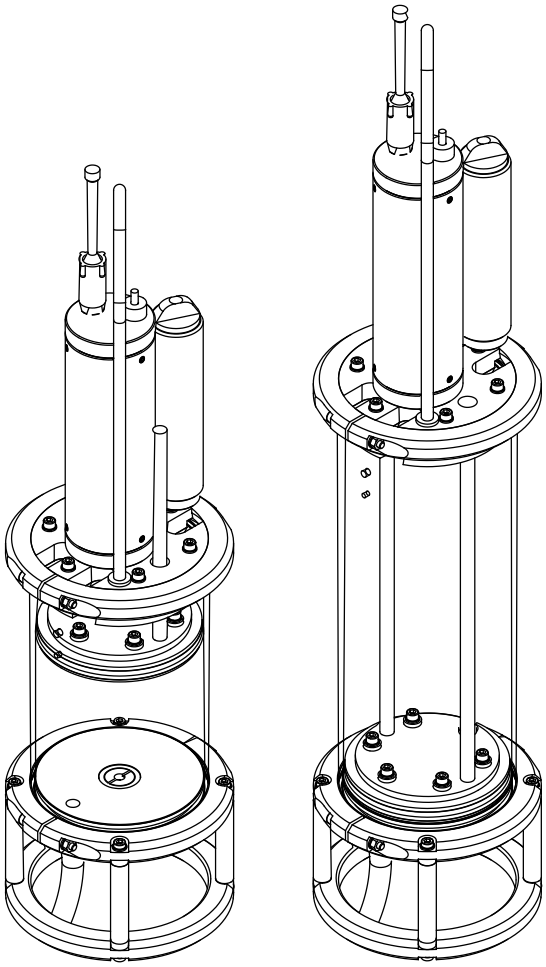


INTEGRATING WATER SAMPLER IWS 4

OPERATION MANUAL

Product ID 436 610 / 615

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 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

HYDRO-BIOS Integrating Water Samplers enable obtaining composite samples of water columns and layers. Whereas classic approaches involve repeated sampling and mixing procedures the microprocessor-controlled IWS achieves the same result in one single cast.

The IWS 4 significant upgrades over the previous revision IWS 3:

- New hand held control unit with graphical user interface
- Language selection
- Enhanced LiFePO4 power source
- Increased motor efficiency, resulting in
    - up to 10% faster sampling
    - up to 10% longer battery life
- Improved motor protection

For programming and operating the sampler every IWS 4 comes with the hand-held control unit (IP65). Its multi-language graphical user interface features integrative modes for both depth-sensitive and timed sampling. Additional modes include spot-sampling one individually specifiable depth, as well as manual sampling to operate the IWS 4 independently from pre-sets.

Connectivity options include wireless, serial cable, and long distance telemetry.

Parameters and protocols are stored in the sampler's internal memory. Casts can thus be repeated with no need to re-program the instrument and data may be transferred subsequently.

HYDRO-BIOS Integrated Water Samplers are powered by rechargeable state-of-the-art lithium iron phosphate (LiFePO4) batteries and come including a charger and a plug set for worldwide use.

STANDARD EQUIPMENT

1 Integrating water sampler	
1 Control unit	Fig. 1 B
1 Protecting cap for each LEMO connector	
1 USB flash drive OceanLab	
1 PC to serial cable Subconn MC IL 5 M – USB	Fig. 1 D
1 Full speed serial cable MC IL 5 M - Lemo (8 mm)	Fig. 1 C
1 Control unit serial cable to PC Lemo (6 mm) - USB	Fig. 1 E
1 Dummy connector SUBCONN MC DC 5 M	Fig. 1 F
1 Can pin-lubricant	
1 Spare piston gasket	
1 Hexagon socket screw 2.5 mm	
1 Hexagon socket screw key 5 mm	
1 Box spanner 10 mm	
1 Automatic LiFePO4 charger with connecting cable	
3 Mains supply / power outlet adaptors	
1 Operation manual with calibration certificate(s)	

TECHNICAL DATA

IWS

Sampling volume:	2.5 l (436 610) resp. 5 l (436 615)
Overall length:	720 mm (2.5 l) resp. 880 mm (5 l)
Outer diameter:	190 mm
Empty weight:	8 kg
Operational depth:	100 m
Underwater connector:	Subconn MC BH 5 F
Materials of sampler getting in contact with sample:	PMMA, POM, NBR, FKM
Other materials:	titanium, stainless steel
Operating temperature:	0° C ... + 50° C
Storage temperature:	-20° C ... + 60° C
Maximum sampling duration (complete piston stroke):	50 sec. (2.5 l) resp. 100 sec. (5 l)
Protocol memory:	sufficient for 2000 operation protocols

POWER SUPPLY

Type:	2 cell rechargeable LiFePO4 battery
Nominal voltage:	6.6 V
Capacity:	2500 mAh, sufficient for approx. 50 to 80 fill-empty-cycles or for approx. 300 to 400 hours of continuous operation without motor action
Charge conditions:	approx. 2.5 hours at 1500 mA to 80% capacity approx. 5 hours to 100% capacity
Charge temperature:	+5° C ... +40° C
Life expectancy:	up to 2000 charge-discharge-cycles
Self-discharge:	typ. 3% per month

CHARGER

System:	automatic charger for double-cell LiFePO4 packs
Type:	FRIWO FW7290
Input voltage:	100 ... 240 V AC
Charge current:	1500 mA

WIRELESS COMMUNICATION

Type:	2.4 GHz wireless point to point communication
Range:	2 to 10 meters line of sight

CONTROL UNIT

ENVIRONMENTAL	
Operating temperature:	-20 to 55° C
Storage temperature:	-30 to 60° C
Ingress protection:	IP65 *

BATTERY	
Operating time (no backlight):	50 to 100 hours
Operating time (backlight full brightness)**:	10 hours
USB charge current:	500 mA
Charge time:	2 to 3 hours
Charging temperature range***:	approximately 4° to 48° C
Life expectancy:	>80 % after 2000 charge-discharge-cycles
Self-discharge:	typ. <3 % per month

PHYSICAL (including case protector)	
Length:	171 mm
Width:	96 mm
Height:	45 mm
Weight:	350 g

DISPLAY	
Resolution:	240*128 pixels
Type:	transflective LCD with LED backlight

** IP65 even without protective caps. Caps are intended for dusty / salt water environments.*

*** backlight will auto power-off after a few minutes to save battery power.*

**** unit will not charge outside this range.*

RECHARGEABLE BATTERY

BATTERY SAFETY

The rechargeable LiFePO4 batteries embedded in the INTEGRATING WATER SAMPLER as well as the control unit use lithium iron phosphate (LiFePO4) chemistry. This type of battery is inherently the **safest** rechargeable battery currently available on the market with highest thermal and chemical stability and highest tolerance to abuse. In contrast to other lithium ion batteries, LiFePO4 batteries do **NOT** tend to thermal runaway, gassing or explosion.

