

Am Jägersberg 5-7
24161 Altenholz
Germany

phone.: + 49 - 4 31 - 3 69 60 - 0
fax: + 49 - 4 31 - 3 69 60 21
mail: info@hydrobios.de
sales@hydrobios.de
web: www.hydrobios.de



DEPTH METER FOR ONLINE / OFFLINE OPERATION

WITH 4 MB DATA MEMORY

CATALOGUE NO: 450 400

OPERATION MANUAL

Edition 12/2019

© Copyright 2019, by: **HYDRO-BIOS** Apparatebau GmbH

All rights reserved. Reproduction in every form – even by way of abstracts – with explicit permission by **HYDRO-BIOS** Apparatebau GmbH only.

CONTENTS

GENERAL DESCRIPTION.....3

STANDARD EQUIPMENT4

TECHNICAL DATA5

ELECTRICAL CONNECTION HAND UNIT / UNDERWATER UNIT6

CHARGING THE BATTERIES OF THE UNDERWATER UNIT7

BATTERY REPLACEMENT OF THE HAND UNIT8

HAND UNIT: SWITCHING ON AND OFF, MAIN SCREEN9

HAND UNIT: RECORDING, MEMORY 10

HAND UNIT: MENU 11

ONLINE OPERATION 13

OFFLINE OPERATION 14

MAINTENANCE 15

CALIBRATION 16

WIRING SCHEME..... 17

GENERAL DESCRIPTION

The DEPTH METER FOR ONLINE / OFFLINE OPERATION is a light and handy precision measuring instrument for the acquisition of pressure data during operation of plankton nets, water samplers etc. for limnic and oceanographic applications. The DEPTH METER can be operated in ONLINE MODE (with data transfer to the Hand Unit via electro-mechanical cables) as well as in OFFLINE MODE (where the measuring data are stored inside the internal data memory of the probe).

The state-of-the-art electronics, optimized in power consumption, are designed for ambient temperatures from -40°C up to $+85^{\circ}\text{C}$.

The system consists of an Underwater Unit with measuring electronics (data memory 4 MByte) and pressure sensor and a Hand Unit which is the link between Underwater Unit and a PC during ONLINE OPERATION. The Hand Unit additionally displays the measuring data of the Underwater Unit in clear text.

The power supply of the Underwater Unit is made by integrated Ni-MH-batteries which can be charged with a supplied microprocessor-controlled charger. Thanks to most up-to-date technique and primary plug-set the charger is worldwide usable. The capacity of the rechargeable batteries is sufficient for up to 110 hours of continuous operation.

The measuring data of the pressure sensor can be stored in the Underwater Units data memory of 4 MByte with a data rate of 1 Hz. Considering the number of 4 Byte per data set the data memory allows operations up to 290 hours duration.

The Hand Unit is battery operated. An additional power connector allows to connect an external power supply of 7 - 12 V DC.

The DEPTH METER is delivered with the data acquisition software OceanLab 3. This Windows based software is an easy-to-use package for pre-deployment probe set-up, real-time data acquisition, data visualization, data storing and data export in ASCII-format.

STANDARD EQUIPMENT

1. 1 Underwater Unit with integrated pressure sensor and rechargeable battery
2. 1 Automatic charger with connecting cable
3. 1 Hand Unit
4. 1 Adaptor cable MC IL 5 M → IL 2 M for Online Operation
5. 1 Connecting cable to winch (3 m long)
6. 1 Connecting cable Hand Unit to PC
7. 1 Connecting cable Underwater Unit to PC (MC IL 5 M → Sub-D 9 pin)
8. 1 Dummy MC DC 5 M
9. 1 Spare O-ring 125
10. 1 Can O-ring lubricant
11. 1 Can pin lubricant
12. 1 Battery 9 V (PP3)
13. 1 CD-ROM OceanLab 3
14. 1 Hexagon socket screw key 5 mm
15. 2 Spare fuses (125V~, 500mA, fast) for conductor
16. 1 Operation manual

