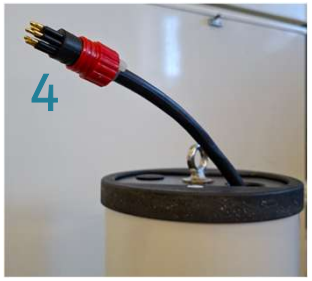
The ClearWater Sensors Nutrient Sensors. QuickStart Instructions.

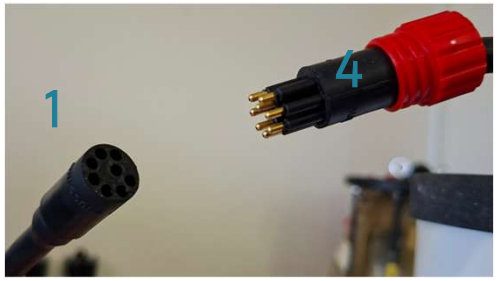
Unpacking the Sensor

Take the sensor out of its Peli case

Check against the included packing list whether all parts have been provided.

Connecting the Sensor to a PC





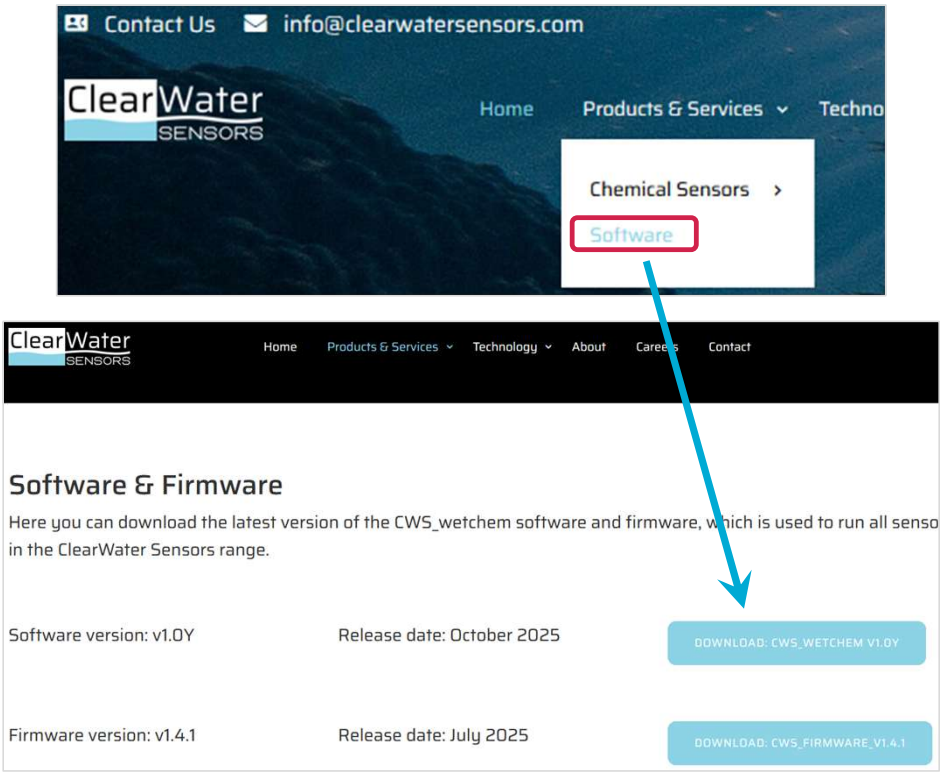
Use the supplied lab cable to connect the sensor to a computer:

- Connect the female SubConn connector end (1) to the male SubConn connector end protruding from the sensor top (4)
- Plug the USB end (2) into a computer
- Connect the banana plugs (3) to an external power supply (12 V required)

USB power is sufficient to 'talk' to the sensor, i.e. to view/change settings and download data.

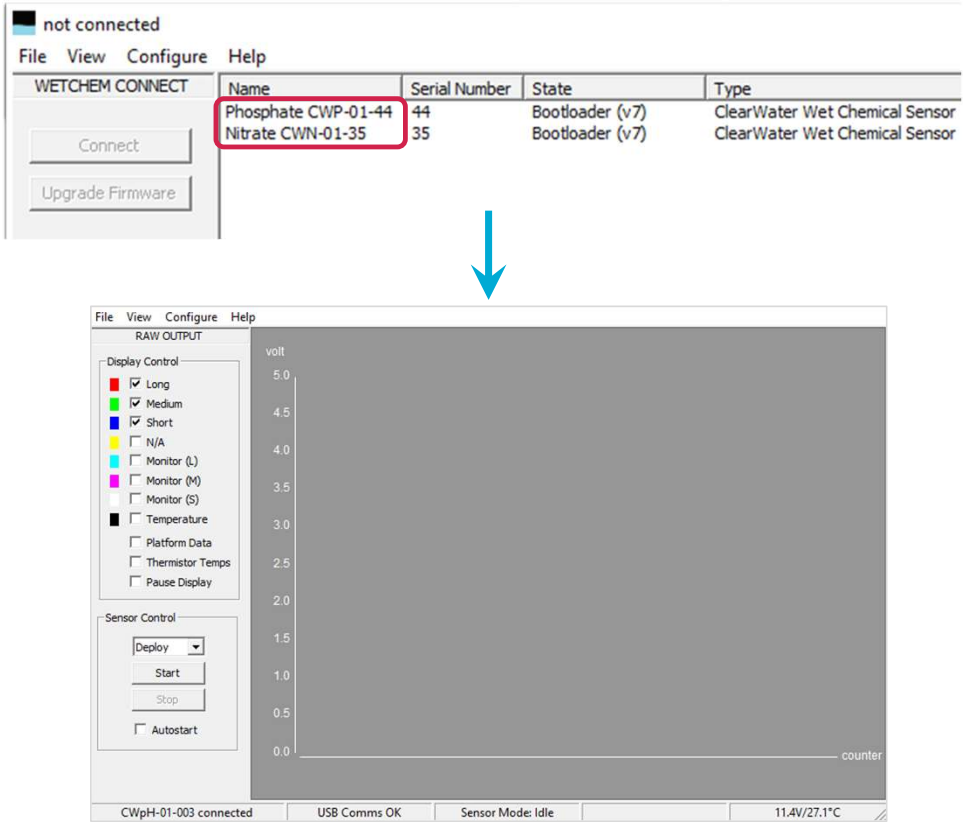
To run measurements, 12 V external power is required.