CHARGING THE SAMPLER BATTERY

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. Take the sampler to a dry room.
2. Connect the sampler to the charger.
3. Select appropriate primary plug for your mains supply. Connect charger to mains supply (100 ... 240 V AC). The charging process will start automatically.

   A **green fast flashing** of the charger's LED indicates the rapid charge process. Depending on state of discharge, the rapid charge process will last up to 2.5 hours.

Note: A **yellow fast flashing** of the charger's LED indicates that the battery is defective or connected with reversed polarity.

Having completed the rapid charge process (leading to approx. 80% capacity), the charger switches to maintenance charge (indicated by **green slow flashing** of the charger's 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 completely charged.

4. Disconnect charger from mains supply.
5. Disconnect sampler from charger.

   Partially charging the IWS is allowed – this has no adverse effects on battery life.

CHARGING THE CONTROL UNIT

1. Connect the control unit to a USB port (PC, wall wart or power bank) using the supplied cable.
   The battery symbol in the top right corner of the display will show a filling animation with a flash symbol next to it.
2. Wait until the display indicates a fully charged battery.
   Partially charging the control unit is allowed – this has no adverse effects on battery life.

BATTERY MAINTENANCE

Charge batteries to approx. 80% state of charge (according to item 5. at page 9) and keep them cool for storage - this reduces self-discharge and prolongs the battery life.

NOTICE



Avoid total discharge to ensure a long battery life. **Charging is needed at the latest when the battery voltage falls below 6.2 V.** This is indicated by a blinking battery icon in the user interface.

The capacity of a completely charged battery is sufficient for approx. 50 to 80 fill-empty-cycles of the sampler or for approx. 300 to 400 hours of continuous operation of the sampler without motor action.

QUICK-START BUTTON, POWER SAVE FUNCTION

NOTICE

Make sure that the hose clamp, located at the outlet (Fig. 2 B) of the sampler, is opened before pressing the quick-start button!

If the piston seal has dried out, a little water must be poured into the sampler from above to moisten it, so that the piston can move easily.

The **quick-start button** (Fig. 2 G) on the motor unit allows the following operations without the need to connect the control unit or a PC.

ACTIVATE WITH LAST PROGRAM

When **pressed for 3 to 4 seconds**, the quick-start button will:

- Empty the sampler (move the piston downwards)
- Load the previously used program
- **Activate** that program

*The piston of the sampler **always** (even if in start position) performs a homing operation when activated with the quick-start button. This is a confirmation for a successful activation of the sampler.*

A **short press** of the button will:

- Wake the sampler if in power-save mode
  (do this before searching wirelessly on the control unit)
- **Deactivate** any active program and the piston (if it was moving)

Cable connections to an active control unit or to a PC will automatically wake up the sampler.

*The **power-save function** automatically deactivates (and switches off) the sampler when no operation is detected (i.e. if the piston does not leave the start position) within 4 minutes upon waking by **quick-start button**.*

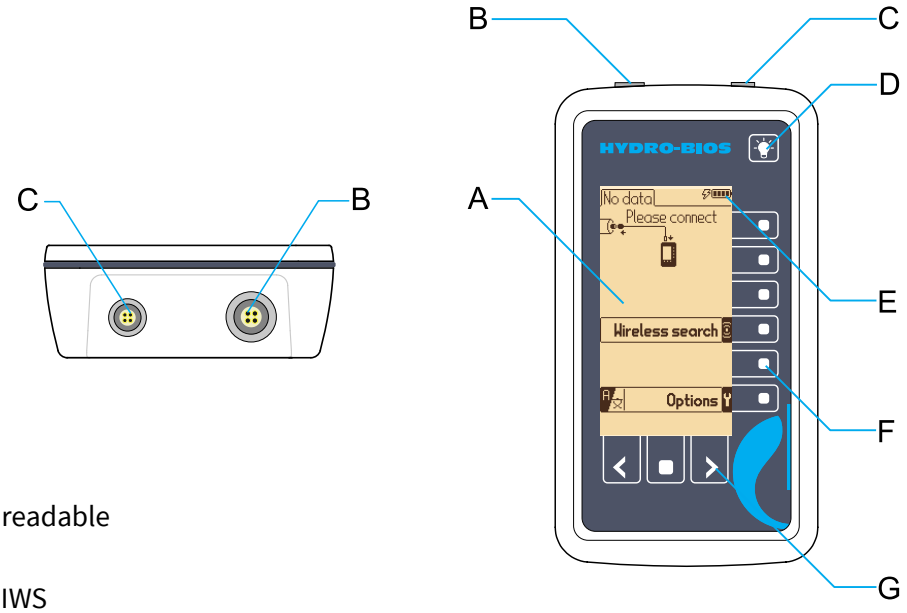
NOTICE

The power-save function does not apply when the sampler is operated in time integrated sampling mode or when a data connection to the control unit or a PC is active.

CONTROL UNIT BASIC OPERATION

The control unit is a portable user interface for the IWS 4. It can be used to view live status data, prepare and perform deployments as well as to view protocol files after deployment.

Communication to the IWS may be established wirelessly, via full speed serial cable and via long distance telemetry. The control unit can also connect to a PC via USB port, translating the telemetry signal to USB protocol. This enables full control on the PC using the OceanLab software (version 4.3 or later).



A. LCD-Screen
backlit and sunlight readable

B. IWS connector
cable connection to IWS

C. USB Connector
Use supplied USB cable to connect to OceanLab PC-software. Charging also occurs over this connector.

D. on-/off and display backlight switch
Turn the control unit on with this switch. While on, a short press will enable/disable the backlight and a long press will turn off the unit.
A *light bulb icon* in the top right of the display indicates that the display backlight is on. This way the user can notice a switched on backlight even in bright outside conditions and turn it off to save battery power.

E. battery charge indicator
A *flash icon* indicates that the control unit battery is being charged.

F. vertical soft buttons
An on-screen symbol and text will indicate that the button can be pressed in the current context.

G. horizontal soft buttons
An on-screen symbol and text will indicate that the button can be pressed in the current context. Typically used for flipping through pages or navigating menus.

The INTEGRATING WATER SAMPLER IWS 4 provides three different options for connecting the control unit to the sampler. Two of them are also used to connect the sampler to a PC. All communication channels provide identical functionality.

