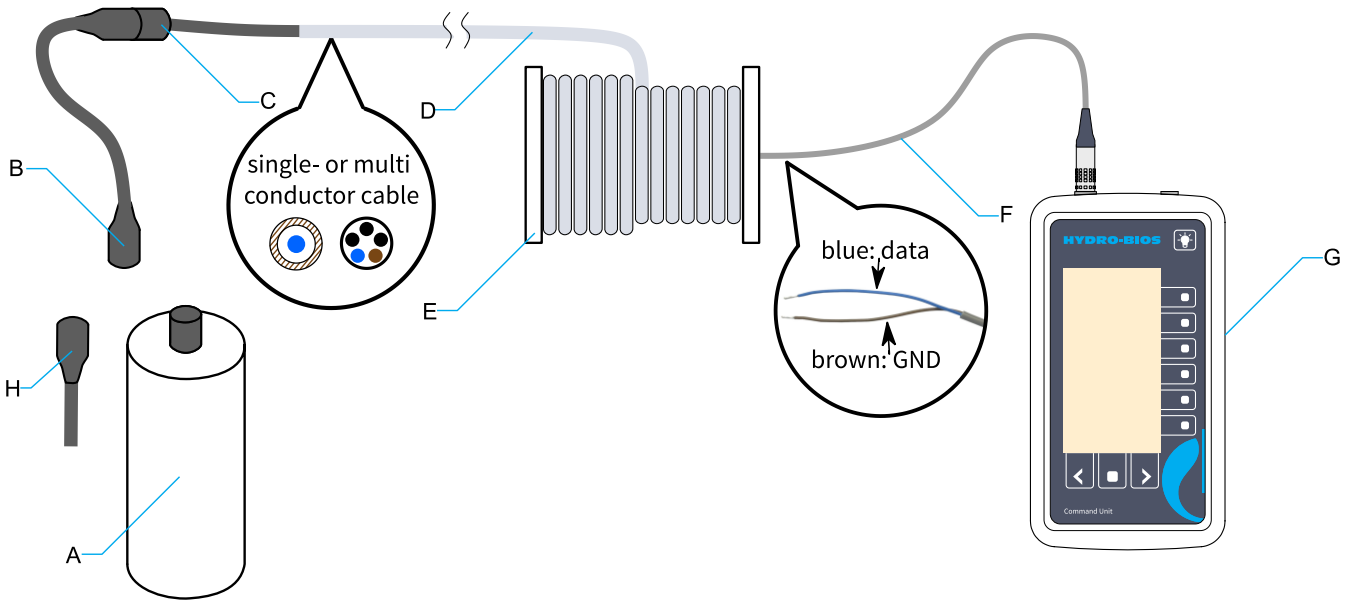
NOTICE



Automatic data recording to internal memory will only take place in offline mode and only if there is sufficient free memory available in the MPP!
To log / record data while operating online a PC running OceanLab has to be connected to the Command Unit via USB.

ONLINE OPERATION

WIRING FOR ONLINE OPERATION



A. Multi Parameter Probe MPP
B. adaptor cable: 5-pin connector to 2-pin connector
C. 2-pin socket (pig tail) attached to winch cable
D. electromechanical winch cable (e.g. single- or multi conductor cable)
E. winch and winch cable
F. slip ring box cable: 2 open wires to 4-pin lemo plug
G. Command Unit
H. dummy connector

1. Connection between Command Unit and the MPP is made by a single- or multi conductor cable in conjunction with the supplied adaptor cable IL 5 M – IL 2 M. The single- or multi conductor cable is not included in our scope of delivery.
    a. When using a *single conductor cable* (one isolated core and outer steel armour) the outer steel armour of the cable has to be connected to the black core of pin 1 (ground). The isolated core of the cable has to be connected to the white core of pin 2 (data) of the supplied pig tail SUBCONN IL 2 F.
    b. When using a *multi conductor cable* (two or more isolated cores) any two cores of this cable have to be connected to the white (data) and the black (ground) wires of the supplied pig tail SUBCONN IL 2 F.
    c. When an existing single- or multi conductor cable is *already equipped with an underwater connector*, the supplied pig tail SUBCONN IL 2 F has to be combined with a counter plug (corresponding to the existing connector) to a cable adaptor.
2. The connection from the shipside end of the single- or multi conductor cable at the winch drum (via slip rings of the winch) to the Command Unit has to be made by using the supplied slip ring box cable: The steel armour (or core in case of a multi conductor cable) coupled to pin 1 (ground)

of the plug SUBCONN IL 2 F has to be connected to the brown wire of the slip ring box cable. The core coupled to pin 2 (data) of the plug SUBCONN IL 2 F has to be connected to the blue wire of the slip ring box cable.

