Getting Started with OrigaMu

OrigaLys
ElectroChem

Contents

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1. Welcome

OrigaMµ is a 3-electrode (Reference, Work and Auxiliary) amperometric system allowing to impose a preset and known potential and measure current that flows through the auxiliary electrode. OrigaMµ is isolated from outside electrical disturbances thanks to its entirely metallic casing and that OrigaMµ automatically reverts to internal battery power supply during measurements. The OrigaMµ is an extremely sensitive instrument, specially designed to allow the detection of very low currents (down to 30 aA with the 1 pA current range) generated at the surface of microelectrodes such as those of the carbon fibre type (MFC1).

When used alone, the OrigaMµ allows a constant potential of between -1 V and +1 V to be applied between the working and reference electrode. The current passing through the electrodes is measured continuously and amplified.

When used in association with a OrigaStat (OGS100 or OGS200), the OrigaStat generates the potential signal between -2 V and +2 V and the OrigaMµ applies these signal between the working and reference electrode. The current passing through the electrodes is measured continuously, amplified then transferred to the OrigaStat as a voltage analog signal. Imposed potential and measurement data are collected by the PC software OrigaMaster 5. Post run processing treatments can therefore be applied..

2. OrigaMµ used as a stand-alone instrument
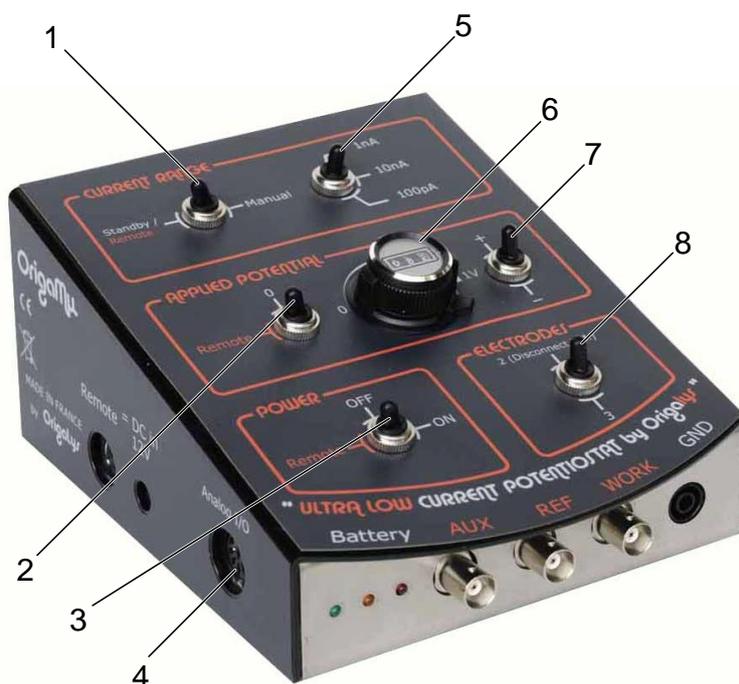
1. Current range switch
2. Applied potential switch
3. Power switch
4. Anlaog I/O socket
5. Current range value
6. Potentiometer
7. Positive / Negative selector
8. Electrodes switch

Figure 1: OrigaMµ

1. Set the **Electrodes** switch (ref. 8) to **3** (3-electrode setting) or **2** (2-electrode setting).
2. Connect the electrodes to the OrigaMµ (see Connecting the electrodes to the OrigaMµ).
3. Connect the **Analog I/O** socket (ref. 4) to a XY recorder using a dedicated cable (ask OrigaLys for more information).

Measured potential and currents will be recorded according to the output specifications given below:

- Measured potential output "E": repeats at low impedance (< 1 Ohm) the voltage measured at the working electrode "WORK" against reference electrode "REF". This output corresponds to the voltage imposed to the cell or equals the Open circuit potential (OCP) when the electrode circuitry is opened (Stand-by mode).

   The potential ranges from -2 V to +2 V.

- Measured current output "I": repeats an image of the current that flows through the electrochemical cell. The potential outputs varies from -1 V to +1 V corresponding to ± 100% of the current range nominal value in use. The output source resistance is about 470 Ohm.

- Measured potential output "Vs": repeats at low impedance (< 1 Ohm) the voltage measured at the auxiliary electrode "AUX" against reference electrode "REF". When a 2-electrode setting is used, this potential output is maintained to 0 V.

   The output source resistance is about 470 Ohm.

⚠️ This cable is wired so as to preserve carefully the electrical signals, and, contains specific electronic components. In case of necessity to use another cable (different type or length), please consult OrigaLys Technical service.