CONNECT WIRELESSLY

- Switch on the sampler by pressing the quick-start button at the sampler (for one second or less).
  This is necessary as the control unit is not able to switch on the sampler over the air.
  The IWS is now switched on and will wait for a wireless connection for 4 minutes.
- Switch on the control unit by pressing any button.
- Press **Wireless search** on the control unit.
- The control unit will search for any IWS that are switched on and
  - automatically connect if it only finds one IWS,
  - present a list of up to 6 IWS with their ident numbers to choose from should more than one IWS be found. The ident number can be found on the label on top of the IWS.

*Wireless connectivity can be used for programming / activation only, **not** for monitoring the deployment since water will block the radio signals. For underwater monitoring purposes use long-distance telemetry instead.*

CONNECT VIA SERIAL CABLE

The communication via full speed serial cable is provided as an alternative to wireless communication. The supplied cable is 2 m long.

- Slightly grease the pins of the underwater connectors of the underwater unit and the full speed serial cable (Fig. 1 C) with PIN-lubricant.
- Connect IWS to the control unit via the full speed serial cable.
- Switch on the control unit by pressing any button – the control unit will automatically switch on the IWS.
- Optional: connect the PC via the supplied USB to control unit cable (Fig. 1 E) and start OceanLab.

CONNECT VIA LONG-DISTANCE TELEMETRY

Telemetry is used for applications where a supervision of the sampler is needed during the entire operation.

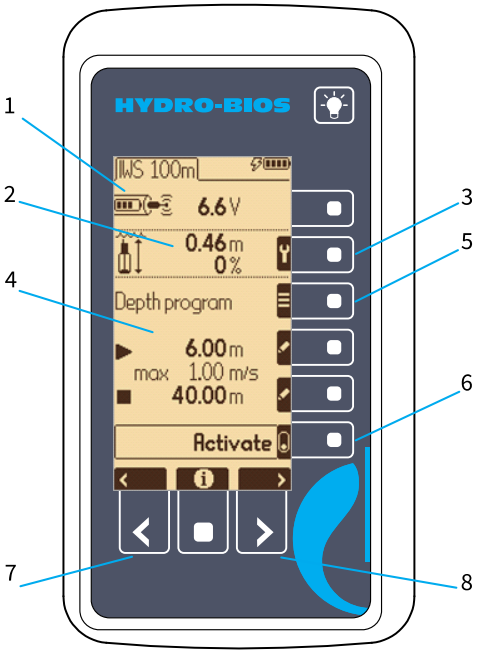
- Connect IWS to the control unit via the telemetry cable (buy separately).
- Switch on the control unit by pressing any button – the control unit will automatically switch on the IWS.
- Optional: connect the PC via the supplied USB to control unit cable and start OceanLab.

Please contact HYDRO-BIOS in case you want to use the long-distance telemetry. Usually you will already have an adequate electro-mechanical cable available which has to be adapted by fitting adaptor cables or connectors.

MAIN SCREEN

As soon as a valid communication between control unit and sampler has been established, the following screen will be displayed:

1. IWS battery charge state
2. Current depth and % filling
3. Press to:
   - choose between meter and dbar [1]
   - choose the inlet location / orientation
   - set pressure sensor offset
   - reset the pressure sensor (air pressure compensation)
4. Currently chosen programming method with settings
5. Press to choose between available programming methods and manual control
6. Activation button to start program
7. Press left to flip through previous deployment protocol pages
8. Press right to access more options such as
   - clock setting
   - display and language settings
   - showing the device's ident number



NOTICE

When the battery voltage falls below 5 V the sampler will be switched off automatically. Before restarting the battery of the sampler must be charged.

[1] *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.*

PC CONNECTION

The IWS is designed to be operated using the control unit – no PC necessary.

Nevertheless the sampler supports to be operated by the OceanLab software (PC) via USB cable. This is typically only done during production and factory maintenance.

That being said, there *are* a few additional use cases for a PC connection:

- Exporting PDF reports of protocol files.
  The control unit can only display them.
- Plotting diagnostic / service data such as
  - motor current
  - status
  - pressure
  - % filling
- Editing calibration coefficients for e.g. the pressure sensor.

USB CONNECTION TO PC

- Connect the PC to serial cable (Fig. 1 D) to the IWS and the PC.
- Start OceanLab software (version 4.3 or later required).
- Press the **Connect** button in OceanLab.
- To view protocol files press **View** > **Controlling mode** and then **Protocols** in the component window on the left.
- Follow the on-screen instructions and the OceanLab help file.

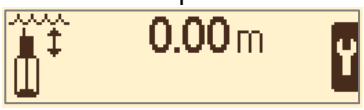
PRESSURE OFFSET

SETTING UP START AND END DEPTH (VERTICAL OR HORIZONTAL DEPLOYMENT)

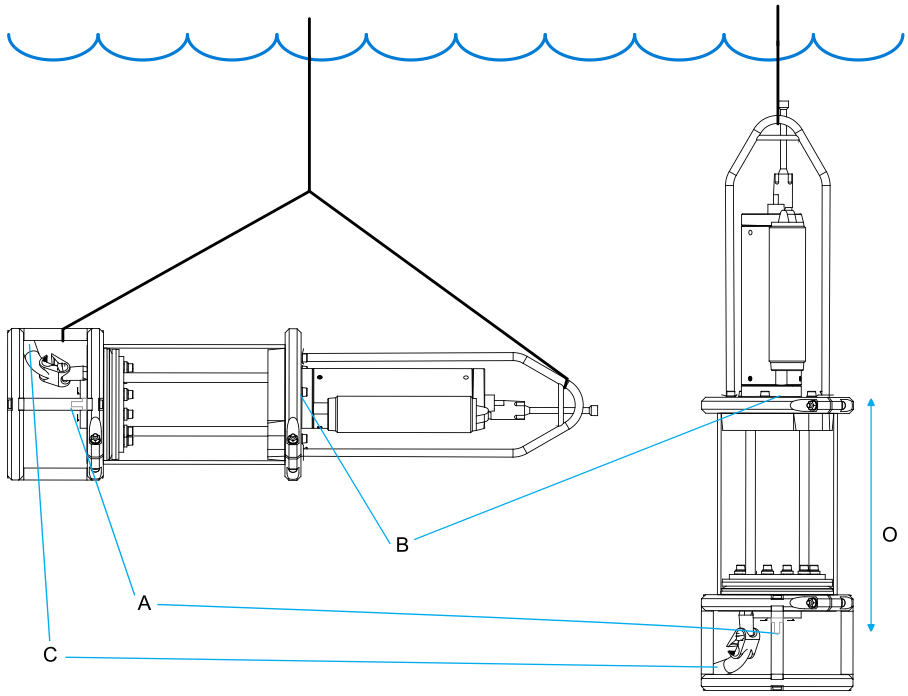
- The end depth may not exceed the device depth rating (e.g. 100 m).
- Desired **start depth 1 m or deeper?**
  - Deploy **vertically.**
  - Make sure the pressure offset is set to measure at the bottom of the device.



