3-Divider cable – Measuring the potential of the CE

This document describes how to measure the potential of the counter electrode (CE) with respect to the working electrode (WE) using the ADC164 of the Autolab. For this measurement, a special 3-Divider cable (Item code: CABLE.3DIVBNC) is required.

The 3-Divider cable divides the voltage of the CE, E_{CE}, with respect to the voltage of the WE, E_{WE}, by a factor of three, according to:

$$E = \left(\frac{E_{CE} - E_{WE}}{3}\right)$$

This cable can be used for all the Autolab potentiostat/galvanostat instruments[1] except the PGSTAT100N. It is also not compatible with the PGSTAT302F operated in floating mode.

Important restriction

The ADC164 is not a high input impedance voltmeter. The input impedance of the ADC164 is 1GΩ. This means that the 3-Divider cable cannot be used when the cell is switched OFF. Open circuit potential (OCP) measurements are not possible when the cable is connected. For OCP measurements in combination with a differential measurement of the CE potential with respect to the WE, a dedicated pX1000 module is required.

1 – Part list

The 3-Divider cable kit includes the following items:

1. CE 3-Divider cable
2. 2 m BNC cable

[1] For the PGSTAT12 use the connections described for the PGSTAT128N. For the PGSTAT30 and PGSTAT302, use the connections described for the PGSTAT302N.

2 – Connections to the instrument

Connect the male banana end of the 3-Divider cable to the CE banana connector of the potentiostat. Connect the 2 m BNC cable to the female BNC plug on the 3-Divider cable.

Depending on the type of instrument, the other end of the BNC cable should be connected to:

1. **For the PGSTAT128N, and PGSTAT302N:** the BNC cable should be connected to ADC164 input 1 or input 2, as shown in Figure 1.
2. **For the PGSTAT302F (operated in grounded mode):** the connection is the same as for the PGSTAT302N (see Figure 1). The cable cannot be used in floating mode.
3. **For the µAutolab III[2]:** the BNC cable should be connected to the female V_{in} plug on the back plane of the µAutolab III.
4. **For the PGSTAT101, PGSTAT204, M101 and the M204 module[3]:** the BNC cable should be connected to the V_{in} plug located on the optional monitor cable.

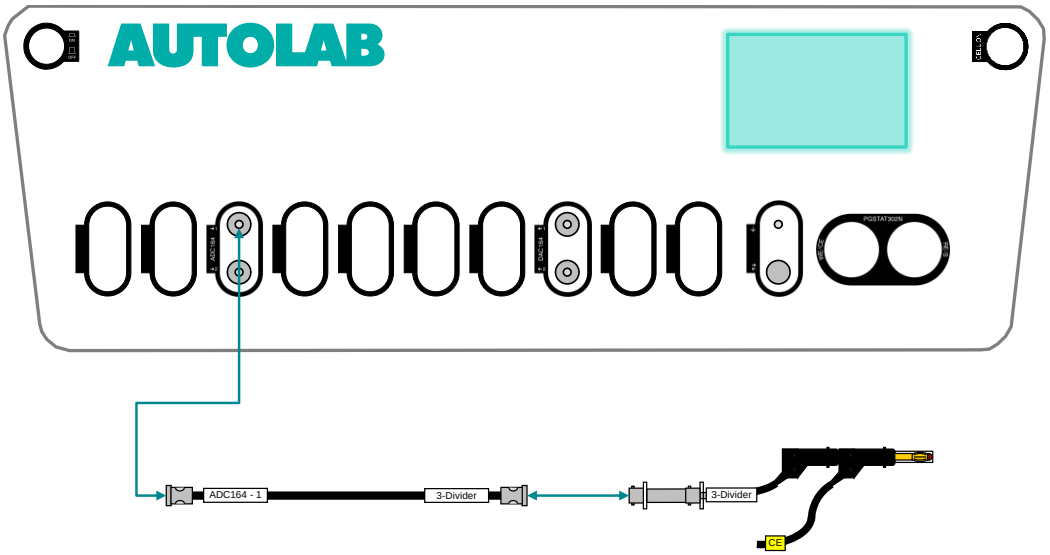

Figure 1 – Connections between the 3-Divider cable and the Autolab PGSTAT

[2] For the µAutolab I/II use the connections described for the µAutolab III.
[3] More information can be found in the NOVA Manual.

3 – Software settings

To use the 3-Divider cable, the hardware setup needs to be adjusted.

3.1 – Hardware setup

Open the Hardware setup in Nova (Tools – Hardware setup). In the Additional Module(s) frame on the right-hand side of the Hardware setup window, select the External module (see Figure 2).

