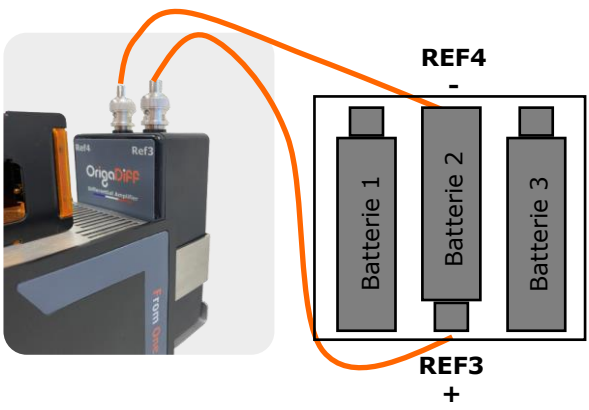
Application Note

Battery
AP-B07

OrigaDiff: measures the potential difference between two sample points simultaneously with the main test



OrigaDiff is an external module connected to the rear panel of the potentiostat enabling user to measure difference of potential between two parts of a sample moreover of what is measuring by main electrodes.

In this application note, two additional voltage measurements are taken at the terminals of batteries during charge-discharge test while there are 3 batteries connected in series mode.

Origalys Electrochem

12 ANS YEARS AÑOS 2010 – ORIGALYS – 2022 MERCI – THANK YOU – GRACIAS

INTRODUCTION

In normal electrochemical cells, potential is measured between Reference and Working electrodes.

But while there is a specific sample in which, in addition to the usual routine potential, another measurement between two other points of sample is needed, then thanks to OrigaDiff, this is possible according to user's application.

For example, when the sample is 3 batteries which are connected from no.1 to no.3 to the potentiostat (figure 1) in series mode, it is possible to measure the potential of the middle battery (battery no.2) or any other parts of battery with OrigaDiff simultaneously, while the charge-discharge test is running.

More details will be explained in next chapters.

Figure 1: Battery samples connected to potentiostat.

Hardware Setup

The OrigaDiff connects to the rear panel of potentiostat through two cables (figure 2):

1- Connect one of the two "Power" inputs to the "Power" connector of the OrigaFlex using the mini-DIN6 – DC cable.

2- Connect the "Analog" socket to the "Analog I/O" connector of the OrigaFlex using the DIN8 – DIN8 cable.

There are 2 other important BNC connections at the top part of OrigaDiff (figure 2, part 3). These are for connecting cables to reference electrodes or directly to sample for measuring the potential.

WARNING: Always make sure that the caps on the + and – (no.3) are correctly fitted if the OrigaDiff is not used.

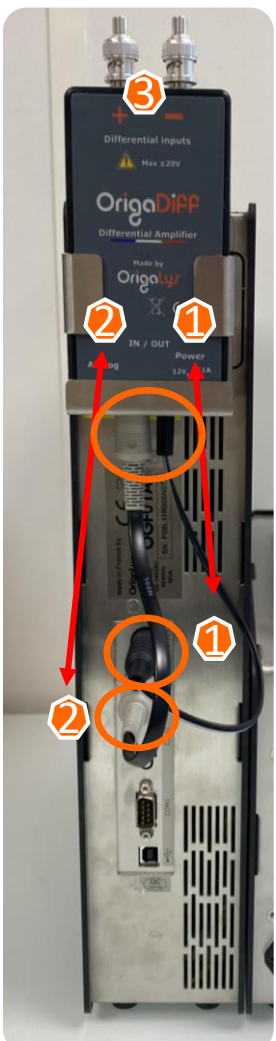


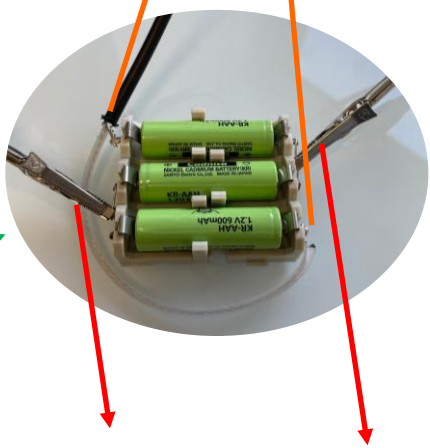
Figure 2: Connection of OrigaDiff to rear panel

Hardware Setup

Connecting to sample is easy as well as can be seen in figure 3.