1. Set the **Current range** switch (ref. 1) to **Manual**.
2. Select the Current range value (ref. 5). Start by selecting the highest range (10 nA).
3. Set the **Power** switch (ref. 3) to **ON**.
4. Turn switch **Applied potential** (ref. 2) toward the right (potentiometer side).
5. Turn potentiometer (ref. 6) to impose a constant potential between the reference and working electrodes. The amplitude of this potential can be adjusted between 0 V and 1 V (10 turns). The sign of this potential depends on the position of switch (ref. 7).

3. OrigaMμ used with an OrigaStat

3.1 Set up the instruments
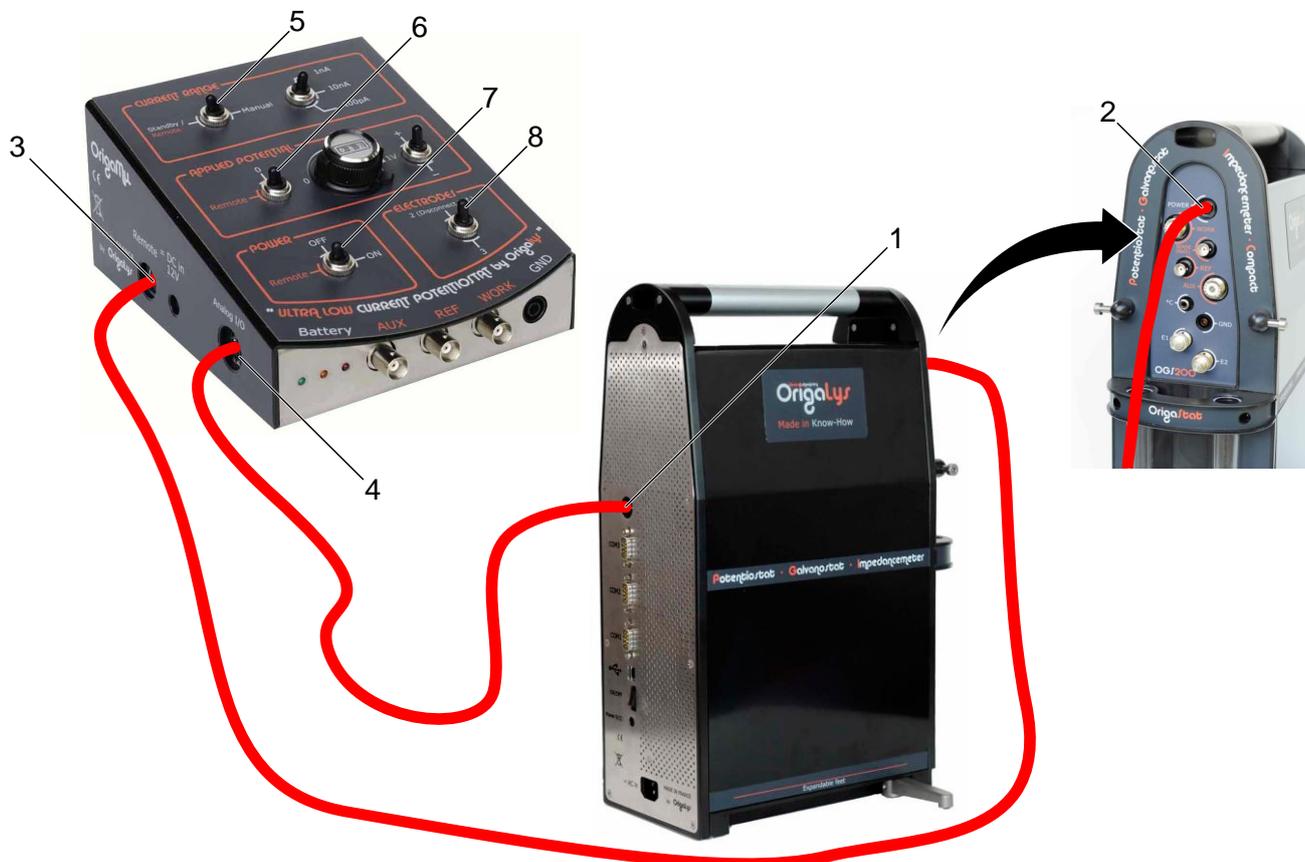
1. Analog I/O socket
2. Power socket
3. Remote socket
4. Analog I/O socket
5. Current range switch
6. Applied potential switch
7. Power switch
8. Electrodes switch

Figure 2: OrigaMμ with OrigaStat (OGS200)

1. Set the **Electrodes** switch (ref. 8) to **3** (3-electrode setting) or **2** (2-electrode setting).
2. Connect the electrodes to the OrigaMμ (see Connecting the electrodes to the OrigaMμ).
3. Connect the **Analog I/O** socket (ref. 4) of the OrigaMu to the **Analog I/O** socket (ref. 1) of the OrigaStat.