NOTICE

To avoid corrosion at the contacts of the underwater connectors the contacts should be slightly greased with pin lubricant and always be protected by the corresponding dummy when the single- or multi conductor cable is not used.

NOTICE

When the connector IL 2 F has been attached to the single- or multi conductor cable recently or when a new cable adapter has been attached, a continuous supervision of the display of the Command Unit is recommended during the first operation. For localization and repair of faults see chapter *Localization of Faults* of the Command Unit operation manual.

NOTICE

THE CONNECTION OF THE UNDERWATER CONNECTOR TO THE SINGLE- OR MULTI CONDUCTOR CABLE HAS TO BE MADE WITH GREATEST CARE!

MOST MALFUNCTIONS ARE CAUSED BY CABLE CONNECTION FAULTS!

In particular make sure not to accidentally connect HYDRO-BIOS-equipment to devices from other manufacturers because this could damage the Command Unit, the instrument or other connected equipment.

INSTRUMENT AND WIRING TEST BEFOR ONLINE OPERATION

This test should be carried out:

- prior to first deployment of the MPP on any vessel
- after any changes / work / maintenance on related shipside wiring, winch, slip ring, wet end terminator of electromechanical cable
- when the MPP and / or winch have not been used for an extended period of time

In order to check the function of Command Unit and underwater unit in conjunction with shipside wiring (i.e. single- or multi conductor winch cable, slip ring, wiring to lab) the following steps have to be carried out:

> ***NOTICE***
>
> Make sure no other electrical / electronical equipment is actively using the abovementioned electrical connections during test or operation of the Hydro-Bios instrument. Failure to do so may result in loss of data and / or damage to equipment.

1. Connect the slip ring box cable to the Command Unit.
2. Switch the lever switch at the underwater unit into position **O**.
3. Remove dummy connector SUBCONN DC 5 M from the underwater unit.
4. Slightly grease the pins of all underwater connectors of the underwater unit and the adaptor cable with PIN-lubricant.
5. Connect adaptor cable IL 5 M – IL 2 M to the connector BH 5 F on the underwater unit.
6. Connect the single- or multi conductor cable to the adaptor cable (Fig. 1).
7. Switch on the Command Unit, the display indicates **Please connect**.
8. Switch the lever key at the underwater unit into position **I**, the Command Unit shows the MAIN SCREEN, which includes sensor readings, among other data.
9. Observe the device's battery voltage on the Command Unit. The battery of the underwater unit should be charged when the battery symbol is blinking.
10. Check reading of the sensors.
11. Switch off underwater unit and Command Unit.
12. To avoid corrosion at the contacts of the connectors the contacts should be slightly greased with pin lubricant and always be protected with their respective dummy connectors when no single or multi conductor cable is connected.

If this test passes the data connection is ready.

Should the test fail please refer to section *Localization of Faults* of the Command Unit operation manual.

Before each offline operation an INSTUMENT TEST (page 15 point 7 – 12) with Command Unit and high speed serial cable (Fig. 1) is recommended.

ONLINE OPERATION: DEPLOYMENT

1. Slightly grease the pins and connect the adaptor cable IL 5 M --> IL 2 M to the connector BH 5 F of the underwater unit and the IL 2 F to the winch cable. Secure both connections with the locking sleeves.

> ***NOTICE***
>
> **In no case must the MPP be submerged without the appropriate cable connections resp. dummy connectors attached to the respective connectors!**

If the MPP is equipped with external sensors make sure that the adaptor cables or the corresponding dummy connectors are plugged in and secured with the locking sleeve in order to protect it from the water.
When the MPP has not been operated for a longer period, an INSTRUMENT AND WIRING TEST BEFOR ONLINE OPERATION acc. to page 14 should be carried out to check proper functioning of the system.

