

MEASURING & RECORDING DISSOLVED OXYGEN LEVELS



The amount of oxygen present in water is very important information. It is essential for productivity in fish farming, as it is necessary for aquatic organisms and for oxidation of organic material. By measuring the amount of oxygen available in the water, it is also possible to check the waste water treatment installations.

In this case study, the following instruments are used:

- **OSD23 Oxygen Analyser**, for measuring the amount of dissolved oxygen
- **L452 DataLogger**, for recording the measurement results



Education

Environment

Fish farming

OPERATING PRINCIPLE

The **OSD23** oxygen analyser is based on polarographic dissolved oxygen measurement, which means using a Clark electrode:

The oxygen is diffused through a fine Teflon membrane, depolarizing the platinum electrode (cathode) maintained at a given negative potential. The oxygen is reduced at the cathode and the current produced is directly proportional to the dissolved oxygen concentration. The current is then measured and converted by the oxygen analyser, which indicates the measurement directly in ppm or mg/L of dissolved O₂.

Liquid : 0.01 – 19.99 mg/L (Rs = 0.01 mg/L)

Gas: 0.1 – 199.9 % (Rs = 0.1 %)

Real-time recording and display of electrochemical data with an L452

The **OSD23** oxygen analyser is equipped with a 2,000-count display. It delivers a 0-5 V analogue signal which is used to calculate the value displayed on the instrument.

In % mode, 100% gives a 2.5 V output signal.

In mg/L mode, 20.0mg/L gives a 5.0 V output signal.



Configuration of the L452 logger

The **L452** offers three voltage acquisition modes: 0-100 mV / 0-1 V / 0-10 V. You should use the 0-10 V mode and enter in the instrument the value in % or mg/L at 0 V and the value in % or mg/L for 10 V.

Analogue output	% mode display	mg/L mode display
0V	0 %	0 mg/L
2.5 V	100 %	10.00 mg/L
5 V	200 %	20.00 mg/L
10 V	400 %	40.00 mg/L

It is possible to adjust the instrument directly using the buttons provided on the front panel or using the free Data Logger Transfer software (www.chauvin-arnoux.com/support).



Direct setup on the instrument (example for % mode)

Refer to paragraph 4.2 of the user's guide

(<http://www.chauvin-arnoux.com/sites/default/files/D00WCG73.PDF>).

You must set the unit to %, the 0 V value to 0 % and the 10 V value to 400 %. This means the display on the **L452** will match the display on the **OSD23**.

You can then start recording the data by setting the following times:

- Duration: this represents the total duration of the recording campaign.
- Sampling period: this represents the sampling period, i.e. the interval between two measurements. The measurements are then averaged before being stored.
- Storage period: this represents the aggregation time for the different samples, i.e. the interval between 2 memory points.

Example: Duration 15 minutes, Sampl. per. 200 ms, Storage per. 1 sec enables you to measure for 15 minutes and to store a point every second which is the average of the 200 ms samples.

DID YOU KNOW?

The dissolved oxygen level corresponds to the amount of molecular oxygen present in solution in the water. It enables plants and animals to respire. It is measured using an oxygen analyser. This amount varies according to the ambient temperature (as the temperature rises, the level of dissolved oxygen falls).

Setup using the software (example of mg/L mode)