TECHNICAL DATA

Underwater Unit:

Dimensions (without connectors):	ø 45 mm x 225 mm
Weight:	approx. 1 kg
Operational depth:	limited to measuring range of pressure sensor (max. 3000 m)
Data memory:	4 MByte, allowing for 290 hours recording time
Data sampling rate:	1 Hz (one data set per second)
Material:	Titanium, stainless steel
Operating temperature:	- 40 ... + 85°C
Telemetry connector:	SUBCONN IL 2 M

Power supply of Underwater Unit:

Type:	4 Ni-MH-batteries
Capacity:	730 mAh, up to 110 hours of continuous operation
Charge conditions:	Approx. 1.5 hours at 800 mA
Charge temperature:	+15 ... +30°C
Life expectancy:	More than 500 charge-discharge-cycles
Self-discharge:	Typ. 25% per month

Charger for Underwater Unit:

System:	Microprocessor-controlled charger for Ni-MH packs
Type:	ANSMANN ACS 310 traveller
Input voltage:	100 ... 240 V AC
Charge current:	800 mA

Pressure sensor:

Type:	Piezo-resistive cell
Range:	standard: 0 ... 3000 dbar
Accuracy:	typ. ± 0.1% f.s.

Long-Distance Telemetry (for ONLINE operation):

Type:	FSK-telemetry for cable length up to 10 km
Data transmission speed:	1200 baud
Voltage at the cable:	Max. 5 V
Cable type:	Single or multi conductor cable
Cable resistance:	Max. 1 kOhm (go-and-return line)

PC Connector:

Type:	RS 232 (serial COM-port)
Data transmission speed:	38400 baud

Hand Unit:

Dimensions:	152 x 83 x 33,5 millimeters
Power supply:	Battery 9 V (PP3)
LC-display:	4 x 20 characters
Keyboard:	12 keys
Protection type:	IP 65
Operating temperature:	-5°C ... +50°C

ELECTRICAL CONNECTION HAND UNIT / UNDERWATER UNIT

The connector MC BH 5 F at the Underwater Unit incorporates two different interfaces. A serial COM-port (RS-232) is used for direct communication with the PC which is used to prepare OFFLINE OPERATION and to transfer stored data from the Underwater Unit to the PC. A long-distance telemetry interface is used to connect the Hand Unit to the Underwater Unit (via a winch cable) to the Hand Unit during ONLINE OPERATION. The selection of the interface is made by connecting:

- a) the adaptor cable MC IL 5 M → IL 2 M to use the long-distance telemetry during ONLINE OPERATION
- b) the connecting cable MC IL 5 M → Sub-D 9 pin to use the serial COM-port for direct communication with the PC

The electrical connection of the long-distance telemetry interface from Underwater Unit and Hand Unit to winch and winch cable is made as follows.

1. The connection between Hand Unit and Underwater Unit is made by an electro-mechanical cable (single or multi conductor cable). This cable is not included in our scope of delivery.
2. The electrical specification of the electro-mechanical cable shall correspond to chapter TECHNICAL DATA (page 5), section LONG-DISTANCE TELEMETRY. The mechanical specification of the electro-mechanical cable shall correspond to the specification of the towed instrument.
3. The wet end of the electro-mechanical cable has to be equipped with an underwater connector SUBCONN IL 2 F. Pin 1 (black core) of the connector SUBCONN IL 2 F is used as ground line, pin 2 (white core) is used as data line. When using a single conductor cable the ground line has to be connected to the steel armour of the electro-mechanical cable, the data line has to be connected to the isolated core of the electro-mechanical cable.
4. The connection from reverse end of the electro-mechanical cable at the winch drum (via slip rings of the winch) to the Hand Unit is made by using the supplied connecting cable. The ground line has to be connected to the brown core of the connecting cable, the data line has to be connected to the blue core of the connecting cable.
5. To avoid corrosion at the contacts of the SUBCONN connectors the contacts should be slightly greased with pin lubricant and always be protected by corresponding dummies when not in use.