  - Press on the wrench symbol to change the offset if it is set incorrectly.
- Desired **start depth shallower than 1 m?**
  - Deploy **horizontally.**
  - Make sure the two air holes in the clear acrylic cylinder face upwards to avoid water dripping out after deployment.
  - Make sure the pressure offset is set to measure at the pressure sensor.



  - Press on the wrench symbol to change the offset if it is set incorrectly.



A.water inlet

B. pressure sensor location

C. drain hose

O. offset between inlet and pressure sensor

Technical background regarding the offset: The inlet is 0.46 m (5 l model) respective 0.3 m (2.5 l model) below the pressure sensor. This pressure sensor offset is stored in the device such that it can determine the exact water depth ***at the inlet.***

This offset also means the minimum depth for IWS deployment in ***vertical orientation*** *is 0.46 m resp. 0.3 m. To allow sampling starting from the surface, the IWS can be deployed horizontally[2]. When doing so, the device needs to be told that this is the intention by setting the offset to zero.*

Even if deployed vertically, the IWS will first float into an almost horizontal position for some seconds when lowered into the water until the area above the piston fills with water. This makes it difficult to ensure the sensor never reads deeper than 0.46 m resp. 0.3 m. This is why ***we recommend the horizontal deployment for all start depths shallower than 1 m.***

[2] Some of our customers have used a pipe to extend the inlet back up to the sensor height as an alternative to horizontal deployment. We do however not recommend this due to the added dead volume and increased water friction (especially with small diameter or flexible pipes) which could lead to the motor stalling / failed deployments.

DEPTH PROGRAM

The IWS's depth programming mode enables sensor-guided integrated composite (mixed) sampling of water columns or layers with a single cast.

CONTROL UNIT SETTINGS

- Establish your preferred connection between control unit and sampler.
- Press and select **Depth program** from the mode menu.
- Ensure that the piston is at the bottom and that 0 % is correctly displayed by the control unit.
  If either is not:
  - Open the outlet hose clamp.
  - Press **Empty sampler** on the control unit.
- Set sampling parameters by editing **Start depth** ▶ (upper limit) and **End depth** ■ (lower limit).
  - Example: start depth 1 m, end depth 30 m.
  - If depths <1 m are supposed to be sampled*:* Observe the PRESSURE OFFSET as described on page 16.

  Editing depth parameters is possible only at 0 % filling (piston all the way down)!
- Your input is stored in the control unit persistently. Press to flip through the protocols. Use the **Copy** button to reapply previously used settings.
  This is especially useful when a handful of depth intervals are used repeatedly.
- The control unit will calculate and display the maximum allowed descent rate in the default screen. *Exceeding that speed will fail the integrating process (the piston cannot keep up with the casting speed) and abort the program indicated by a new protocol entry* (**cast too fast**).

SAMPLER PREPARATION

- While the data connection is still active, check the sampler's battery status as displayed by the control unit. *Charge sampler for at least 5 – 10 minutes if the icon is flashing.*
- Once on site re-establish data connection and press next to the default screen's depth reading. Increase sampling accuracy by pressing **Reset** to compensate air pressure fluctuations.
- Return to the default screen and press **Activate**. The sampler is now armed and will react to changes in pressure.
- Close the outlet's hose clamp.
- Securely fasten the sampler to your rope / cable.

DEPLOYMENT

- Start the downcast constantly observing the descent rate limit as calculated by the control unit.
  Once the desired depth is reached make sure to pay out extra rope to account for current(s) and drift.
  Not reaching the programmed depth will fail the integration process, leading to an incomplete sample and abort the program indicated by a new protocol entry (**cast too shallow**).
- *Reel in the sampler.*
- Retrieve the water sample as described on page 22.

TIME PROGRAM

The IWS's time programming modes enables obtaining water samples integrated (accumulated) over a preset time span of up to 24h. The individually specifiable interval is set independently from calendar date to allow periodic usage without needing to re-program the sampler.

CONTROL UNIT SETTINGS

- Establish your preferred connection between control unit and sampler.
- Press and select **Time program** from the mode menu.
- Ensure that the piston is at the bottom and that 0 % is correctly displayed by the control unit.
  If either is not:
  - Open the outlet hose clamp.
  - Press **Empty sampler** on the control unit.
- Set sampling parameters by editing **Start time** ▶ and **Run time** ■.
  - Start time as time of day (hh:mm). Use to toggle hours / minutes.
  - Run time as duration (hh:mm). Use to toggle hours / minutes.

  Editing time parameters is possible only at 0 % filling (piston all the way down)!
- Your input is stored in the Control Unit persistently. Press to flip through the protocols. Use the **Copy** button to reapply previously used settings.
  This is especially useful when a handful of time intervals are used repeatedly.

SAMPLER PREPARATION

- While data connection still active check the sampler's battery status as displayed by the control unit. *Charge sampler for at least 5 – 10 minutes if the icon is flashing.*
- Once on site re-establish a data connection and double-check current time and start time as displayed by the control unit. If necessary, edit the start time value to ensure a time gap sufficient to complete preparations and reach the desired depth. Next, press **Activate**. The IWS will begin moving the piston upon the specified start time.
- Close the outlet's hose clamp.
- Securely fasten the sampler to your rope / cable.

DEPLOYMENT

- Lower the sampler to the desired depth.
- Wait for the start time and run time to pass.
- Reel in the sampler.
- Retrieve the water sample as described on page 22.

SPOT SAMPLE

The IWS's spot sampling mode enables sensor-guided sampling from one individually specifiable depth (spot).

The sampling is automatically triggered by the IWS when the following conditions are met in this order

1. The IWS is lowered into the water with at least 10 cm/s for at least 3 consecutive seconds.
2. The IWS stops and is kept within ±30 cm of this target depth for ten seconds.

On a fully charged battery filling the sampler will take between 50 seconds (2.5 l model) and 100 seconds (5.0 l model).

Once sampling starts it will complete regardless of changes in depth!

CONTROL UNIT SETTINGS

- Establish your preferred connection between control unit and sampler.
- Press and select **Spot sample** from the mode menu.
- Ensure that the piston is at the bottom and that 0 % is correctly displayed by the control unit.
  If either is not:
  - Open the outlet hose clamp.
  - Press **Empty sampler** on the control unit.
  - If depths <1 m are supposed to be sampled*:* Observe the PRESSURE OFFSET as described on page 16.