Measured potential and currents will be recorded according to the output specifications given below:

- Measured potential output "E", Measured current output "I" and Measured potential output "Vs": same specifications as described above (OrigaMμ used as a stand alone instrument).

- Generator signal input "-VG": used to input the potential being applied between the "WORK" and "REF" electrodes.

    This terminal is connected only when switch **Applied potential** (ref. 6) is set to **Remote**.

The maximum potential applied is ±2V.

The Input resistance is 100 kOhms.

⚠️ The potential applied to the electrodes is equal to the absolute value programmed but the polarity is the reverse as the voltage applied to the socket pin.

👆 Avoid applying high rate signals and/or high stepped signals in order to minimize sources of external interferences.

⚠️ This cable is wired so as to preserve carefully the electrical signals, and, contains specific electronic components. In case of necessity to use another cable (different type or length), please consult OrigaLys Technical service.

4. Set the **Current range** switch (ref. 5) to **Remote** and **Applied potential** switch (ref. 6) to **Remote**.

   Using these positions, the OrigaStat automatically controls the OrigaMµ:

   o opening or closure of the working electrode circuitry (Operation/Stand-by autoswitching),

   o selection of the current measurement range (current range autoswitching),

   o connection of all input/output analog signals.

5. Connect the **Remote** socket (ref. 3) of the OrigaMu to the **Power** socket (ref. 1) of the OrigaStat.

6. Set the **Power** switch (ref. 7) to **Remote** (see Powering up the OrigaMµ).

3.2 CONNECTING THE ELECTRODES TO THE ORIGAMµ

1. Reference electrode   2. Working electrode   3. Auxiliary electrode
4. AUX BNC socket   5. REF BNC socket   6. WORK BNC socket
7. Ground socket

Figure 3: Connecting the electrodes to the OrigaMµ

1. Setup the electrochemical cell on the OrigaStat (OGS100 or OGS200).
2. Connect the electrodes to the OrigaMµ.

- Generally, the electrochemical cell is connected to the OrigaMµ using a 3-electrode setting as follows:
- The working electrode (ref. 2) to the WORK BNC socket (ref. 6),
- The auxiliary electrode (ref. 3) to the AUX BNC socket (ref. 4),
- The reference electrode (ref. 1) to the REF BNC socket (ref. 5),
- You can ground the cell by placing it inside a metal casing connected to the GND socket (ref. 7).

Another setting can be used : the 2 electrode setting. Connect the 2 electrodes to the OrigaMµ as follows:

- The working electrode (ref. 2) to the WORK BNC socket (ref. 6),
- The auxiliary electrode (ref. 3) to the ground socket (ref. 7).

4. Powering up the OrigaMµ

1. Reference electrode   2. Working electrode   3. Auxiliary electrode

Figure 4: Connecting the electrodes to the OrigaMµ

OrigaMµ is powered by two batteries giving about 20 hours of battery life in operation mode, and, about three times more in Stand-by mode.

Charging these batteries can be done in two ways:

- automatically managed by OrigaStat when the **Remote** socket (Ref. 2) of the OrigaMµ is connected to the **Power** socket (Ref. 1) of OrigaStat.
- or periodically when the user connects the optional mains power adapter connected to **DC in 12 V** socket (Ref. 3). Use this option when OrigaMµ is used as a stand alone instrument.

Three coloured DEL pilot lamps informs the user on the battery load level:

- the orange lamp is lit when the batteries are charging. This pilot lamp is working whatever the position of the **Power** switch (**Remote**, **Off** or **On**),

- the red lamp is lit when the batteries are full (maximum load). This pilot lamp is working only if the **Power** switch is set to **On** or **Remote**,
- the green lamp is lit when the batteries are running out and must be reloaded immediately. This pilot lamp is working only if the **Power** switch is set to **On**. The battery charger may remain connected when the green lamp is on as the OrigaMµ simply fed the batteries with the necessary low-level current.

⚠️ The use of a charger of characteristics others than those of a model provided by OrigaLys may damage the OrigaMµ!

5. Powering up the OrigaStat

1. Connect the OGS100 mains socket to the mains using the line cord provided.
2. Switch on the OGS100 (O/I switch).

Please refer to the OrigaStat relevant topics in dedicated "Getting started manual".

6. Setting up OrigaMaster 5

6.1 Declaring the OrigaStat/OrigaMµ system

You must declare to OrigaMaster 5 the type of OrigaStat system and OrigaMµ you have connected to the PC.

