Metrohm Autolab B.V.

Autolab Application Note AUT03

Automated Sample Handling and Analysis With NOVA: High-throughput electrochemistry

Keywords

Sample processor; Automatic sample handling; Metrohm devices; Automatic burette

Summary

The Metrohm 858 Professional Sample Processor is a robotic liquid handling system capable of handling large series of samples automatically. This instrument provides a platform that can be directly controlled by the NOVA software and combined with the Autolab potentiostat/galvanostat for automated high-throughput electrochemical measurements.

This application note provides information on the combination of the Metrohm 858 Professional Sample Processor in the framework of a practical electrochemical measurement, performed with the NOVA software.

Metrohm 858 Professional Sample Processor

The Metrohm 858 Professional Sample Processor system consists robotic tower and a rotating sample rack (see Figure 1).

Figure 1 – The Metrohm 858 Professional Sample Processor

The Sample Processor is directly connected to the host computer by a USB connection. Additional Metrohm devices can be connected to the Sample Processor, using a MSB connection or a dedicated connection on the back of the tower (see Figure 2).

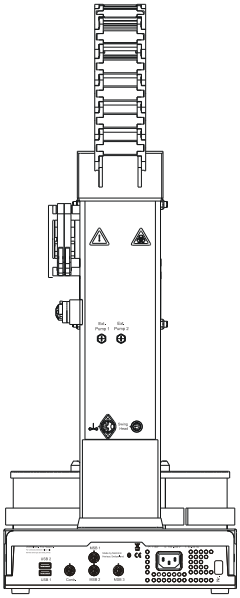

Figure 2 – The connections located on the back of the Metrohm 858 Professional Sample Processor can be used to connected additional devices

In this application note, a complete automation setup is described. The setup consists of the following products:

- Metrohm 858 Professional Sample Processor, fitted with a Metrohm 6.2041.470 Sample Rack (22 positions, 120 mL)
- Three Metrohm 800 Dosino, connected through MSB to the Sample Processor
- Metrohm 801 Magnetic Stirrer connected through MSB to the Sample processor
- Metrohm 6.2148.010 Remote Box connected through MSB to the Sample Processor
- Metrohm 843 Membrane Pump Station, connected to the External Pump connectors of the Sample Processor
- Metrohm 849 Level Control connected to the Remote Box

The connections and role of each instrument is detailed in the rest of this application note.

Connections of MSB devices

Figure 3 shows an overview of the MSB devices connected to the back of the Sample Processor. The Magnetic Stirrer, remote box and Dosino 1 are daisy-chained and connected to the one of the MSB ports of the Sample Processor. Dosino 2 and 3 are connected to the remaining MSB ports of the Sample Processor.

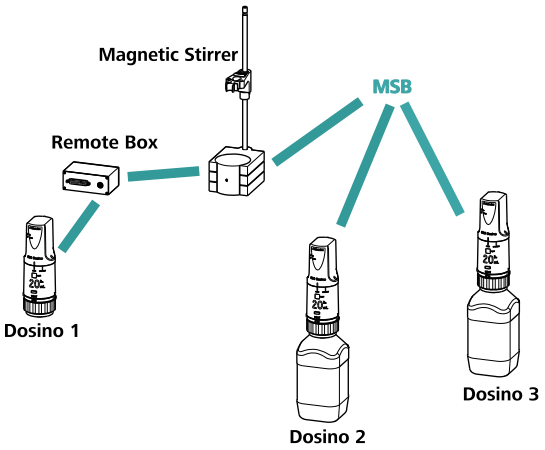

Figure 3 – Connection of the MSB devices used in this application note

The cell is mounted on top of the Magnetic Stirrer. Dosino 1 is connected to the needle of the Sample Processor and is used to aspirate sample from the vials located on the Sample Processor rack and dispense a controlled quantity to the cell. Dosino 2 is mounted on a stock bottle of supporting electrolyte, which is also used to dispense controlled amount to the cell. Dosino 3 is used to perform standard additions during the measurement.

Connections of Pump Station

Figure 4 shows the connection to the Pump Station, which is fitted with two membrane pumps. One of the pumps is connected to the cell and is used to drain the cell content after each measurement. The waste is pumped into a 10 L canister. The other pump is connected to a similar 10 L canister filled with MilliQ water to clean the cell is drained.

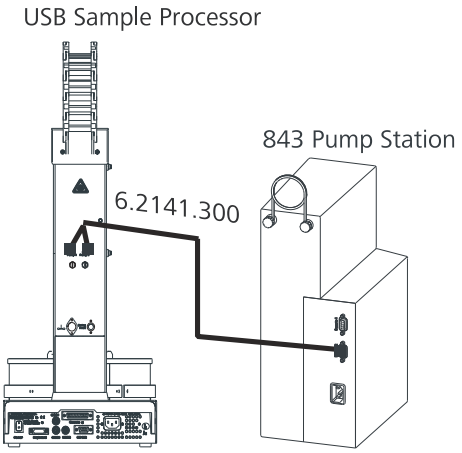

Figure 4 – Connection to the Pump Station

The status of the two 10 L canisters is monitored each time the membrane pumps are used using the Level Control unit connected to the Remote Box (see Figure 5).