SAMPLER PREPARATION

- While the data connection is still active check the sampler's battery status as displayed by the Control Unit. *Charge sampler for at least 5 – 10 minutes if the icon is flashing.*
- Once on site re-establish a data connection and press next to the depth reading. Increase sampling accuracy by pressing **Reset** to compensate air pressure fluctuations.
- Return to the default screen and press **Activate**. The sampler is now armed and will react to changes in pressure.
- Close the outlet's hose clamp.
- Securely fasten the sampler to your rope / cable.

DEPLOYMENT

- Lower the sampler to the desired depth.
- 2.5 l model: Maintain depth for min. 60 seconds (10 sec. to trigger + 50 sec. to fill).
  5.0 l model: Maintain depth for min. 110 seconds (10 sec. to trigger + 100 sec. to fill).
- Reel in the sampler.
- Retrieve the water sample as described on page 22.

MANUAL CONTROL

The IWS's manual control mode enables to individually sample arbitrary depths. Sample integration can be started, paused, and resumed any time. This mode requires maintaining a telemetry connection throughout the deployment and a suitable cable / winch and adapter cables.

Since manually actuating the piston is considerably less precise than sensor-guided modes it is recommended to utilise the IWS's depth programming mode for true integrative sampling.

This mode is also useful for testing / troubleshooting on land or in the office.

CONTROL UNIT SETTINGS

- Establish your preferred connection between control unit and sampler.
- Press  and select **Manual control** from the mode menu.
- Ensure that the piston is at the bottom and that 0 % is correctly displayed by the control unit.
  If either is not:
  - Open the outlet hose clamp.
  - Press **Empty sampler** on the control unit.

SAMPLER PREPARATION

- While the data connection is still active check the sampler's battery status as displayed by the control unit. *Charge sampler for at least 5 – 10 minutes if the icon is flashing.*
- Once on site re-establish data connection and press  next to the default screen's depth reading. Increase sampling accuracy by pressing **Reset** to compensate air pressure fluctuations.
- Close the outlet's hose clamp.
- Securely fasten the sampler to your rope / cable.

DEPLOYMENT

- Lower the sampler to the desired depth.
- Press **Fill sampler** to start sampling.
- Press **Stop** to suspend sampling.
- Move sampler to the next desired spot.
- Repeat according to your requirements.
  Avoid pressing **Empty sampler** *while the IWS is submerged and its outlet clamped shut. This will likely cause the sampler to lose its reference point resulting in a failed cast with the piston moved all the way to the cylinder ceiling.*
- Reel in the sampler.
- Retrieve the water sample as described on page 22.

RETRIEVING THE SAMPLED WATER

After deployment the integrated (mixed) water sample can be retrieved as follows:

- Make sure the sampler is filled to 100 % by connecting the control unit or checking whether the piston has travelled up until the point between the two small airholes in the clear cylinder.

  If the sampler is not filled to 100 %, probably something went wrong (e.g. the sampler was not cast deep enough). Connect the control unit and check the protocol () for a hint as to what happened.

- Place a container with sufficient capacity under the outlet.
- Open the outlet hose clamp.

  The water will start running immediately.

It is possible but not recommended to use the **Empty sampler** command to have the motor push out the water slightly faster.

NOTICE



Do not use the quick start button to empty the sampler. This will activate the sampler, which in turn will lead to unexpected movement (especially if it was previously set to time programming) and increased battery use.

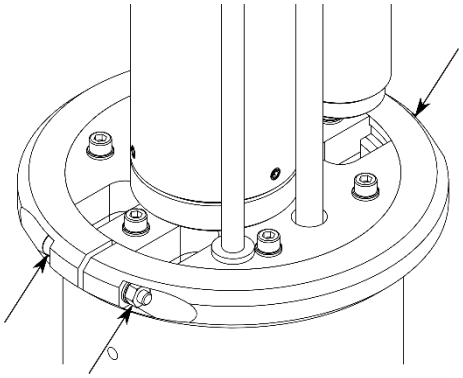
REPLACEMENT OF THE PISTON GASKET

The gasket can be replaced regardless of the piston's position (i.e. % filling).

Ensure the sampler to be INACTIVE (indicated by the control unit's default screen showing an option to activate it). Disconnect the control unit and switch it off to avoid a sudden start of the piston drive.

Open the outlet's hose clamp at the bottom of the sampler.

To remove the upper locking ring undo both of its screws (see sketch) with the supplied hexagon socket screw key 5 mm and box spanner 10 mm.

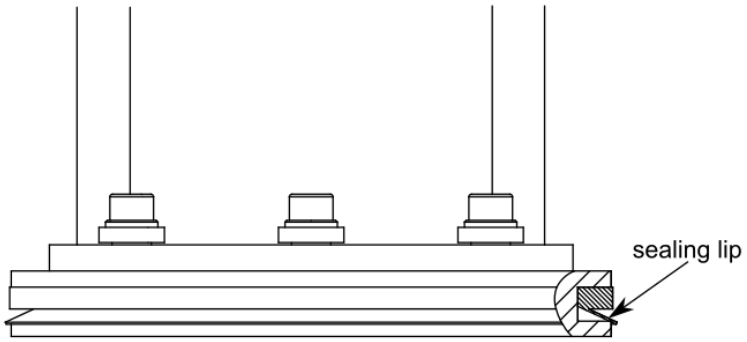


Without locking ring the piston assembly (incl. drive housing) can now be pulled out of the transparent tube. Pull on the metal hoop vertically while holding the tube.

Remove the piston gasket. Stitch a robust needle into the solid rectangular zone of the gasket and lift the gasket out of its groove. Make sure that the groove itself is not getting damaged by the needle.

Clean the groove with a lint free cloth, if necessary.

Insert a new gasket into the groove. **Observe correct position of the gasket in the groove** (see sketch). The thin sealing lip of the gasket must sit close to the lower side of the groove.



Moisten the gasket with tap water and insert the piston into the sampling tube.

Carefully insert the piston into the tube and push the assembly until it meets the transparent tube.

Re-clamp the upper locking ring. **Check the locking ring to correctly fit the tube's groove before tightening the screws!**

REPLACEMENT OF THE RECHARGEABLE BATTERY

1. Open battery housing by unscrewing lid (counter-clockwise).
2. Disconnect color-coded plugs (black / red).
3. Extract battery.
4. Insert new battery (wires pointing upwards).
5. Connect color-coded plugs (black / red).
6. Store excess of wire(s) between battery and housing.
7. Check sealing surface (battery housing) and O-ring (lid) for dirt or damage. Electrical safety may be compromised if not intact. Use only lint-free cloth for cleaning. Grease O-ring with supplied lubricant.
8. Replace defective O-rings. If in doubt, replace worn O-rings.
9. Close battery housing by tightening lid (clockwise). Exercise caution not to pinch any wire(s).