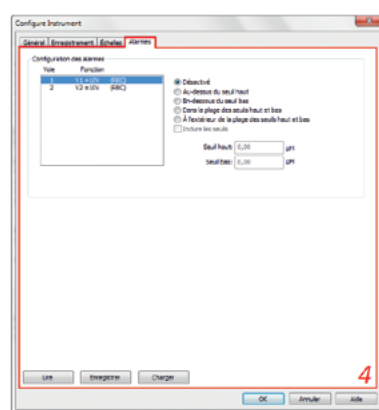
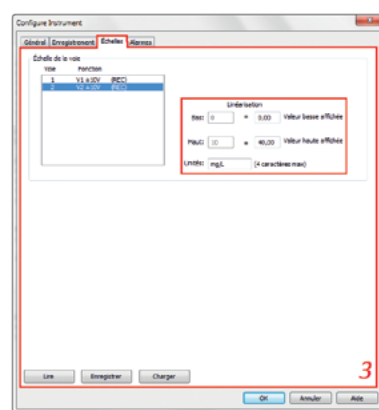
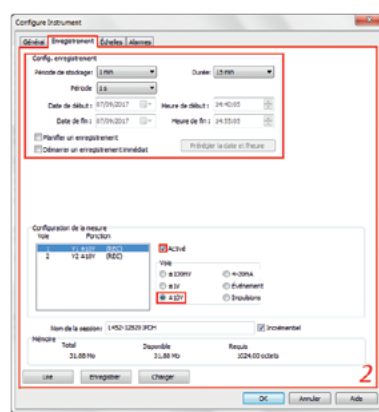
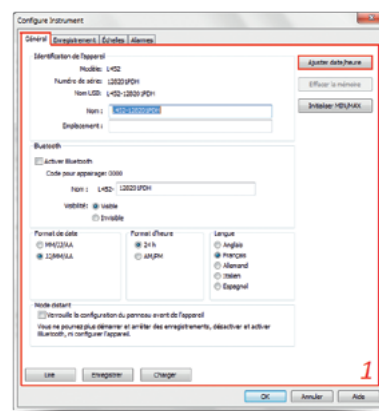
This example examines how to set up a measurement in mg/L.

First, you must select:

- the unit mg/L,
- the value at 0 V => 0 mg/L
- the value at 10 V => 40.0 mg/L

You must then do the following:

- Connect the L452 to your PC and wait for a few minutes while the drivers are installed
- Open Data Logger Transfer
- Go to the Instrument menu and select Add Instrument
- Choose "A local instrument connected to this PC with USB"
- The instrument's serial number should be displayed, indicating that your PC has recognized the instrument correctly. If not, it is certainly due to a driver problem (http://www.ftdichip.com/Drivers/CDM/CDM21228_Setup.zip)
- Go to the Instrument/Configure menu used to configure the instrument and start a measurement campaign.
- At the same time, set the instrument's time and date by synchronizing with the PC or by entering them manually (image 1).
- Set the various recording parameters (image 2)
- Set the parameters as indicated above:
unit mg/L, 0 V => 0 mg/L and 10 V => 40.0 mg/L (image 3)
- Set alarms if you want to be alerted if a value overshoots or undershoots or both (image 4)



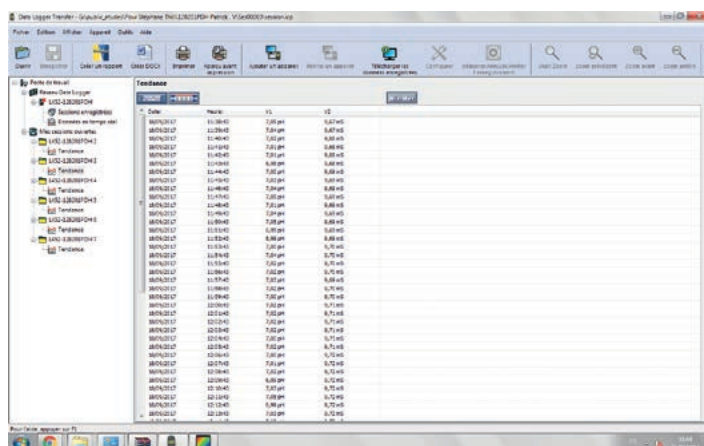
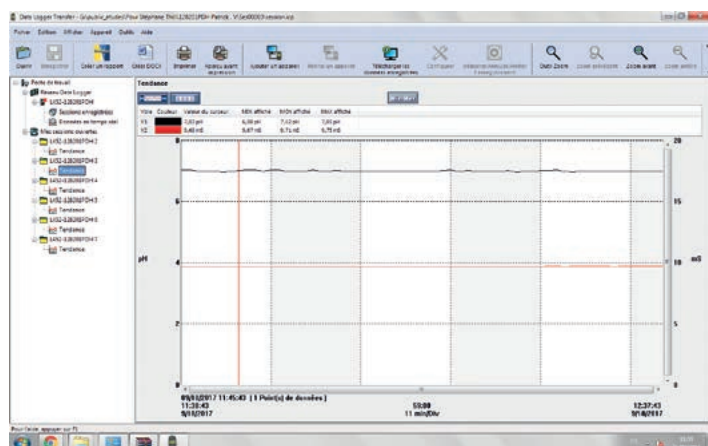
SPECIFIC APPLICATIONS: FISH FARMING