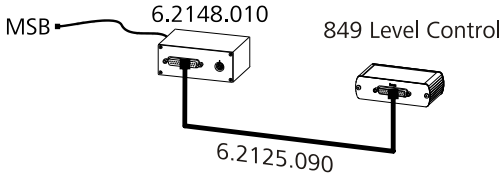

Figure 5 - Connections to the Level Control unit

This prevents the waste canister from overflowing and provides a warning when the MilliQ water is about to run out.

Using the sample rack

Finally, the sample rack can be loaded with samples (see Figure 6). In this setup, position 1 on the rack is used as a washing position for the needle to reduce sample carryover during the measurements.

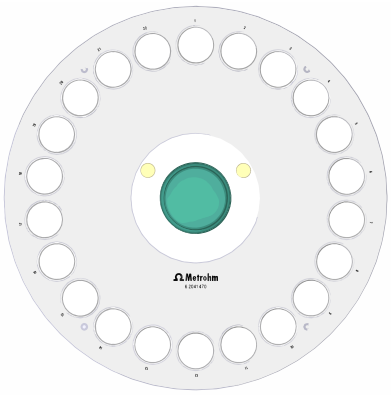

Figure 6 – The Sample Rack provides room for 22 sample vials of 120 mL

Software control

NOVA provides direct control of all the devices used in this application note. The settings for each device are specified in the Liquid Handling Setup of NOVA (see Figure 7).

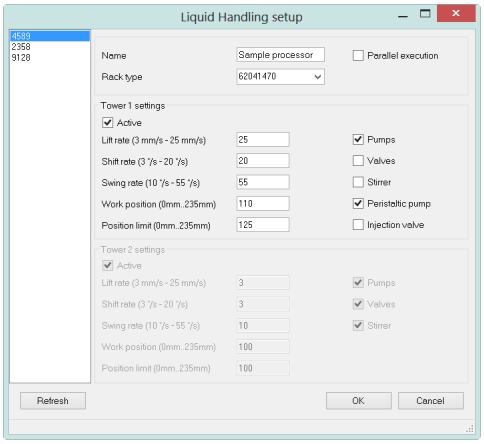

Figure 7 – The Liquid Handling Setup settings of the Metrohm 858 Professional Sample Processor

When the settings have been defined, each instrument can be controlled either manually, at any time, or during a measurement.

Manual control is provided by a dedicated control panel added to the Autolab display of the NOVA software (see Figure 8).

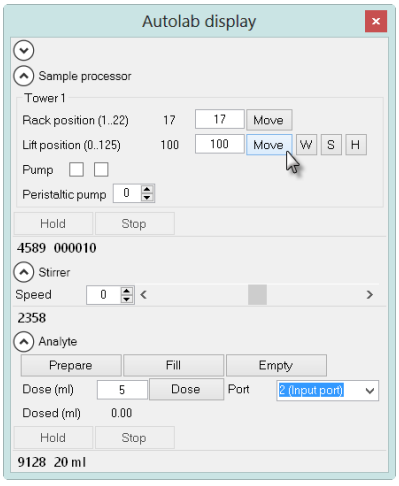

Figure 8 – Manual control of connected Metrohm devices

Using the manual control panel, the instruments can be operated from NOVA, either when the connected Autolab is on standby or during an electrochemical measurement.

It is also possible to embed control commands directly into a NOVA procedure for completely automatic liquid handling.

The commands used to control the instruments can be found in the Metrohm devices group of commands (see Figure 9).

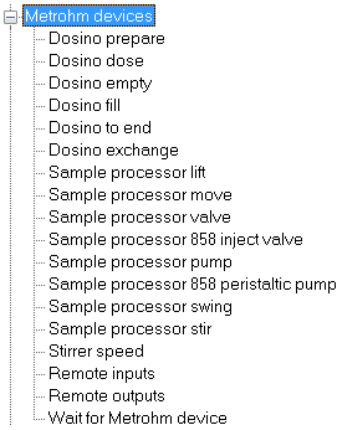

Figure 9 – The control commands are located in the Metrohm devices group of commands

Conclusion

The combination of the Autolab instrument with Metrohm liquid handling systems is straightforward in NOVA. Using the Metrohm Liquid Handling instruments, it is possible to create a completely automatic electrochemical measurement system, capable of performing the sample handling and the measurements without user intervention.

Find out more

For more information on Autolab NOVA, visit the Metrohm Autolab website. Additional information and specifications of the supported Metrohm devices can be found on the Metrohm website: http://products.metrohm.com/

Additional information about the support of the Metrohm devices can be found in the External devices tutorial, available on the Metrohm Autolab website: http://www.metrohm-autolab.com/Products/Nova/Tutorials.html

Date

26 June 2014