Figure 3: Connection of sample

The 3 batteries in series mode are connected to working socket of potentiostat from these two poles via BNC cable. The system configuration for charge discharge were "2 electrodes".



These two alligator clamps are used to measure the potential of battery no.2 through the Banana-BNC cable connected to OrigaDiff in rear panel of potentiostat.

Software Setup

After hardware connection, now it is time to set the parameters regarding OrigaDiff in OM5 software.

1- In « Setting » tab – "Configuration" window – the "OrigaDiff" must be selected (figure 4).

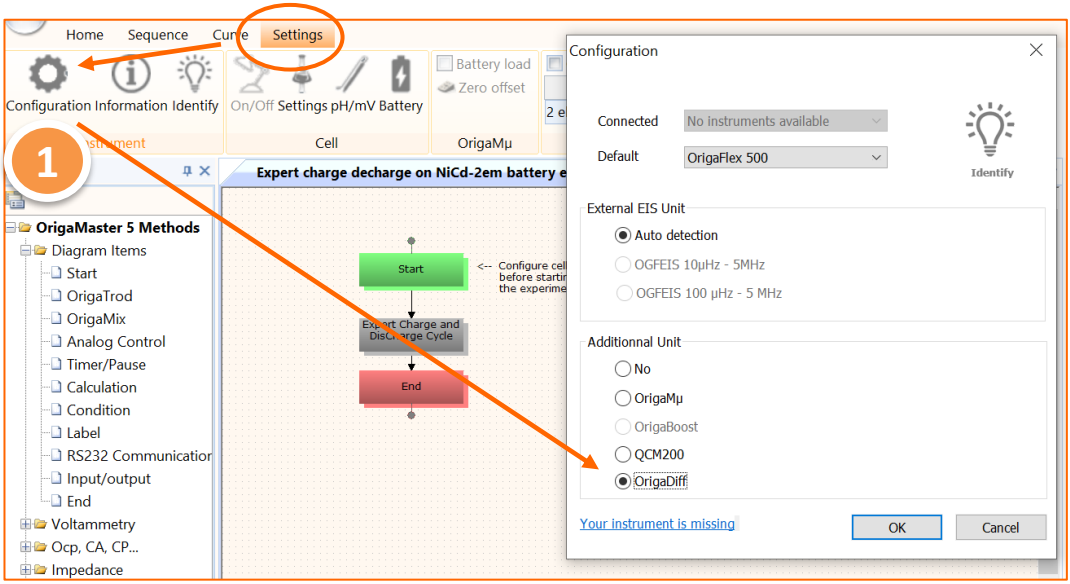


Figure 4: The "OrigaDiff" must be selected through "Configuration" window

Clicking on « Ok », continuing by selecting the « Supplied by Power Output » in the "Setting" tab, will connect the OrigaDiff to the system (figure 5).

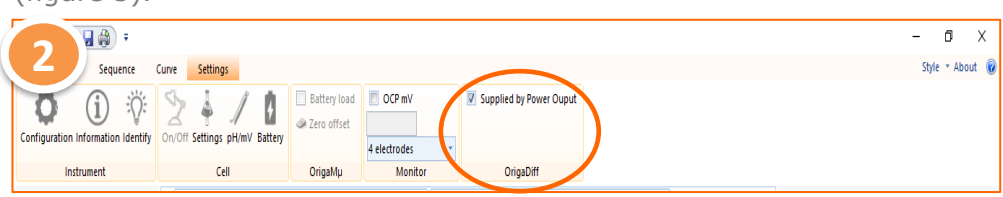


Figure 5: In the "Setting" tab, OrigaDiff "Supplied by Power Output" must be checked

Parameters of the test

Figure 6 shows the flow chart related to charge/discharge of 3 Ni-Cd batteries by capacity of 600 mA.h, these batteries are connected to each other in series mode.