2. Switch the lever key of the MPP into position **O**.
3. Connect the MPP as described in INSTRUMENT AND WIRING TEST BEFOR ONLINE OPERATION or in Fig. 1.
4. Switch on the Command Unit, the display indicates **Please connect**.
5. Switch the lever key of the underwater unit to position **I**, the main screen appears on the Command Unit, displaying sensor readings and various other parameters.
6. Deploy underwater unit as scheduled.
7. When the underwater unit is back on deck switch off the underwater unit and the Command Unit.
8. Thoroughly rinse the complete instrument with fresh water.

If more than one operation is planned during an expedition the single- or multi conductor cable may remain connected to the underwater unit.

If a further operation of the MPP is not intended it is good practice to disconnect the winch cable. Make sure to switch the lever key of the underwater unit into position **O** before disconnecting the cable. To avoid corrosion of the contacts slightly grease the pins with pin-lubricant and plug the dummy DC 5 M onto the connector BH 5 F and plug the dummy DC 2 M into the connector IL 2 F of the single- or multi conductor cable.

OFFLINE OPERATION

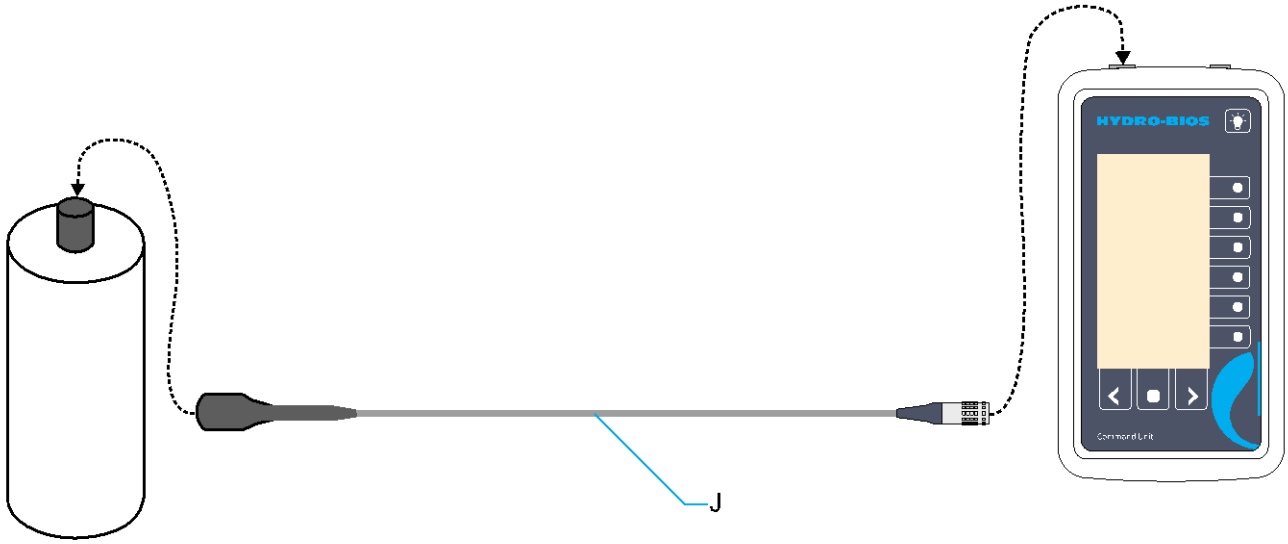
INSTRUMENT TEST BEFOR OFFLINE OPERATION

Before each offline operation an INSTUMENT TEST (page 15 point 7 – 12) with Command Unit and high speed serial cable is recommended.

PREPARATION FOR OFFLINE OPERATION

To prepare an OFFLINE OPERATION use one of the two following methods:

METHOD A: USING COMMAND UNIT



J. full speed serial cable

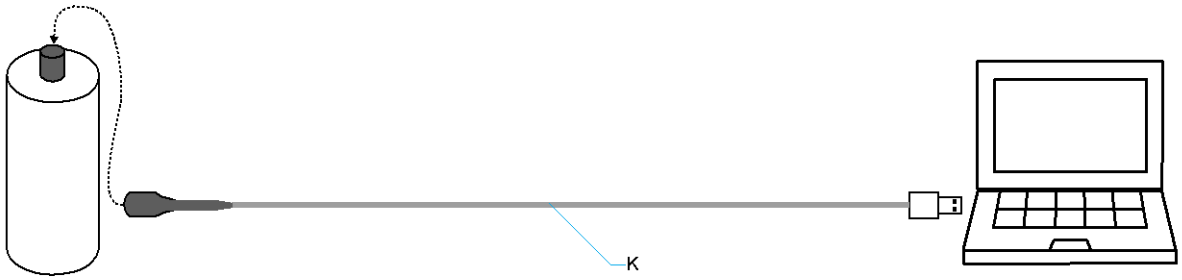
1. Establish a direct connection between Command Unit and MPP using the full speed serial cable.
2. Switch on the Command Unit and the MPP.
3. Check if the remaining memory capacity is sufficient for the planned mission.