CHARGING THE BATTERIES OF THE UNDERWATER UNIT

Safety instructions:

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 cabinet or power plug.

Only charge rechargeable Ni-Cd or Ni-MH packs with 3 – 10 cells.

Charging procedure:

Please note that during charging the batteries of the Underwater Unit a communication with the Hand Unit is not possible!

1. Bring the Underwater Unit in a dry room.
2. Remove dummy MC DC 5 M from the Underwater Unit.
3. Connect charger to the Underwater Unit by using the supplied cable.
4. Connect charger to mains supply (100 ... 240 V AC). The charging process will start automatically.
5. If the red LED starts flashing (error indicator), either the cell pack is defective or is connected with wrong polarity.
6. The charging procedure is indicated by a green flashing LED. The charging procedure can last up to 1.5 hours (depending on remaining capacity before charging).
7. Having completed the charging procedure, the charger switches over to trickle charge (permanent green LED on).
8. Disconnect charger from mains supply.
9. Disconnect Underwater Unit from charger.
10. Slightly grease the contacts of the dummy MC DC 5 M with pin lubricant, connect the dummy to the Underwater Unit and secure it with the locking sleeve.

Notice: In rare cases (deep discharged batteries) the charger erroneously indicates a successful charging procedure after approx. 10 minutes of charging. In this case please disconnect and re-connect the charger from the Underwater Unit to re-start the charging process.

The capacity of completely charged batteries is sufficient for up to 110 hours of continuous operation of the probe.

Please note that due to the self-discharge rate of approx. 25% per month the batteries should be charged at least after 3 months of storage.

BATTERY REPLACEMENT OF THE HAND UNIT

1. The battery case is located at the rear side of the Hand Unit. For battery replacement remove the lid, kept by two screws (tool: screwdriver for recessed-head screws).
2. Remove the exhausted battery.
3. Clip a fresh battery (9 V, PP3) onto the battery contacts.
4. Make sure that packing and sealing surfaces are clean.
5. Remount the lid (tool: screwdriver for recessed-head screws).

HAND UNIT: SWITCHING ON AND OFF, MAIN SCREEN

The splash-proof Hand Unit is equipped with the following elements:

1. LC-display with 4 lines
2. Bank of 12 keys, partly with double function.
The second function of a key is accessible upon pressing the **SHIFT** key before.
3. 4-pin socket to connect the Underwater Unit.
4. 3-pin socket to connect a PC.
5. Battery case (at rear side) for a battery 9 V (PP3)
6. 2 banana sockets to connect an external mains supply circuit (7...12 V DC, 12 mA)

SWITCHING ON:

Switching on of the Hand Unit is made by pressing any key once. The LC-display will indicate the main screen.

SWITCHING OFF:

Switching off is made by pressing any key for approx. 2 - 3 seconds until the text at the display disappears. Additionally an integrated auto power off switches off the hand terminal after approx 5 minutes of inactivity.

After switching on the following text will be temporarily displayed at the LC-display:

NO DATA	
HAND UNIT	9.2 V

NO DATA

No instrument connected or connected instrument not ready for communication.

alternatively:

INVALID DATA

The instrument connected is not supported by the Hand Unit.

alternatively:

CABLE: SHORT CIRCUIT

short circuit detected in the cable connection between Hand Unit and Underwater Unit.

HAND UNIT

9.2 V

Battery voltage of the Hand Unit.

When a correct communication between Hand Unit and Underwater Unit has been established, the following **MAIN SCREEN** will be displayed:

DM	500 m
RECORDING INACTIVE	
PROBE	4.8 V
PRESSURE	0.00 dbar

This **MAIN SCREEN** will be displayed any time you call function **F1** (by pressing **SHIFT** and **7** successively).