In this sector, the level of dissolved oxygen in the water is crucial to the productivity of any fish farm.

The level of oxygen in the water has a direct influence on the growth of the fish, their food consumption, the size of the fish farm, etc. In fish farming, the fish live in a closed space where oxygen is a limited resource. Constant monitoring of dissolved oxygen levels and a continuous supply of oxygen-rich water (aeration, oxygenation) are necessary to ensure that the conditions are optimum. Oxygenation and aeration of the water help to protect the fish from falls in the oxygen level when they are growing and after temperature variations.

Fish-farming water quality standards define limit values for dissolved oxygen in the water (e.g. dissolved oxygen concentration in cold water > 5 mg/L).

With **Data Logger Transfer**, the measurement results are displayed either as curves or in tables



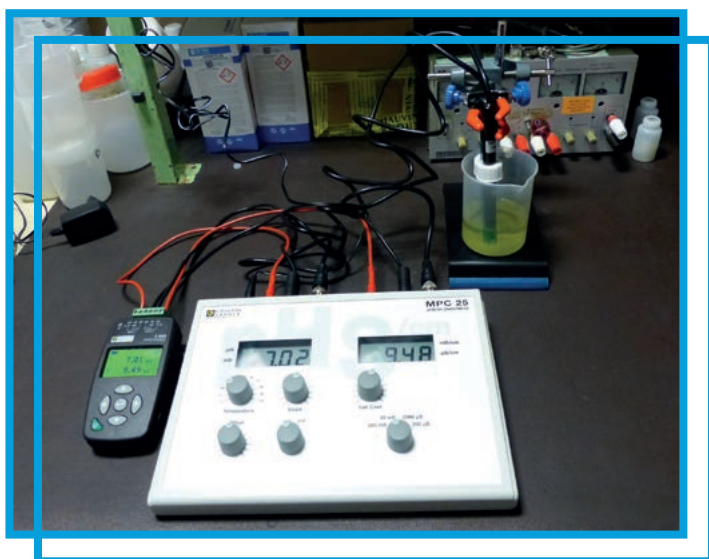
A FEW TECHNICAL SPECIFICATIONS...

OSD 23 - Oxygen analyser

Measurement range and associated resolution (Rs)	Liquid: 0.01 – 19.99 mg/L (Rs = 0.01 mg/L) Gas: 0.1 – 199.9 % (Rs = 0.1%)
Temperature compensation	Automatic (ATC)
Connections (inputs)	5-pin plugs for oxygen probes
Communication (outputs)	Isolated 4 mm terminals for logger output

L452 - Current, voltage and process logger (4-20 mA & 0-10 V)

Recording modes	Start/Stop (stop when memory full or when campaign end-date is reached)
Recording duration	10 minutes to 1 year, configurable
Sampling interval	5 samples/s
Communication	Bluetooth 2.1, Class 1, USB 2.0



The **L452 Datalogger** can be used with all Chauvin Arnoux electrochemical measuring instruments (analogue and digital)



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