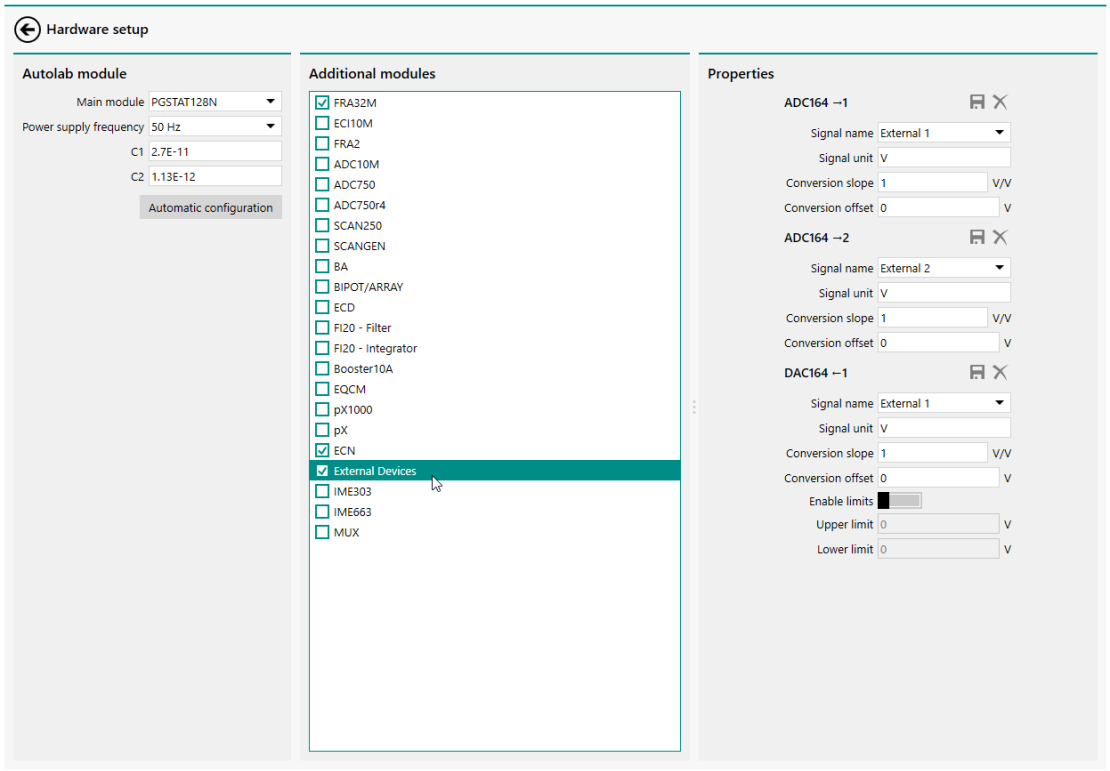

Figure 2 – Select the External signal in the Additional Module(s) frame

Additional settings related to this module will be shown in the frame on the right (see Figure 2).

Depending on the location of the 3-Divider cable (input 1 or input 2, if applicable), change the Conversion slope from 1 to 3 to force the software to multiply the values measured on the analog input by three (see Figure 3).

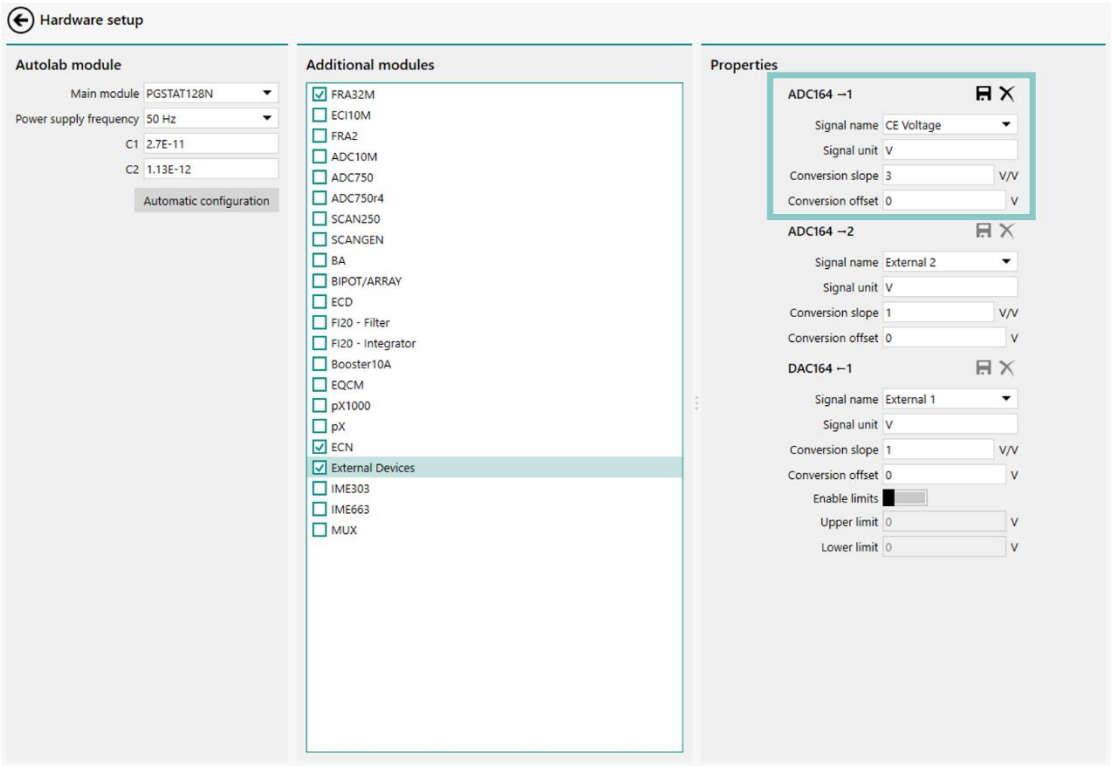

Figure 3 – Setting the multiplication factor for the external signal

Note

The settings for the external signal can be named and saved in the hardware setup file for future use. Click the button next to the ADC channel to save it in the hardware setup file.