DM

500 m

Type of instrument connected: Depth Meter, operational depth 500 m. Underwater Unit is in Online mode and **not storing** measuring data.

RECORDING INACTIVE

Alternatively:

RECORDING ACTIVE

Underwater Unit is in Offline mode and **is storing** measuring data.

PROBE

4.8 V

Battery voltage of the Underwater Unit.

When the battery voltage falls below 4.0 V the Underwater Unit is switched off automatically. A restart is only possible after charging the batteries.

PRESSURE

0.00 dbar

Actual pressure data of the Underwater Unit.

HAND UNIT: RECORDING, MEMORY

To open the **RECORDING** dialog call function **F2** by pressing **SHIFT** and **9** successively.

RECORDING RECORDING INACTIVE ACTIVATE = ENTER

RECORDING	Name of function
RECORDING INACTIVE Alternatively: RECORDING ACTIVE ACTIVATE = ENTER	Underwater Unit is in Online mode and not storing measuring data. Underwater Unit is in Offline mode and is storing measuring data. Press ENTER to start the Offline mode with data storage inside the Underwater Unit.
Alternatively: DEACTIVATE = ENTER	Press ENTER to stop the Offline mode (stop data storage inside the Underwater Unit).

To open the **MEMORY** dialog call function **F3** by pressing **SHIFT** and **5** successively.

MEMORY	4 MB
	100 % FREE
	290 h
CLEAR = ENTER	

MEMORY	4 MB	Name of function and size of data memory of the Underwater Unit.
100 % FREE		Remaining capacity of the Underwater Units data memory in %.
290 h		Remaining capacity of the Underwater Units data memory in hours.
CLEAR = ENTER		Press ENTER to clear the Underwater Units data memory.
		Please note: This function is irreversible! Therefore make sure having successfully transferred the measuring data from the Underwater Unit into a disk file at the PC!

HAND UNIT: MENU

To enter the **MENU**, offering additional dialogs, call function **F5** by pressing **SHIFT** and **3** successively.

```
MENU
> RESET PRESSURE
  ZERO OFFSET
  PHYS. UNIT
```

The navigation inside the menu is made via the cursor keys \uparrow (by pressing **SHIFT** and **8** successively) and \downarrow (by pressing **SHIFT** and **2** successively).

To enter the menu item selected press the **ENTER** key.

To quit the menu or a menu item call function key **F1**.

The **MENU** incorporates the following menu items:

Menu item **RESET PRESSURE**:

Due to the high accuracy of the pressure sensor used inside the DEPTH METER, air pressure fluctuations cause variations of the pressure resp. immersion depth measurements which can be eliminated with assistance by the menu item **RESET PRESSURE**.

The Underwater Unit **must not be immersed into the water** whilst resetting the pressure sensor.

```
MENU
0.25 dbar
RESET = ENTER
```

The air pressure compensation will be carried out upon pressing the **ENTER** key. As reply the Hand Unit will indicate **0.00 dbar** as actual pressure.

Menu item **ZERO OFFSET**:

In some instrument configurations it is not possible to place the pressure sensor in the exact level of interest, e.g. when the probe is mounted separately to the towing cable of a plankton net. Thus the pressure sensor is placed above the mouth opening of the net. The vertical **ZERO OFFSET** can be used to eliminate the misreading (related to the mouth opening of the net) of the pressure sensor:

```
MENU
DISTANCE          x.xx m
STORE = ENTER
```

The vertical distance from pressure sensor to level of interest (e.g. center of mouth opening) has to be entered in meters by using the number keys of the keyboard. The entered **DISTANCE** will be stored upon pressing the **ENTER** key. As reply the fourth line of the LC-display will indicate **STORED**.

Please note: The entered **DISTANCE** directly increases the reading of the pressure sensor. This leads to the fact that the pressure data inside **MAIN SCREEN** and inside menu item **RESET PRESSURE** equals the entered **DISTANCE** when the instrument is not immersed into the water.