1. In the menu bar of the OrigaMaster 5 Main window, select **Settings** then click the **Configuration** icon.
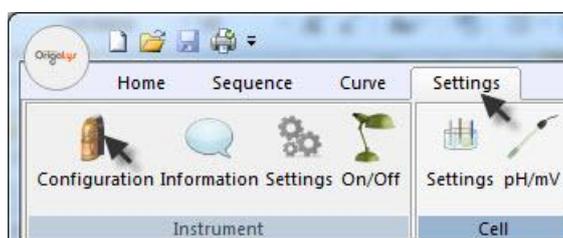

Figure 5: Configuration (1/2)

2. In the Configuration box, select:
   - Potentiostat = OrigaStat 100 for the OGS100 model,
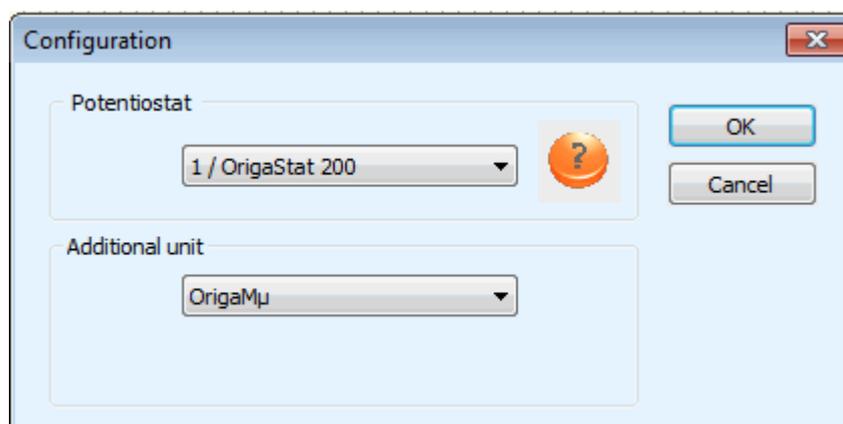   - Potentiostat = OrigaStat 200 for the OGS200 model,
   - Additional unit = OrigaMµ

Figure 6: Configuration (2/2)

3. In the menu bar of the OrigaMaster 5 Main window, select or deselect the **Battery load** option.

Figure 7: Battery load option

- Battery load option selected: the batteries are charged automatically by the OrigaStat when the instrument is in Stand-by mode. The orange pilot lamp shows, when lit, that a battery reload is in progress.
- Battery load deselected: the batteries are not charged by the OrigaStat. In this case, pay attention to the power level of the batteries.

4. Edit a sequence.

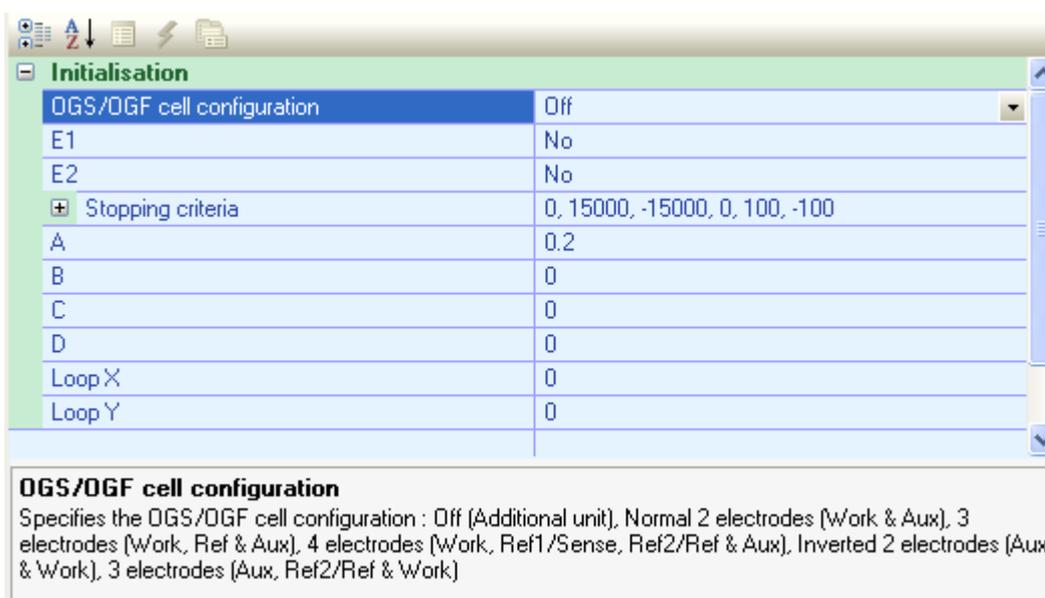In the Start method, select Off for the OGS/OGF cell configuration.

Figure 8: Parameters

Edit the other methods of the sequence. For voltammetries and chrono techniques, 5 current ranges are selectable among 1 pA, 10 pA, 100 pA, 1 nA or 10 nA.

👆 Go on with the next step with the "Getting started with OrigaMaster 5".