   It is displayed on the main screen (e. g. **Free memory: 2 hours***).*

   It may be necessary to change the page using **>** *and* **<** *in order to see this.*
4. When the remaining capacity seems insufficient click on button **Clear memory** to clear the data memory of the underwater unit.

   THIS FUNCTION IS IRREVERSIBLE! Make sure to save any files you wish to keep to a PC beforehand.
5. Switch off the MPP.
6. Proceed with instructions in section Offline operation: .

METHOD B: USING PC RUNNING OCEANLAB



K. PC to serial cable

1. Establish a connection between MPP and PC using the PC to serial cable.
2. Start OceanLab 4 (or later) on the PC.
3. Switch on the MPP.
4. Click on **Connect** in OceanLab.

   OceanLab now displays sensor data.
5. Click on **Controlling mode**.
6. Select **Memory** from the list of components and make sure that the remaining capacity of data memory is sufficient for the next operation.

   If not click on button **Clear memory** to clear the data memory of the underwater unit.

   THIS FUNCTION IS IRREVERSIBLE! Make sure to save any files you wish to keep to a PC beforehand.
7. Switch off the MPP.
8. Disconnect Oceanlab.
9. Proceed with instructions in section Offline operation: .

OFFLINE OPERATION: DEPLOYMENT

The MPP automatically starts an OFFLINE OPERATION when switched on and neither PC nor Command Unit is connected and thus creates a new data file inside the data memory. The measuring data of a previous OFFLINE OPERATION will not be deleted. The MPP will stop recording measuring data automatically when the data memory is full.

1. Make sure the MPP is switched off.
2. Remove the cable, if any, from the underwater unit.
3. To avoid malfunctions make sure that the dummy SUBCONN DC 5 M has been slightly greased and is placed on the connector SUBCONN BH 5 F at the underwater unit and is secured with its locking sleeve.

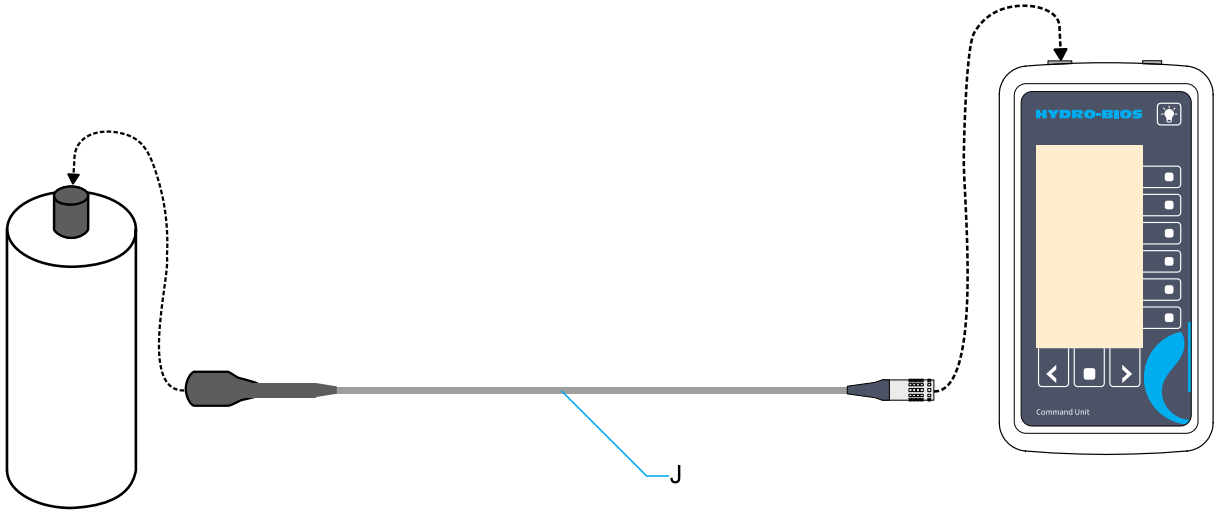
If the MPP is equipped with external sensors make sure that the adaptor cables or the corresponding dummy connectors are plugged in and secured with the locking sleeve in order to protect it from the water.