Software Installation



- Requirement: Windows 7 or later
- The software is included on the supplied USB key, or can be downloaded from our website: www.clearwatersensors.com/software.html
- No installation required;
  save the **CWS_wetchem** file to your computer

Opening the Software



WetChem Software Home screen

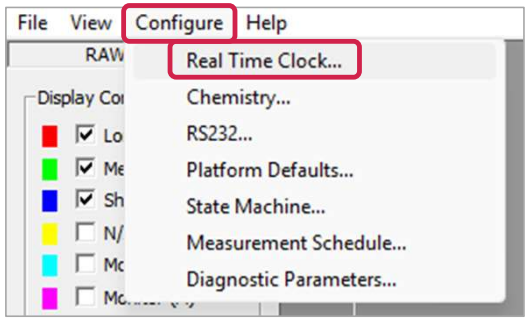
After connecting the sensor and saving the Wetchem software:

- Open the software.
  The sensor name should appear in the software.

- Double-click on the sensor name.
  [Or click on the sensor name once, then click 'Connect']

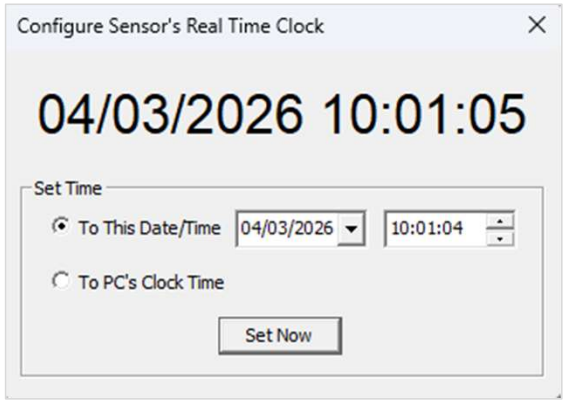
Multiple sensors can be connected to a PC simultaneously. For this, multiple copies of the software must be opened: Right-click on the software icon and click 'open'.

Setting the Real Time Clock



Check the sensor's time settings.

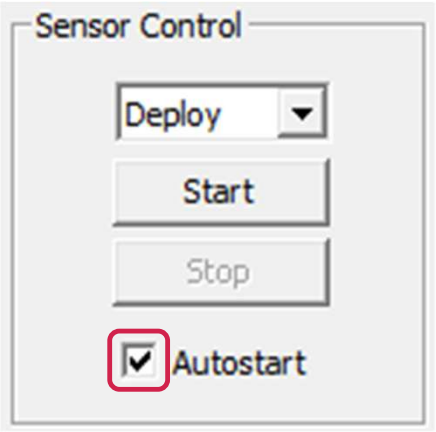
- Click 'Configure' in the menu
- Select 'Real Time Clock'



A new window pops up.

- Set date/time to local time, or to the PC's clock
- Click 'Set Now' to save the changes

Setting Autostart

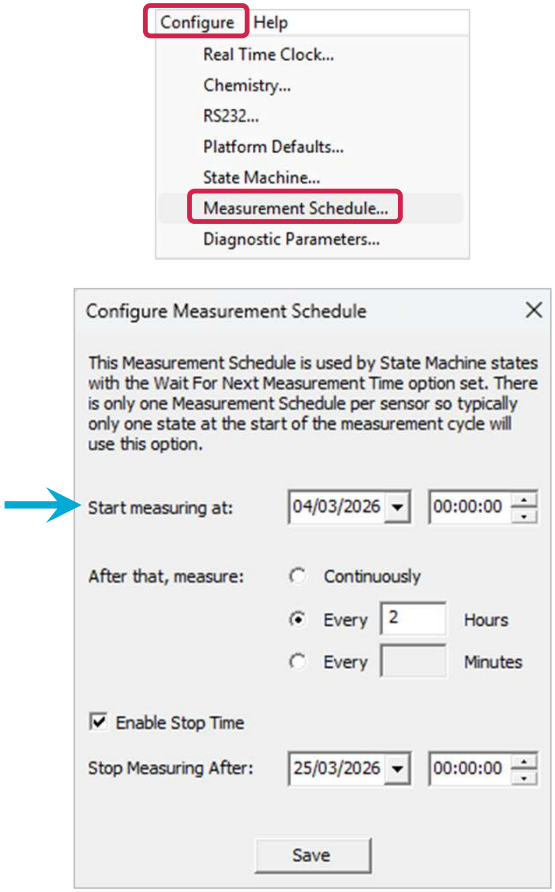


Tick the Autostart box (under ‘Sensor Control’).