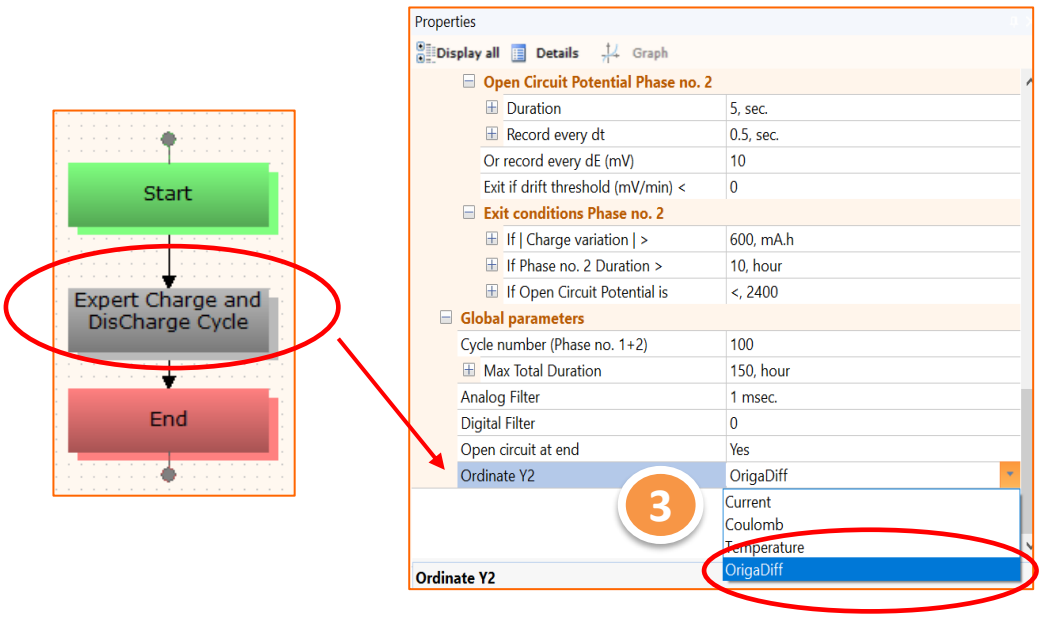


Figure 6: in the list of "Ordinate Y2", "OrigaDiff" must be selected

The important option which needs to be considered is the "Ordinate Y2" in the charge and discharge parameters. For this option, the "OrigaDiff" must be selected to display the results on Y2 axis.

WARNING: Do not forget to put an "END" block at the end of your sequence. If not, the OrigaDiff will remain switch on and can bring perturbations next measurement performed without OrigaDiff.

RESULTS AND DISCUSSIONS

Figure 7 shows the 100 cycles of charge-discharge curve of batteries. In this test, the two cables of OrigaDiff were connected between the poles of battery no.2 to measure its potential which is shown as red line.