LOCALIZATION OF FAULTS

THE SAMPLER DID NOT FILL AT ALL / NOT ALL THE WAY

Connect the control unit and press left to view the protocols (or connect to a PC running OceanLab and click on protocols). Look at the status message in the latest protocol file:

ERROR MESSAGES IN PROTOCOL FILES

“cast too fast”

The maximum speed displayed during programming was exceeded during the cast.

➔ *Retry with a slower descent speed.*

“cast too shallow”

The programmed end depth was not reached during deployment.

After activation, if the piston does not move for 15 min in any position the program aborts with this error message. This is to prevent the IWS from remaining active indefinitely after unintentional activation in e.g. the office.

➔ *Retry and lower the sampler sufficiently deep into the water.*

“motor stalled” and piston is somewhere in the middle after deployment

The motor stalled during deployment. This usually indicates a mechanical obstruction such as a blocked inlet, which resulted in the motor protection becoming active to avoid mechanical damage.

➔ *Check for mechanical obstructions. Try a manual fill / empty cycle. Contact Hydro-Bios if this does not help.*

“motor stalled” and piston is all the way up against ceiling after deployment

Likely the previous emptying operation stalled because e.g. the outlet clamp was closed while the piston was moving downwards. In that case the sampler incorrectly sets the zero position somewhere in the middle of the piston throw, which results in it hitting the ceiling during the next deployment.

➔ *Make sure the piston is all the way down before activating and then retry the cast.*

“did not finish”

This message appears when a time program was deactivated by the user before it could finish.

“battery empty”

When the battery is emptied during deployment (or the internal battery wiring is damaged / has a loose contact), a protocol file is stored with this message.

➔ *Charge the battery and retry.*

“battery weak”

If it says “weak” instead of “empty”, the battery has become empty AND has a higher than nominal internal resistance.

➔ *The battery may need replacement.*

“aborted by user”

Whenever the user hits the **Deactivate** button, a protocol file is stored with this message.

“did not start”

When in Spot sampling mode, the sampler will start filling when lowered and then not moved for a certain time (see section SPOT SAMPLE). When these specific starting conditions have not been met for 15 minutes, the protocol will display this message.

➔ *Retry the cast taking care to meet the starting conditions.*

There is no "Activate" button / the activate button is greyed out

The sampler can only be activated when at 0% filling.

➔ *Empty the sampler to enable the activation button.*

PISTON IS TOUCHING THE CYLINDER CEILING AFTER DEPLOYMENT

See section above: **"motor stalled" and piston is all the way up against ceiling after deployment**

NO DISPLAY ON CONTROL UNIT

Make sure the internal battery of the control unit is sufficiently charged by connecting the USB cable.

MESSAGE "BATTERY NOT DETECTED"

There could be a problem with the internal control unit battery. Contact HYDRO-BIOS for support.

MESSAGE "SHORT CIRCUIT" OR "REVERSE POLARITY"

See Chapter Troubleshooting the telemetry connection.

MESSAGE "INVALID DATA"

The control unit is not compatible with the connected IWS.

Contact Hydro-Bios for support.

TELEMETRY CONNECTION STOPS WORKING AS SOON AS THE DEVICE IS IN THE WATER

The telemetry data connection works fine on deck but stops working as soon as the motor unit of the IWS is submerged into the water? You likely have a single conductor cable and are using the armour as the second conductor with both the slip ring connectors and the underwater cable connected with reversed polarity. **Solution: Reverse the polarity at both ends then double check that the brown wire from the control unit goes to the armour.**

TROUBLESHOOTING THE TELEMETRY CONNECTION

In order for the connection to work the following conditions must be met:

- The IWS is switched on.
- The "GND" and "telemetry signal" pins on the control unit (Lemo connector) are connected to their respective counterparts on the IWS:
    - Without shorts or open circuits in any of the cables.
      Shorts on the telemetry interface won't damage the IWS but will impede the connection.
    - With correct polarity.
- If the winch cable armour is used as one of the conductors the GND pin should be connected to the armour (as opposed to the telemetry signal pin) - otherwise the signal may be shortened when the IWS is in water.
  Reason: the GND pin is electrically connected to the chassis of the IWS.

- The internal fuses of both the control unit and the IWS must be intact.
  The fuses may be blown if they were exposed to third party equipment that outputs high voltages (>>5V). The fuses cannot be blown by shorting the telemetry signal and ground pins.

The following procedure can help finding the cause of a telemetry connection issue. The assumption of this procedure is that the control unit and the IWS are currently connected over the long distance telemetry cable including the winch using winch adaptor cables at both ends.

Initial Tests

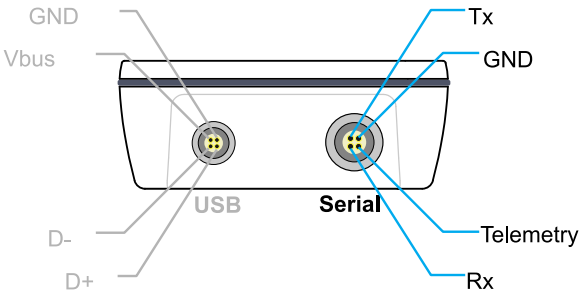
1. Make sure the IWS is switched on and has a sufficiently charged battery.
2. Unplug the telemetry cables from the control unit and from the IWS.
3. Establish a direct connection between the control unit and the IWS by plugging in the full speed serial cable (labeled J, ~2 m long).
   This cable has both the full speed serial pins and the telemetry pins connected.
4. Switch on the control unit.
5. Is the connection now possible?
   a. If so, a full speed serial connection has been established, meaning the power supply and the unit are working. Proceed with step 6.
   b. If a connection is still not possible, look for signs of damage on the full speed serial cable (J) and the connectors. If no damage can be found, go back to step 1 and double check the power supply.
6. On the control unit select **Telemetry test**, found under **Options**.
7. What does the test screen say?
   a. **Connection OK**?
      The telemetry works fine over this cable, meaning the control unit and the IWS (including their fuses) are not faulty. Proceed with **inspecting the winch and winch adaptor cables**.
   b. **Short circuit or wrong polarity**?
      This would only occur if the full speed serial cable is damaged. Look for signs of damage.
   c. **Searching**?
      Proceed with **checking the fuses** in the control unit and the IWS.

Checking the Fuses

This step can be skipped if the direct connection over the full speed serial cable passed the **Telemetry test**.

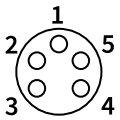
1. Switch on the control unit.
2. Disconnect all cables.

3. Using a multimeter set to DC voltage, measure the voltage between pins 4 (GND) and 3 (telemetry signal) of the serial plug (the larger of the two).