Sensor will automatically start when powered up.

Sensor will automatically re-start after any temporary power-loss.

Measurement Schedule (I)



Open the 'Configure Measurement Schedule' window.
Set a start time, stop time, and measurement frequency.

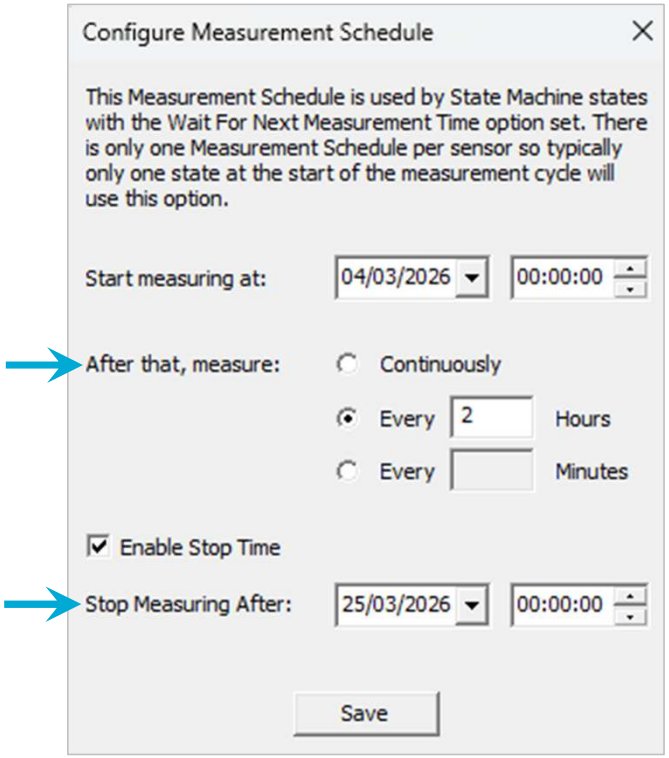
Start date/time

Any start *date* set in the past will be ignored. For the start time it is important to distinguish:
Is it set to an even or odd time?
Which digits are set in the minutes position?

- If it is 10:28 a.m. local time and you do not change the start time (so it is set to 00:00:00), autostart will trigger the first measurement to be taken at the next even hour exactly, so 12:00 p.m. in this instance.

- If it is 10:28 a.m. local time and you set the start time to 01:20:00, autostart will trigger the first measurement to be taken at 20 minutes past the next odd hour, so 11:20 a.m. in this instance.

Measurement Schedule (II)



Measurement frequency

'Continuously' → measurements at highest sampling resolution.
To measure at regular intervals, enter a value in hours or minutes.

Stop date/time

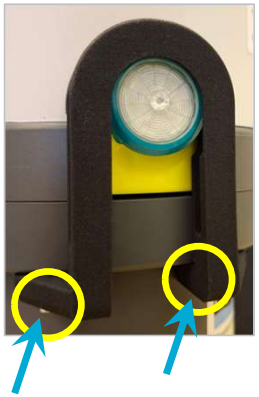
Tick the box 'Enable Stop Time'.

Set a stop time (in the future!) to ensure the sensor does not run out of reagents before you retrieve it.

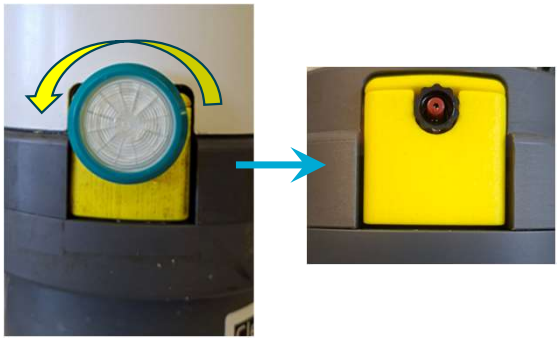
A stop time in the past will prevent the sensor from starting measurements!

Changing Filters

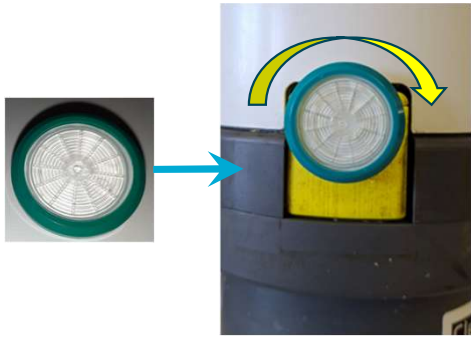
Remove the filter guard:
Unscrew the two screws on the bottom side of the guard.



Remove the filter by twisting it off anti-clockwise.