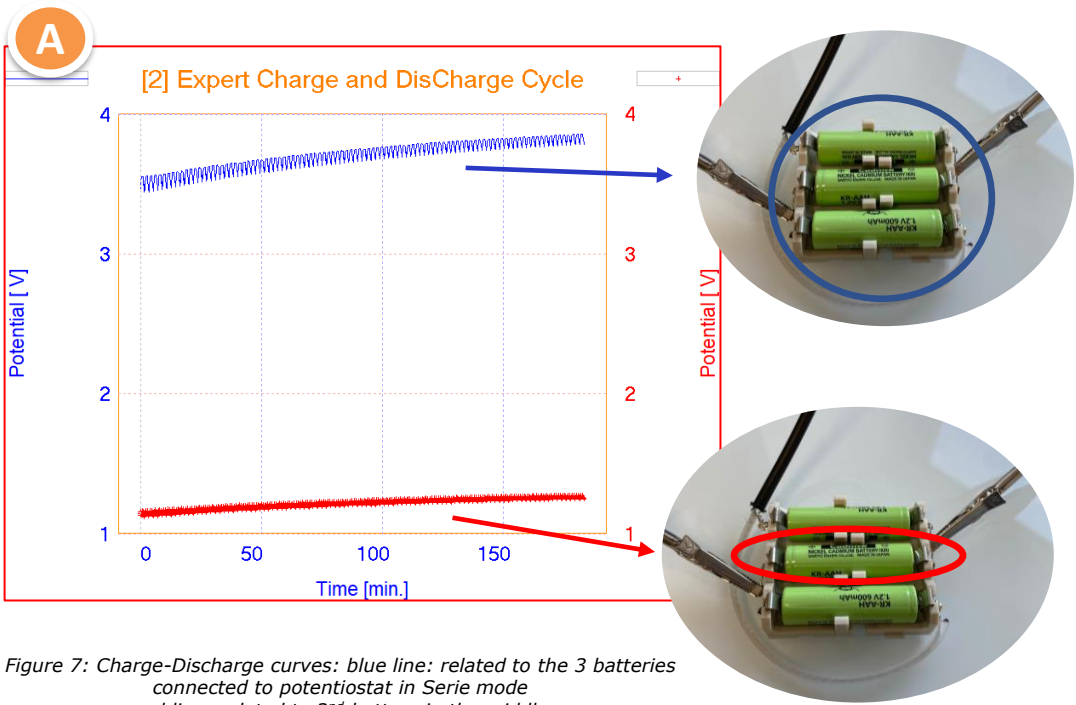


Figure 7: Charge-Discharge curves: blue line: related to the 3 batteries connected to potentiostat in Serie mode
red line: related to 2nd battery in the middle

RESULTS AND DISCUSSIONS

In the other cycles of charge discharge, the difference of potential between 2nd and 3rd batteries in parallel of the main test was measured (figure 8).

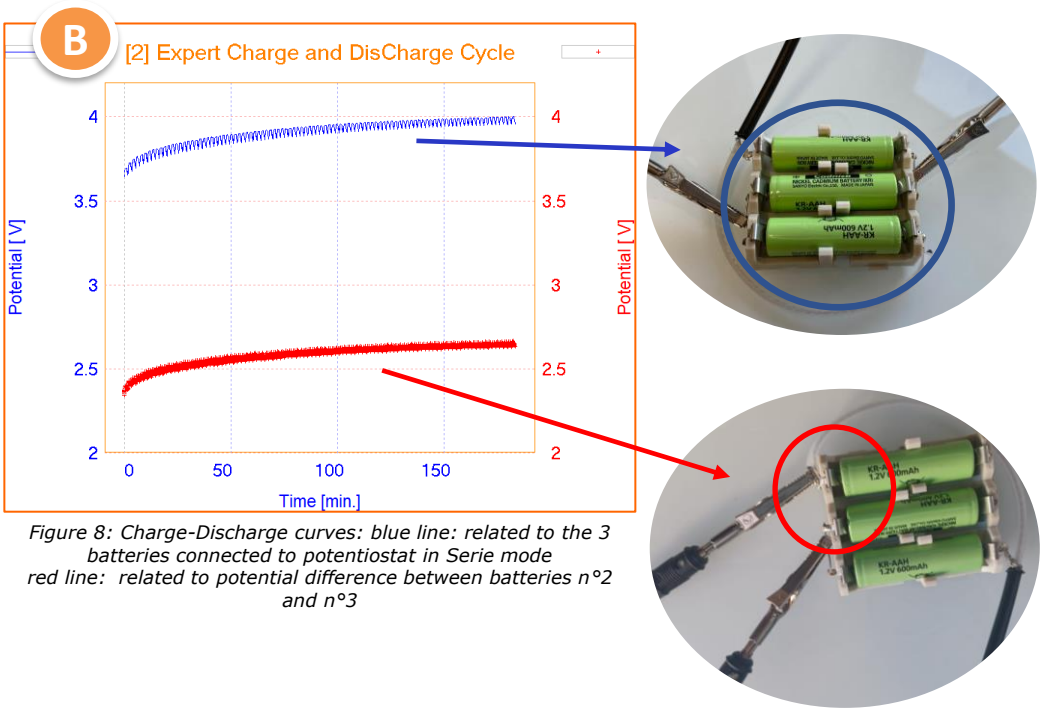


Figure 8: Charge-Discharge curves: blue line: related to the 3 batteries connected to potentiostat in Serie mode
red line: related to potential difference between batteries n°2 and n°3

NOTE: In test A, the Y2 shows the potential value of battery no.2 which is around 1.2 V. In test B, the Y2 value is around 2.6 V related to summation of potential of two batteries no.2 and no.3 .

INSTRUMENT AND ELECTRODES

Figure 9: OrigaFlex OGF0500

Electrode setup	
Sample	Battery NI-Cd 600 mAh, 1.2 V
Instrument	OrigaFlex OGF500 + OrigaDiff
Software	OrigaMaster

Figure 10: NI-Cd Battery

Figure 11: OrigaDiff module

OrigaLys ElectroChem SAS
Les Verchères 2
62A, avenue de l'Europe
69140 RILLIEUX-la-PAPE
FRANCE
☎ +33 (0)9 54 17 56 03
+33 (0)9 59 17 56 03
contact@origalys.com