4. Does the voltage read between 1.5 V and 1.8 V?
    a. Yes: the fuse in the control unit is fine. Proceed with checking the IWS fuse in step 5.
    b. No: Open the control unit case and check the fuse using a multimeter in continuity mode. Replace if necessary and **repeat the procedure from the beginning.**

    If communication between IWS and control unit can now be established you may skip points 5, 6 and 7.
5. Wake up the IWS by shortly pressing the quick start button.
Note: this makes sure the IWS stays on for the duration of this test.
6. Using a multimeter set to DC voltage, measure the voltage between pins GND and telemetry signal of the IWS's serial plug.
See picture below for the pin configuration.
Alternatively the minus probe of the multimeter (which has GND potential) could be held on to the flange, using the plus probe to successively check all the pins of the connector for voltages between 1.5 V to 1.8 V.



1 GND
2 Telemetry
3 Charge
4 Tx
5 Rx

7. Does the voltage read between 1.5 V and 1.8 V?
    a. Yes: the fuse in the IWS is fine.
    At this point, the procedure did not yield any results. Contact Hydro-Bios.
    b. No: The fuse is blown and has to be replaced. For replacement instructions contact Hydro-Bios.

Inspecting the winch and winch adaptor cables

1. Unplug the full speed serial cable (C) and plug in all the telemetry connections incl. winch.
2. Switch on the control unit.
3. Activate the IWS using the control unit soft button.
Note: this makes sure the IWS *stays on for the duration of this test.*
4. Activate the **Telemetry test** mode on the control unit.
5. What does the control unit display?
    a. It reads **Short circuit or reverse polarity**:
        i. Reverse the polarity in the slip ring box.

ii. Has the telemetry test now passed?
- Yes: The fault has been identified and fixed.
- No: It must be a short then. Restore the original polarity and continue.

iii. Start unplugging the cable farthest from the control unit and work your way through all the cables until the short on the display disappears. The last cable unplugged has the short. **Fix the short and retest.**
Alternatively, a multimeter can also be used.

b. It reads **Searching**:
i. Plug in only the slip ring box cable to the control unit and unplug its other end.
ii. Apply a short to the open end.
iii. Does the control unit display **short circuit or reverse polarity** now?
- Yes: Continue to plug in the next cable and shortening it on the far end. The first cable that does not display a short is the one with the open circuit. **Fix the cable and retest.**
- No: **fix the slip ring box cable open circuit and retest.**

BACKLIGHT TURNS OFF AS SOON AS USB IS PLUGGED INTO PC / CHARGER

See section “Control unit is not charging with my wall wart” below.

OCEANLAB CANNOT FIND CONTROL UNIT EVEN THOUGH USB IS PLUGGED IN

See section “Control unit is not charging with my wall wart” below.

CONTROL UNIT HAS A BLINKING ICON NEXT TO THE BATTERY CHARGE INDICATOR

 See section “Control unit is not charging with my wall wart” below.

CONTROL UNIT IS NOT CHARGING WITH MY WALL WART

In the following scenarios:

1. control unit is connected to a PC in Suspend Mode (Standby, Hybernate etc.).
   - or -
2. control unit is connected to a USB charger (wall wart) which does not identify as a charger.
   - or -
3. The USB cable / plug is faulty or has corroded/dirty contacts.
   - or -
4. The USB cable is not plugged in all the way (usually at the PC side).

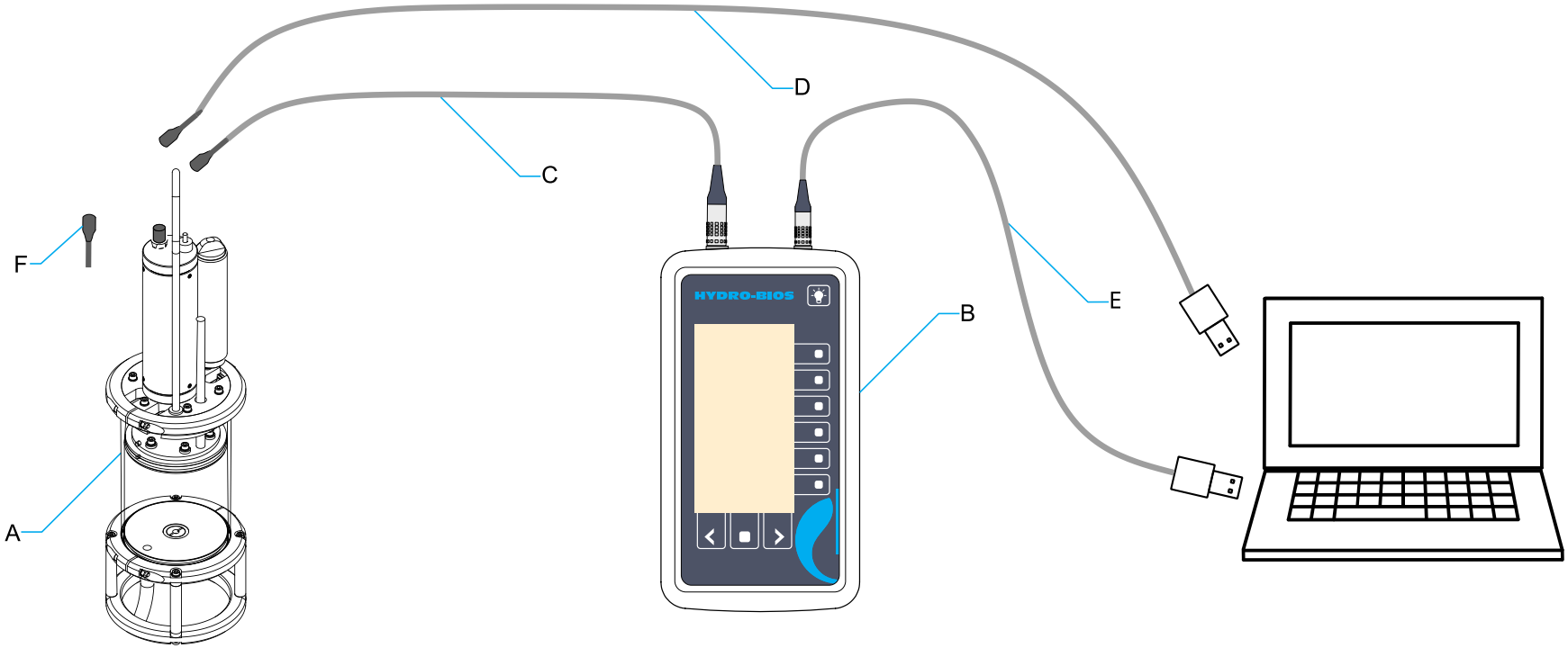
The control unit will behave as follows:

- It will refuse to charge.
- The backlight is turned off.
- A blinking Icon will appear at the top right of the screen.
  