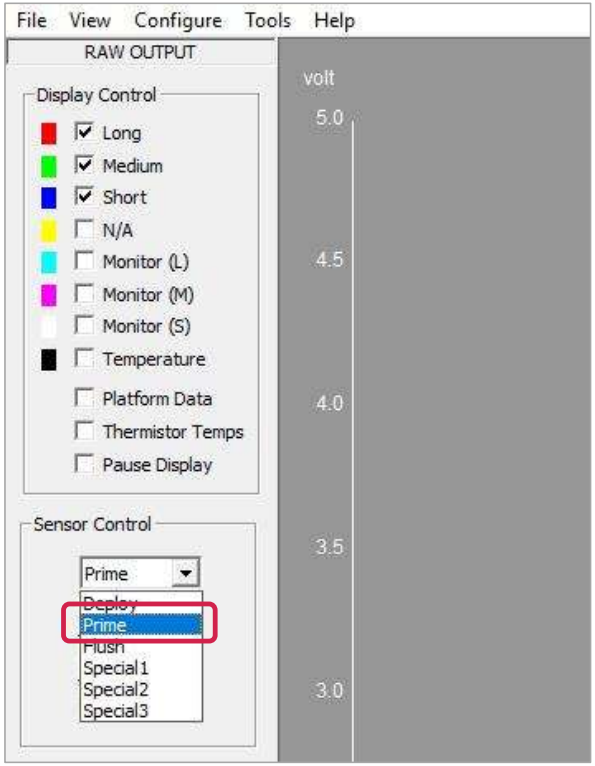


Attach a new filter by twisting it on clockwise.
Attach the filter guard.



The sensor comes with a new filter installed, which does not have to be replaced upon receiving the sensor.
This is a general instruction for future reference.

Priming the Filter



Sensor cannot measure with dry filter.

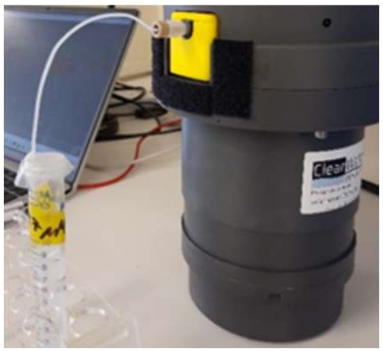
→ Run a 'PRIME' command

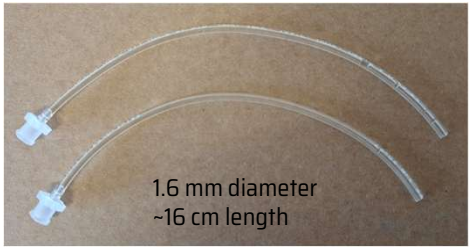
- Before deploying the sensor
- After replacing a filter
- When air might be in the filter
- When filter has dried out

Select 'Prime' under 'Sensor Control' and click 'Start'

Lab Tests (I)

Filtered Samples or Deionised Water

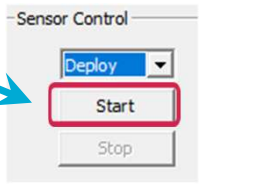


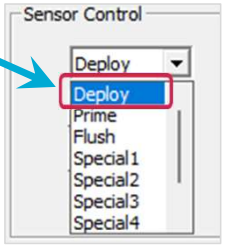


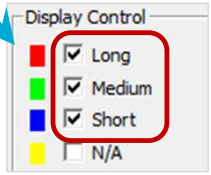
Filtered samples and deionised water can be attached directly to the sample inlet using the supplied tubes.

Alternatively, use any other tube with 1.6 mm diameter and 16 cm length, and attach the tube to a female luer connector

- Remove the filter guard
- Remove the filter from the sample inlet by twisting it off anti-clockwise
- Attach the tube directly to the sample inlet by twisting it on clockwise
- Submerse the tube into the sample you want to measure
- Select the channels you want to monitor under 'Display Control'
- Select 'Deploy' under 'Sensor Control'
- Click 'Start'

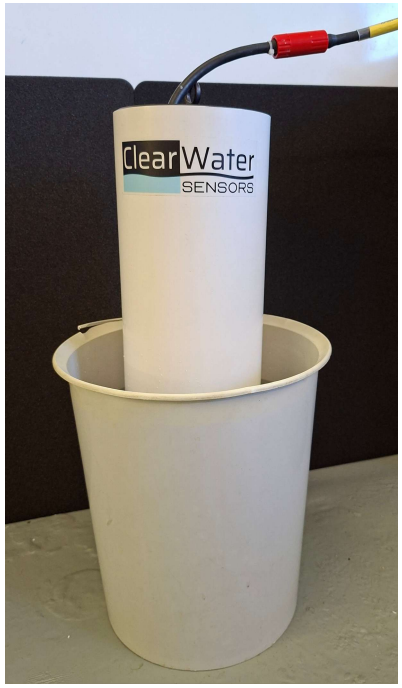






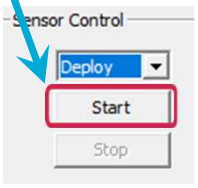
Lab Tests (II)

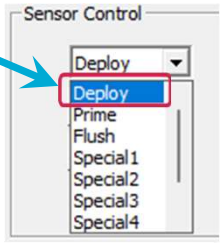
Unfiltered Samples

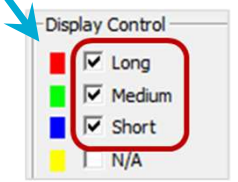


Unfiltered samples must be measured through a filter.