Note

This can also be done manually in the software using the Calculate signal command.

3.2 – Measurements

The voltage of the CE with respect to the WE can be recorded during any experiment in NOVA by adding the required additional analog signal to the signal sampler (see Figure 4).

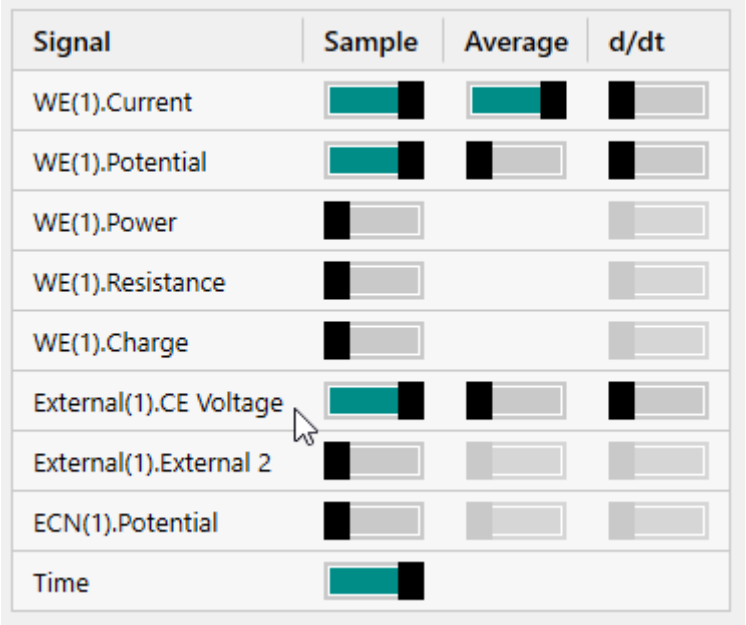

Figure 4 – The CE potential can be recorded by adding the required signal to the signal sampler

Note

The CE potential with respect to the WE cannot be recorded during FRA measurements or measurements involving the ADC10M (or ADC750).

3.3 – Example

Figure 5 shows an example obtained using the Autolab Cyclic voltammetry potentiostatic procedure. The CE voltage is recorded as an external signal and plotted on the right axis (red curve).

Note

A new plot needs to be added to the procedure (please refer to the NOVA User manual for more information).

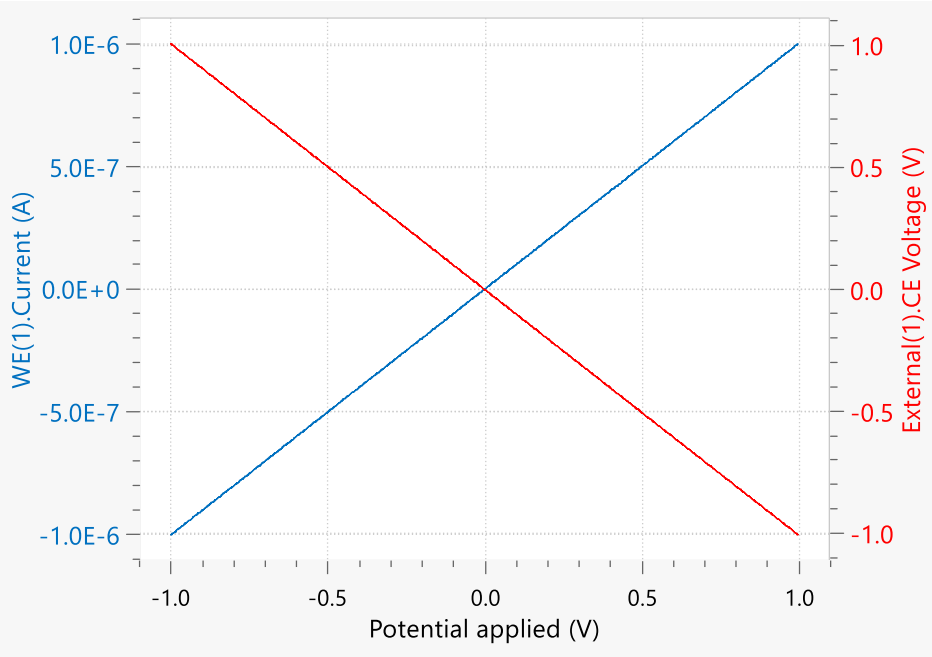

Figure 5 – Example of a measurement with the 3-Divider on dummy cell (a)

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