HAND UNIT: MENU (continued)

Menu item **PHYS. UNIT:**

The menu item **PHYS. UNIT** offers the choice between two physical units for immersion depth / pressure measurements:

```
MENU
  m (LIMNOLOGY)
  > dbar
  STORE = ENTER
```

The selection is made via cursor keys \uparrow (by pressing **SHIFT** and **8** successively) and \downarrow (by pressing **SHIFT** and **2** successively) and will be stored upon pressing the **ENTER** key. As reply the fourth line of the LC-display will indicate **STORED**.

The calculation of the immersion depth from the water pressure is made according to the formula:

$$\text{immersion depth [m]} = \text{water pressure [dbar]} * 1,019716$$

Please note that the physical unit **m** (meter) is applicable for limnic operations only. In salt water the calculation of the immersion depth is not possible without conductivity and temperature measurements.

Menu item **LANGUAGE:**

The menu item **LANGUAGE** offers the choice between English and German language:

```
MENU
  > GERMAN
  ENGLISH
  STORE = ENTER
```

The selection is made via cursor keys \uparrow (by pressing **SHIFT** and **8** successively) and \downarrow (by pressing **SHIFT** and **2** successively) and will be stored upon pressing the **ENTER** key. As reply the fourth line of the LC-display will indicate **STORED**.

Menu item **IDENT NUMBER:**

The menu item **IDENT NUMBER** gives access to the identification number of the Underwater Unit:

```
MENU

  IDENT NUMBER    12345
```

ONLINE OPERATION

1. Connect Underwater Unit mechanically to the instrument to be operated in conjunction with the DEPTH METER.
2. Connect instrument to be operated in conjunction with the DEPTH METER mechanically to the electro-mechanical (single or multi conductor) cable.
3. Remove dummy MC DC 5 M from the Underwater Unit.
4. Connect adaptor cable MC IL 5 M → IL 2 M to Underwater Unit and electro-mechanical cable.
6. Connect Hand Unit to the slip-ring box of the towing cable winch.
7. Connect Hand Unit to the PC.
8. Switch on the Hand Unit by pressing any key once.
9. The **MAIN SCREEN** will be displayed:

DM	500 m
RECORDING INACTIVE	
PROBE	4.8 V
PRESSURE	0.00 dbar

10. Inside the **MENU (F5)** use item **RESET PRESSURE** to compensate air pressure variations, if necessary.
11. At the PC: Open data acquisition software **OceanLab** and start data transfer by using the button **CONNECT**.
12. Send instruments to sea and carry out the mission as scheduled.
13. When the instruments are back onboard make sure that the second line of the **MAIN SCREEN** indicates **RECORDING INACTIVE** to avoid waste of battery and data memory capacity. When the second line indicates **RECORDING ACTIVE**, use the Hand Units **RECORDING** dialog (**F2**) to deactivate the recording process.
14. Switch off the Hand Unit.
15. Remove adaptor cable MC IL 5 M → IL 2 M from electro-mechanical cable and Underwater Unit.
16. Place dummy MC DC 5 M on the connector of the Underwater Unit.
17. Rinse complete Underwater Unit with fresh water after use.

Please note:

When no PC is available during the online operation, the Underwater Unit can record the measuring data inside the internal data memory:

Open the Hand Units **MEMORY** dialog (**F3**) to check the remaining memory capacity. When the free space inside the data memory seems barely sufficient, press **ENTER** to clear the data memory of the Underwater Unit.

Use the Hand Units **RECORDING** dialog (**F2**) before sending the instruments to sea and activate the recording process by pressing **ENTER**.

When the Underwater Unit is back onboard open the Hand Units **RECORDING** dialog (**F2**) and deactivate the recording process by pressing **ENTER**.

Connect Underwater Unit directly to the PC to transfer the measuring data from the Underwater Units data memory into a disk file.