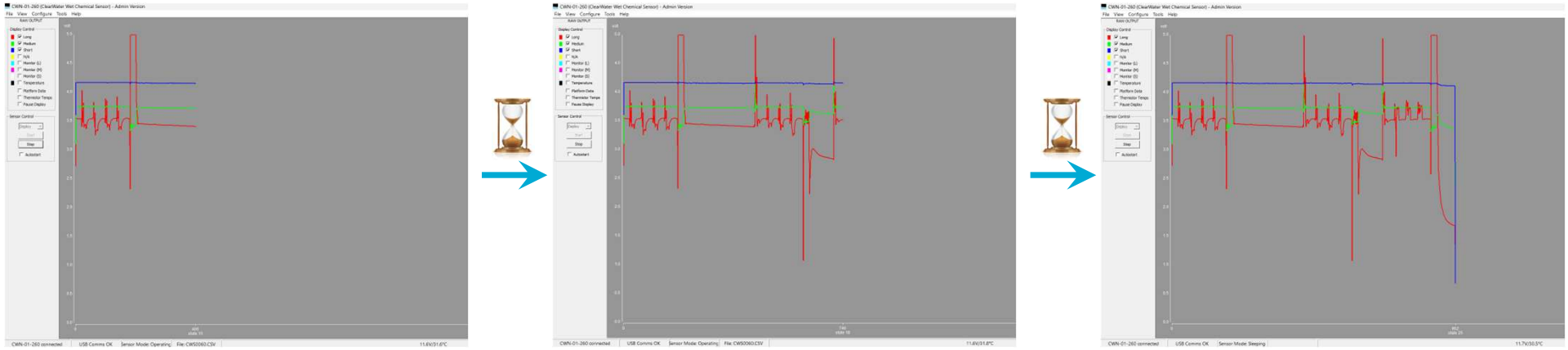
- Submerse the sensor into a bucket filled with sample water
- Select the channels you want to monitor under ‘Display Control’
- Select ‘Deploy’ under ‘Sensor Control’
- Click ‘Start’







Test Assessment

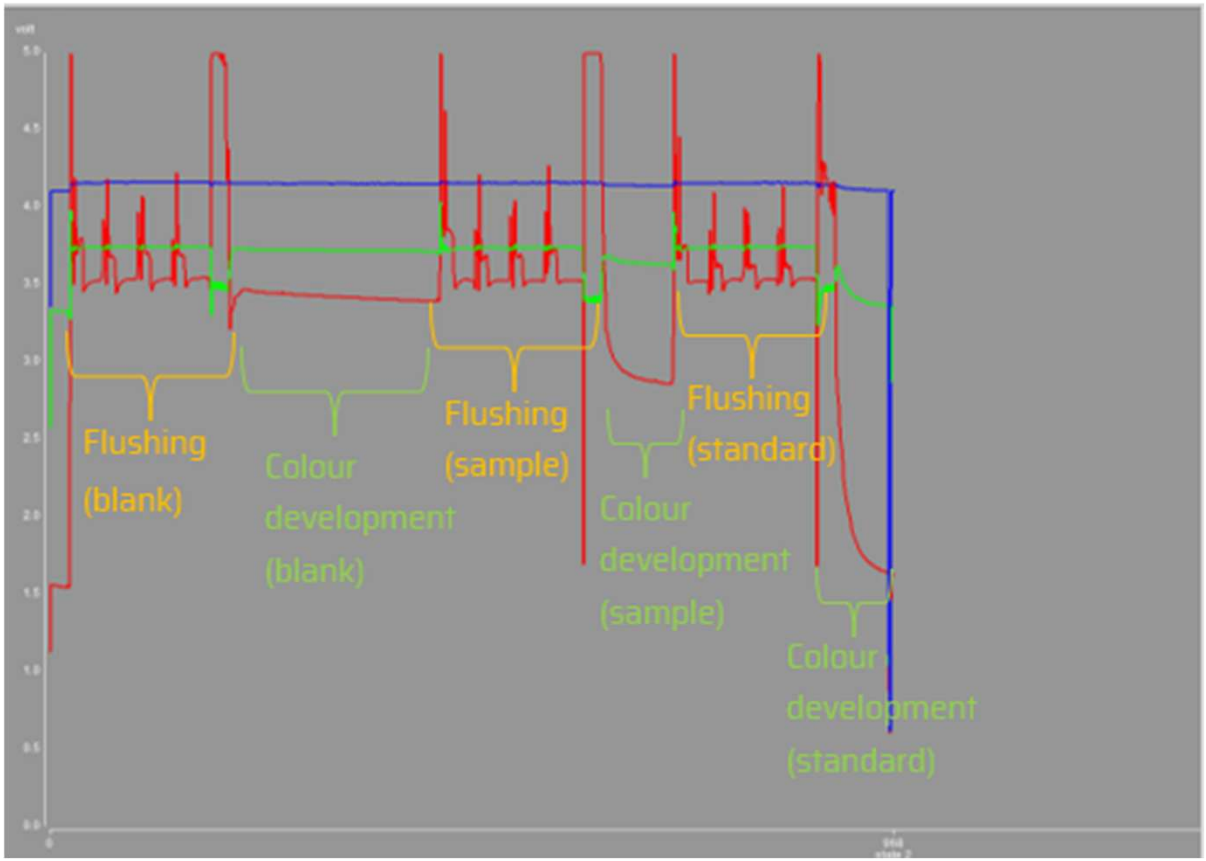


Observe the course of the test measurement(s).