Try the following to resolve depending on the cause above:

1. Wake the PC.

2. Try a different charger (wall wart).
3. Inspect the cable for damage or bad contacts and make sure the USB cable is plugged in straight and all the way.
4. Try a different USB port on the PC.



A. IWS 4

B. control unit

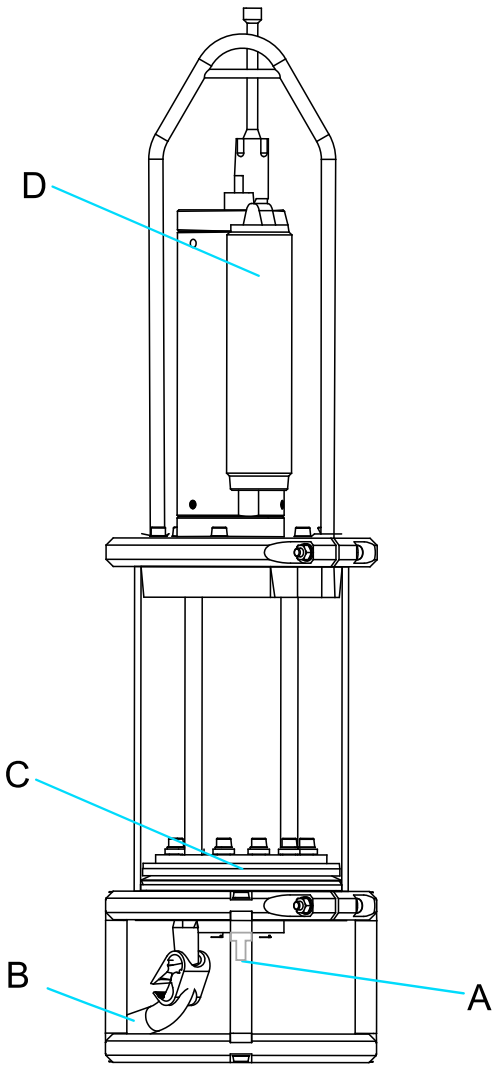
C. full speed serial cable

D. PC to serial cable

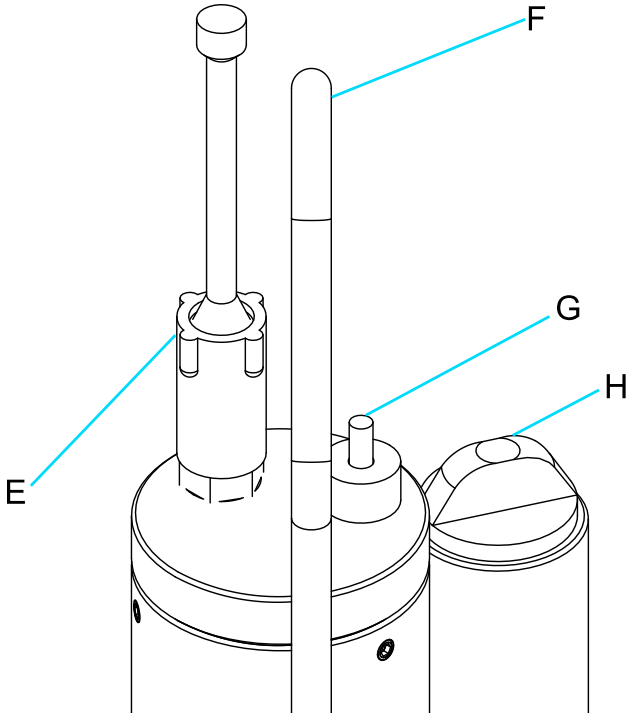
E. control unit serial cable to PC

F. dummy connector

Fig. 1: cable connection overview



A. inlet
B. outlet
C. piston
D. battery compartment



E. charging and communications adaptor
F. metal hoop
G. quick-start button
H. battery compartment

Fig. 2: IWS overviews

AMBER WIRELESS

7.2 Konformitätserklärung

CE

DECLARATION OF CONFORMITY
Directive 1999/5/EG (R&TTE)

The manufacturer: AMBER wireless GmbH
Albin-Köbis-Straße 18
51147 Köln
Tel. +49-2203-699-1950

declares on its sole responsibility, that the following product:

Type-designation: **BlueNiceCom 4 (AMB2300)**

Intended purpose: 2,4GHz-Bluetooth™ wireless data modem
Transfer of digital messages

satisfies all the technical regulations applicable to the product within the scope of council directives 2006/95/EC, 2004/108/EC and 99/5/EC if used for its intended purpose and that the following norms, standards or documents have been applied:

EN 300 328 V1.7.1 (2006-10)
EN 301 489-1 V1.6.1 (2005-09)
EN 301 489-17 V1.2.1 (2002-08)
EN 50371 (2002-11)
EN 60950-1 (2006-11)

FCC 47 CFR Part 15C - Intentional Radiators ANSI C63.4-1992
FCC-ID R7TAMB2300
RSS210 Issue 6 (09-2005), RSS-GEN Issue 1 (09-2005)

Köln, 03.12.2008
place and date of issue

Manufacturer/Authorized representative
Ulf Knoblich

Fig. 3: declaration of conformity

7.3 Bluetooth SIG Qualification Design Certificate QDID B013784



Bluetooth SIG Qualification Design (QDL) Certificate

QDL Certificate: This certificate represents the Specifications declared by the Member as having passed the Bluetooth Qualification/Certification Process as specified within the Bluetooth Specifications and as required within the PRD 2.0.

Design Name: **BlueNiceCom 4**

This Product Design has passed the Bluetooth Qualification Process!

Certified

Specification Version: 2.0/2.0+EDR

QDID: B013784

Declared Specifications: Baseband Conformance, Radio, Service Discovery Protocol, Logical Link Control and Adaption Protocol, Generic Access Profile, Link Manager, RFCOMM, Serial Port Profile, Service Discovery Application Profile, Interoperability Test Specification, Summary ICS, Product Type

Member Company:	Requirements:	Project Dates:
Amber wireless GmbH Hawstr. 2a Trier, Rheinlandpfalz 54290 BQE: Carsten Steinroeder	1. Testing 2. Documentation 3. Assessment 4. Declaration 5. Listing 6. Marking 7. Compliance to Auditing and Enforcement	Assessment Date: February/29/2008 Listing Date: February/29/2008

Abbildung 9 SIG QDL Certificate

7.4 Compliance statement

FCC compliance statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1) This device may not cause harmful interference, and
2) This device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IC compliance statement

Operation is subject to the following two conditions:

1) this device may not cause interference, and
2) this device must accept any interference, including interference that may cause undesired operation of the device.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Fig. 4: Bluetooth SIG qualification design certificate