4. Just before deployment, the MPP has to be switched on by setting the lever switch at the outside of the underwater unit into position **I**.
5. Lower the MPP into the water. Deploy as scheduled.
6. When the underwater unit is back on deck switch off the underwater unit and the Command Unit.
7. Thoroughly rinse the complete instrument with fresh water.

VIEWING RECORDED OFFLINE DATA

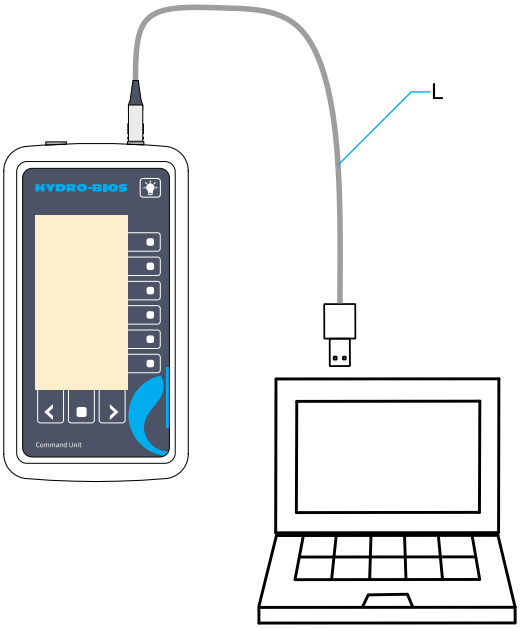
To view recorded offline data the files have to be transferred to a PC. This can be done using one of the two following methods:

METHOD A: USING COMMAND UNIT TRANSPORT MODE



J. full speed serial cable

L. Command Unit serial cable to PC

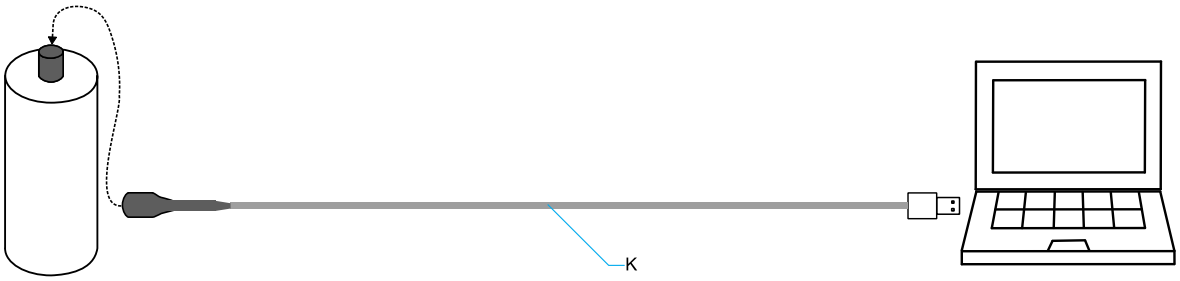


The Command Unit is used as a mass storage device. This is useful when MPP and PC are outside of cable reach and Method B can therefore not be used.

1. Make sure the MPP is switched off.
2. Establish a direct connection between Command Unit and MPP using the full speed serial cable.
3. Switch on the Command unit.
4. Press the soft button labeled **Data transport** if transport mode is not already active.
5. Switch on the MPP.
   If there are new files available for syncing to the Command Unit, it will automatically start syncing data. A progress bar will now indicate that files are being transferred to the Command Unit. Depending on the sampling rate and mission duration this can take from several seconds to several minutes.

6. When file transfer is complete (**Files synched**) switch off the MPP.
7. Disconnect the cable connecting Command Unit and MPP.
8. Establish a connection between OceanLab and Command Unit using the Command Unit serial cable to PC.
9. Continue with “Steps common to method A and B” below.

METHOD B: USING DIRECT CONNECTION TO PC



K. PC to serial cable

1. Connect the PC to serial cable (IL 5 M --> USB) to the connector BH 5 F of the underwater unit before switching it on.
2. Connect the cable to the PC’s USB port.
3. Switch on the MPP.
4. Continue with “Steps common to method A and B” below.