The characteristics on the next slides will help you assessing the quality of your lab tests.

If the results are satisfying, the sensor is ready for deployment.

Characteristics of Good Profiles



Flushing
Signals equidistant and relatively regular
No big upward / downward fluctuations

Colour Development
Blank: Lines of blank curves are slightly going downwards

Sample: Lines of the sample curves are going downwards (depending on nitrate content of sample)

Standard: Lines of standard curves are going downwards

Signals of sample and standard yield lower voltages (i.e. higher absorbances) than blank signal

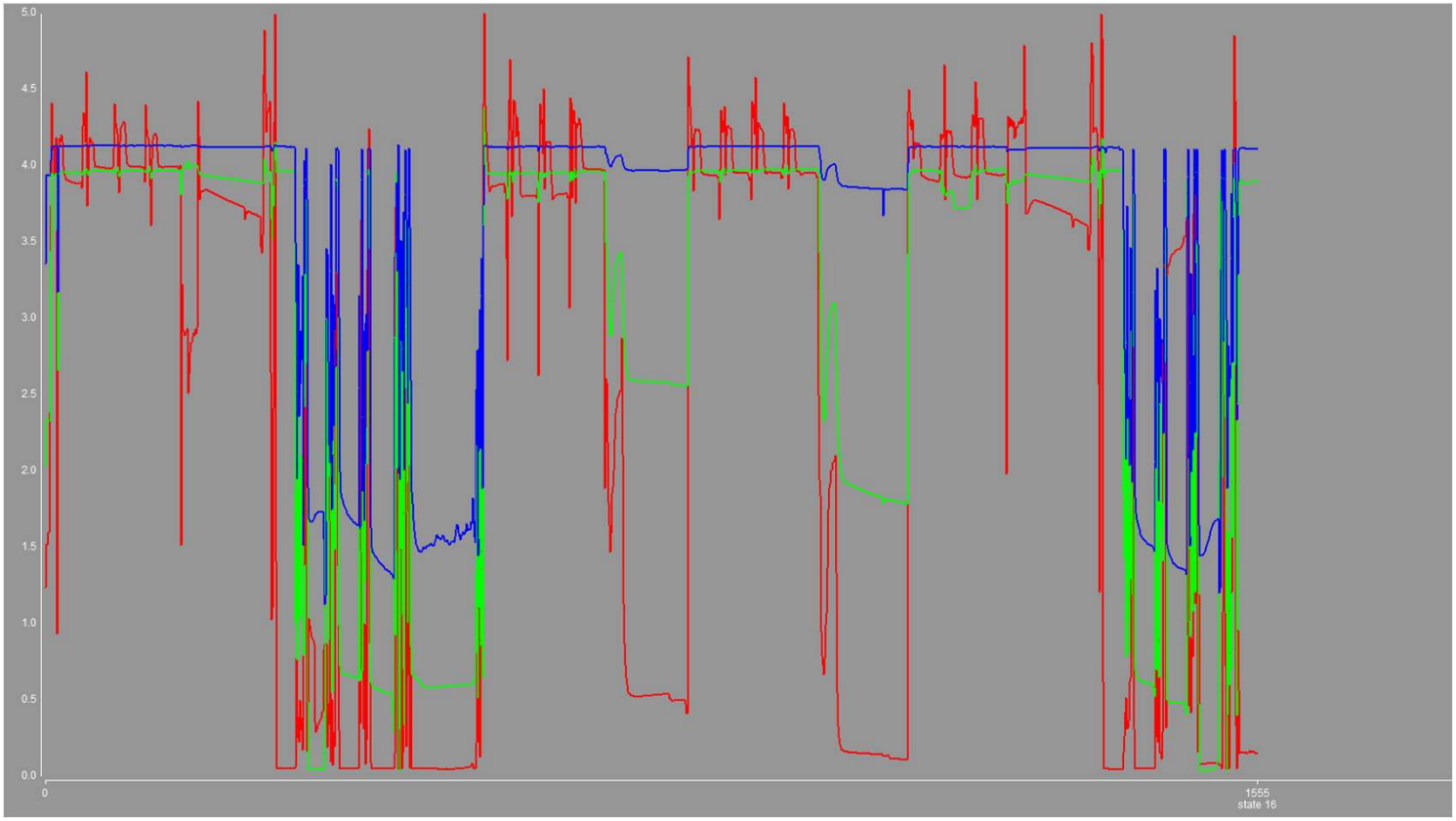
Generally
All lines are smooth, not wobbly

Peak bottom not flat and/or close to 0 V
(flat / 0 V → saturation, often indicating air bubbles)

Measuring same sample: shape/depth of sample curve consistent with previous measurements

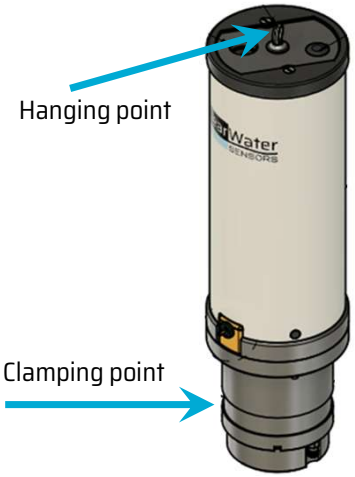
Screenshot shows measurement of nitrate sample.
But criteria will also apply to other sensors.