OFFLINE OPERATION

1. Remove dummy MC DC 5 M from the Underwater Unit.
2. Connect the connecting cable (MC IL 5 M → Sub-D 9 pin) to Underwater Unit and PC.
3. At the PC: Open data acquisition software **OceanLab** and start communication between Underwater Unit and PC by clicking on button **CONNECT**.
4. Activate the CONTROLLING MODE of **OceanLab**.
5. Open the controlling dialog **REAL TIME CLOCK** and adjust the Underwater Units internal clock, if necessary.
6. Open the controlling dialog **PRESSURE** to compensate air pressure variations by clicking on button **RESET PRESSURE SENSOR**, if necessary.
7. Open the controlling dialog **MEMORY** to check the remaining memory capacity. When the free space inside the data memory seems barely sufficient, click on button **CLEAR MEMORY** to clear the data memory of the Underwater Unit. Please note that, in case of not completely free memory, the Underwater Unit will automatically create a new data file inside the data memory when started in Offline mode. The measuring data of previous Offline operations will not be deleted, but the Underwater Unit will stop recording measuring data automatically when the memory is completely used.
8. Click on button **ACTIVATE RECORDING** inside the components window or inside the controlling dialog **MEMORY** to start the Offline mode of the DEPTH METER, where the measuring data of the pressure sensor are stored inside the Underwater Units data memory of 4 MByte with a data rate of 1 Hz.
9. Terminate **OceanLab**.
10. Remove the connecting cable (MC IL 5 M → Sub-D 9 pin) from the Underwater Unit.
11. Place dummy MC DC 5 M on the connector of the Underwater Unit.
12. Connect Underwater Unit mechanically to the instrument to be operated in conjunction with the DEPTH METER.
13. Connect instrument to be operated in conjunction with the DEPTH METER mechanically to the towing cable.
14. Send instruments to sea and carry out the mission as scheduled.
15. Remove dummy MC DC 5 M from the Underwater Unit when the instruments are back onboard.
16. Connect the connecting cable (MC IL 5 M → Sub-D 9 pin) to the Underwater Unit.
17. At the PC: Open data acquisition software **OceanLab** and start communication between Underwater Unit and PC by clicking on button **CONNECT**.
18. Click on button **DEACTIVATE RECORDING** inside the components window or inside the controlling dialog **MEMORY** to stop the Offline mode of the DEPTH METER.
19. Open the controlling dialog **MEMORY**. Select data file(s) for data transfer to the PC and start data transfer by clicking on button **READ SELECTED FILES**.
20. Terminate **OceanLab**, when the data transfer has finished.
21. Remove the connecting cable (MC IL 5 M → Sub-D 9 pin) from the Underwater Unit.
22. Place dummy MC DC 5 M on the connector of the Underwater Unit.

MAINTENANCE

The best maintenance for the DEPTH METER is to handle it with care. Despite the fact that the complete instrument is a substantial construction, extreme shocks should be avoided. Apart from that, there are only few instructions and maintenance rules to be observed ensuring a long life-span and precise measuring data.

To avoid corrosion and salt incrustation the complete instrument should be rinsed with fresh water after use.

UNDERWATER CONNECTORS:

The underwater connectors need just a little care to ensure a long life-span. However it has proved itself to be advisable to grease the sealing surfaces of the pins with pin lubricant. This avoids corrosion of the contacts and reduces wear whilst plugging and unplugging.

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

Connectors at Underwater Units that are not in use should always be protected by corresponding dummies.

Clean underwater connectors with warm soapy water. Avoid chemicals to get in contact with the connectors.

PRESSURE SENSOR:

The pressure sensor is maintenance-free.

CALIBRATION

To read calibration data and raw data of the DEPTH METER from the Underwater Unit and to transfer calibration data to the Underwater Unit please use the CONTROLLING MODE inside the software **OceanLab** with direct connection from PC to Underwater Unit.

The association of raw data values and calibration coefficients to the sensors and the regression formulas is made directly inside the CONTROLLING DIALOGS of **OceanLab**.

WIRING SCHEME