STEPS COMMON TO METHOD A AND B

1. Start OceanLab and press **Connect**.
2. Inside OceanLab enter the **Controlling mode**.
3. Select **Memory** from the list of components.
4. All data files stored inside the instrument’s data memory are available inside the file table.
5. Follow the on screen instructions inside OceanLab to transfer files to the PC.
6. Switch off the underwater unit when done.

MAINTENANCE

The best maintenance for the probe is to handle it with care. Despite the fact that the complete instrument is a sturdy construction 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.

Depending on the configuration of the MPP additional manuals and instructions for various sensors may be included. Adhere to those instructions in addition to this manual.

To avoid corrosion and salt incrustation the complete MPP, with special care for the sensors, should be thoroughly rinsed with fresh water after any use.

UNDERWATER CONNECTORS

The underwater connectors need just a little care to ensure a long life-span. However it is necessary to grease the sealing surfaces of the pins with pin lubricant. This avoids corrosion of the contacts and reduces wear while plugging and unplugging.

To conserve the cable connectors never unplug by pulling on the cable and avoid bending radii above narrow, sharp edges.

NOTICE

In no case must the MPP be submerged without the appropriate cable connections resp. dummy connectors attached to the respective connectors!

Clean underwater connectors with warm soapy water. Other chemicals must not get in contact with the connectors.

PRESSURE SENSOR

The pressure sensor is maintenance-free. It is recommended that the sensor be calibrated every 3 years.

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 distilled 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.