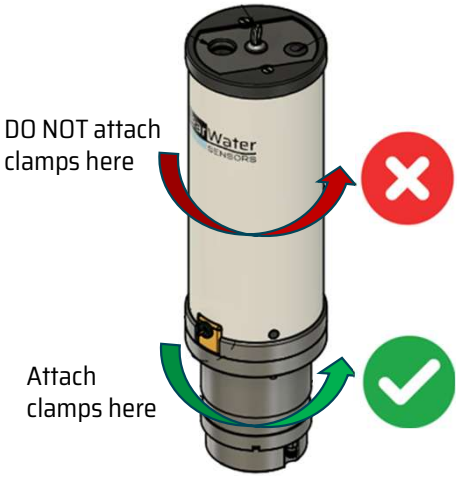
Example of a Bad Profile



Lines of sample curves irregular, big up and down fluctuations.
Signals bottoming out to 0 V during flushing.
Messy.
→ Air bubbles

Deployment Points on Sensor





Fixing:

Use hanging point or clamping point

Never put clamping around the white tube!

Deployment Position

Position:

Deploy upright or at an angle < 90°

DO NOT deploy horizontal, at angles > 90°, or upside down!

Examples of Deployments (I): Rivers

PVC tubes used for protection of sensor
(→ sensor put into PVC tube)

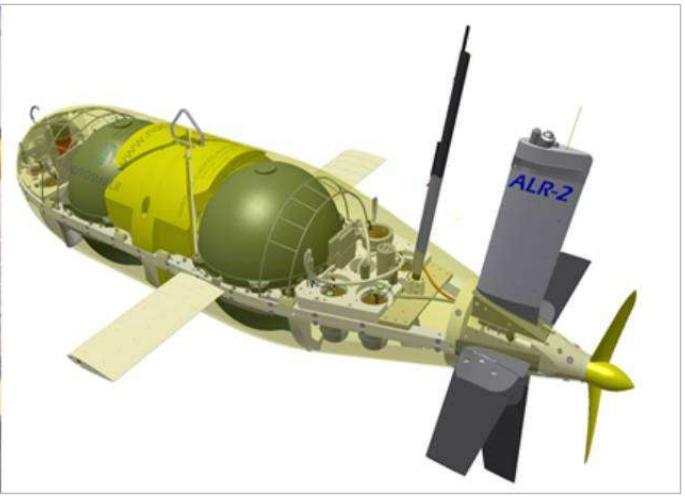
Rod at bottom end of tube supports sensor
(→ sensor 'standing' on rod)

Chain attached to sensor's hanging point for security and easy retrieving

Posts can be installed to fix the PVC tube
→ or use natural structures like trees

No mains power required; sensor can be connected to battery (which can be powered by a solar panel)

Examples of Deployments (II): Sea



Sensors can be connected to buoys, moorings, UAVs,...
Make sure sensor is thoroughly secured (also against physical impacts)
and in an upright position or at an angle <90° (see slide 18).

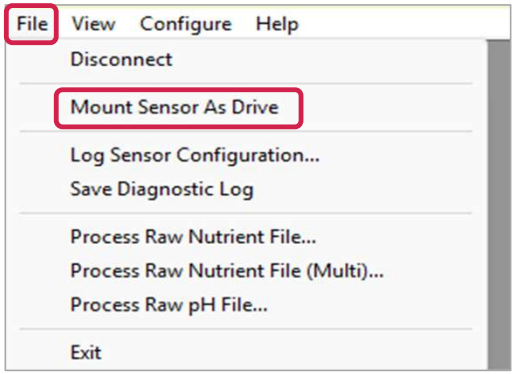
Examples of Deployments (III)

Whether in rivers or on the coast, some sites require specialist protection like the optional stainless-steel cage.
The sensor is placed into the cage. Foam or other cushioning materials inside the cage help absorbing mechanical impacts.

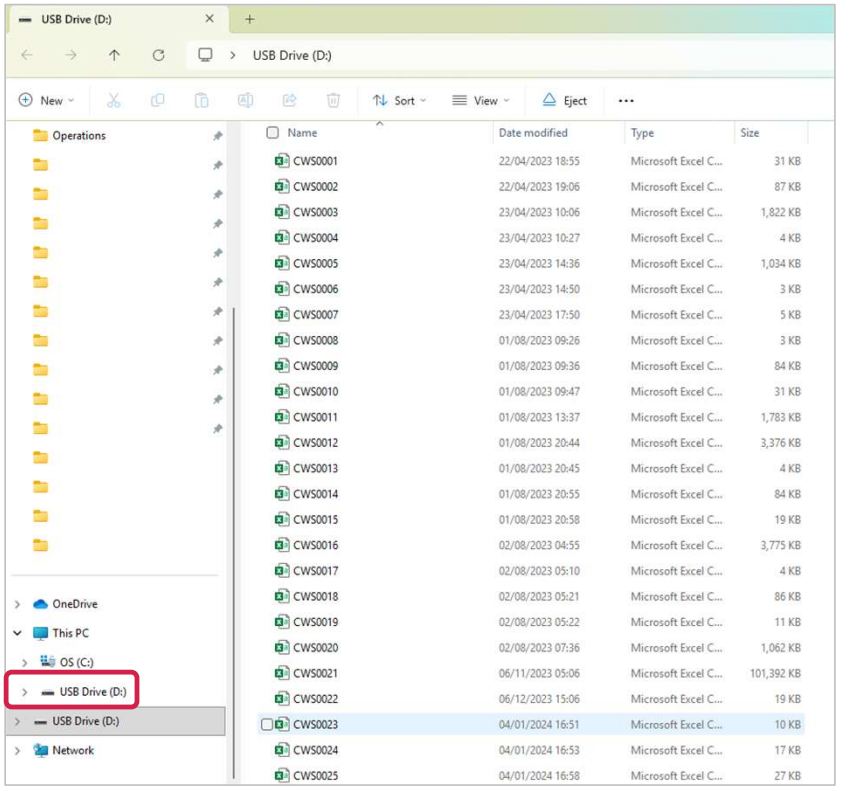
The cages can be mounted to rocks, hung from structures, or carefully placed on riverbeds (at an angle <90°!).
Secure the cages with chains.

Downloading Data

Connect the sensor to a PC via USB.

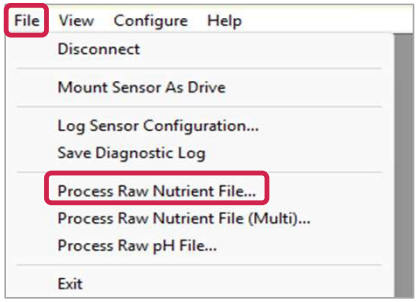


In the Menu, click ‘File’ and select ‘Mount Sensor as Drive’

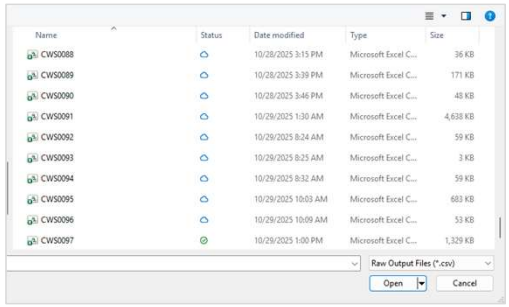


File explorer window pops up.
Sensor appears as drive in the file explorer.
Drag and drop any desired csv file(s) to your computer.

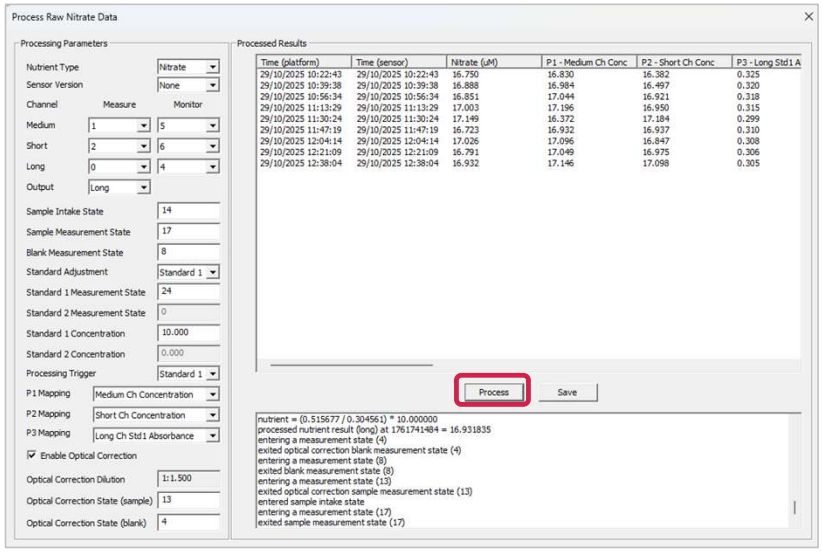
Processing Data



In the Menu, click ‘File’ and select ‘Process Raw Nutrient File’.



File explorer window pops up. Select desired raw data file.



‘Process Raw xxx* Data’ window pops up EMPTY.

Click ‘Process’ → Processed results are shown.

Clicking ‘Save’ will save the processed results in .csv format.

*) xxx = nitrate/phosphate/silicate/iron

Processing data means converting measured voltages into concentrations [µM].

Summary: From First Tests to Results

Save the software CWS_wetchem.exe to your PC/laptop.

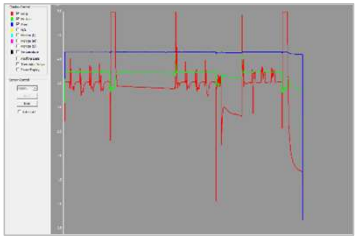
Connect the sensor using the lab cable (USB & 12 V DC).

Set the clock.

Tick Autostart and set desired measurement schedule.

Prime the filter.

Run lab tests, assess results.



Deploy the sensor.

Recover the sensor.

Download data.

Process data and save results.

Contact

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