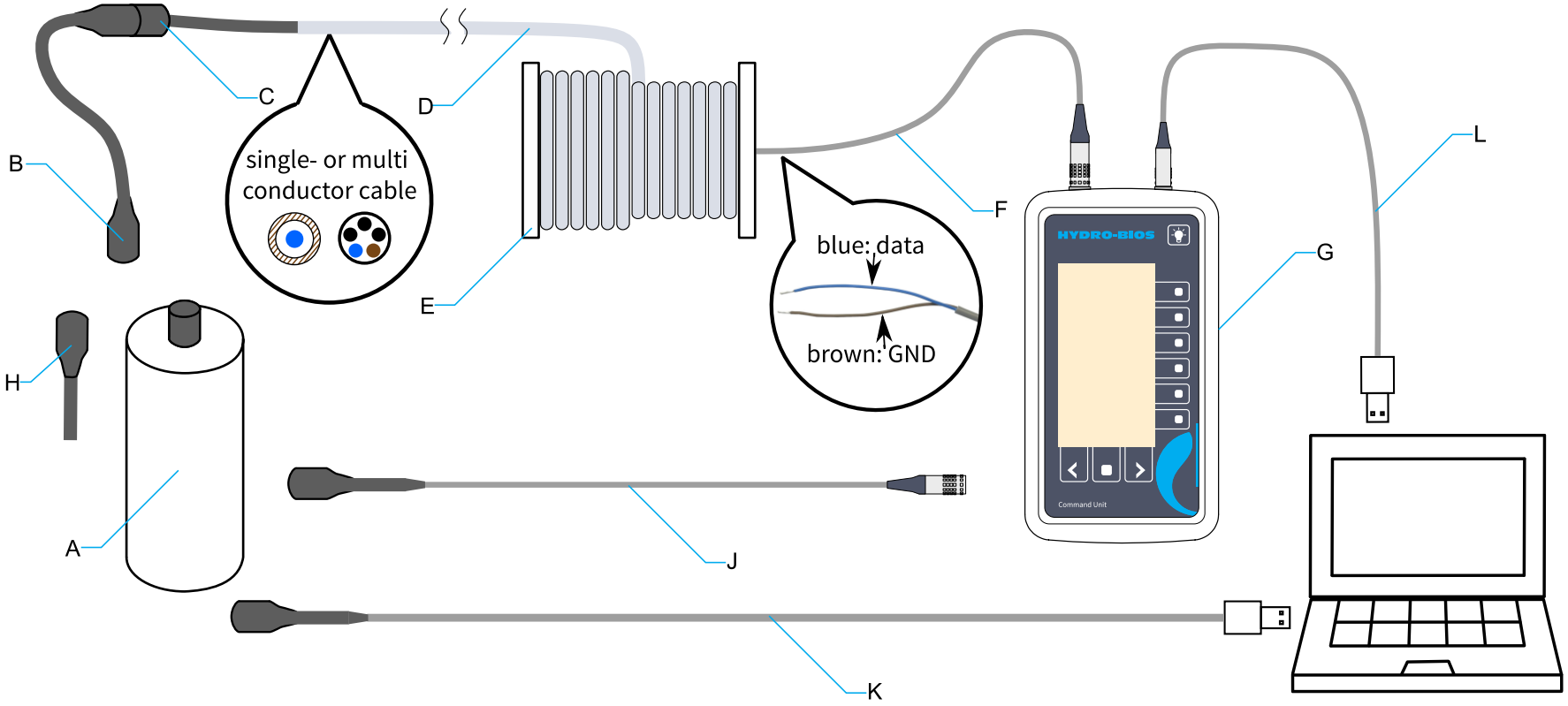
CALIBRATION

The calibration data of all integrated sensors are stored inside the MPP. To read calibration data and raw data of the MPP from the underwater unit and to transfer calibration data of the sensors to the underwater unit use the **Controlling mode** inside the software OceanLab.

OceanLab and the Command Unit will use these calibration values and the raw sensor readings to calculate and display physical units.

For details on calibration coefficients refer to the manuals of the respective sensors and the sensor's help page in the Oceanlab **Controlling mode**.

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.



A. probe / sampler

B. adaptor cable

C. pig tail

D. electromechanical winch cable

E. winch

F. slip ring box cable

G. Command Unit

H. dummy connector

J. full speed serial cable

K. PC to serial cable

L. Command Unit serial cable to PC

Fig. 1: connections overview

DYNAMIS
Batterien

UN 38.3 Test Summary Report

Lithium Cell or Battery Test Summary in Accordance with Transport of Dangerous Good Subsection 38.3 of the UN Manual of Test and Criteria, Part III subsection 38.3.5

[d] Unique report ID: un_021_105

[e] Report date: 20th August 2021

[a] [ ] Cell [x] Battery [ ] Product
Tested Type Part #: 436 601-011

ANR26650 M1B 2S1P

Same Battery Type: 60.16646

[b] Manufacturer
DYNAMIS Batterien GmbH
Brühlstraße 15
78465 Dettingen / Konstanz
Germany

Phone: +49 7533 93669-0
www.dynamis-batterien.de
info@dynamis-batterien.de

[c] Test Laboratory
DYNAMIS Batterien GmbH
Brühlstraße 15
78465 Dettingen / Konstanz
Germany
Phone: +49 7533 93669-0
www.dynamis-batterien.de
info@dynamis-batterien.de

[c] Testing procedure elsewhere

[f] Description
(i) [x] Li-Ion [ ] Li-metal
(ii) Weight: 156g
(iii) Watt hour rating: 16,5Wh
(V) [ ] Cell [x] Battery [ ] Product.
(iv) Secondary (rechargeable) Lithium Iron Phosphate ($LiFePO_4$) battery 2S1P 6,6V 2500mAh. Two Lithium Werks cells ANR 26650 M1B connected in series including 10A fuse with wire in shrink sleeve.

Lithium content:
Model number/Part number: ANR26650 M1B 2S1P

DYNAMIS Batterien GmbH manufactures all batteries under a quality management system as required according to this regulation:

[g] List of Tests Conducted	Result (Pass / Fail / N.A.)
38.3.4.1 T.1: Altitude simulation	Pass.
38.3.4.2 T.2: Thermal test	Pass
38.3.4.3 T.3: Vibration	Pass
38.3.4.4 T.4: Shock	Pass
38.3.4.5 T.5: External short circuit	Pass
38.3.4.6 T.6: Impact/Crush	N.A.
38.3.4.7 T.7: Overcharge	N.A
38.3.4.8 T.8: Forced discharge	N.A.
[h] Battery assembly: [x] Not Applicable [ ] UN.38.3.3(f) [ ] UN 38.3.3(g)	
[i] Test Reference: UN Manual of Test and Criteria, Part III, sub-section 38.3. 7. revised edition Amendment 1	

[j] Signatory A Date: 06th September 2021
Name: Frank Schnettka
Title: Laboratory Manager
Signature

[j] Signatory B Date: 06th September 2021
Name: M. Reichmann
Title: General Manager
Signature

Fig. 2: UN 38.3 Test Summary Report