

PGSTAT128N

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1	ALL.CLIP.SET	Set of crocodile clamps	Black or red crocodile clamps (sold individually) for connections to electrodes in the electrochemical cell.
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1	AUT.DUMCELL	Autolab dummy cell	Dummy cell for instrument testing.
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1	CABLE.BNC.50	50 cm BNC cable	50 cm BNC cable for diagnostics purposes.
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1	CABLE.MONITOR	Monitor cable for N series Autolab	Monitor cable for modular Autolab systems, providing connections for external equipments (Potential output (E_{out}), Current output (i_{out}) and Potential input (E_{in})).
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1	CABLE.PWR	Power cable	Standard power cable for Autolab instruments and accessories.
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1	CABLE.USB	Standard USB cable	Standard USB cable for Autolab instruments.
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1	CELLCABLE.RE	Cell cable	Standard cell cable, 1.5 m, with connection for reference electrode (RE) and sense electrode (S).
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1 CELLCABLE.WE Cell cable

Standard cell cable, 1.5 m, with connection for counter electrode (CE), working electrode (WE) and ground.



1 NOVA Advanced software for electrochemical research

NOVA is the package designed to control all the Autolab instruments with USB interface.

Designed by electrochemists for electrochemists and integrating over two decades of user experience and the latest .NET software technology, NOVA brings more power and more flexibility to your Autolab potentiostat/galvanostat.

NOVA offers the following unique features:

- Powerful and flexible procedure editor
- Clear overview of relevant real-time data
- Powerful data analysis and plotting tools
- Integrated control for external devices like Metrohm Liquid Handling devices



ADC10M **Dual-channel ultra-fast sampling module**

The ADC10M module is an ultra-fast sampling module that increases the sampling rate of the Autolab from 50 kSamples/s to 10 MSamples/s giving you the ability to acquire fast transients with intervals down to 100 ns.

When combined with the SCAN250 module, you can perform ultra-fast cyclic voltammetry measurements with scan rates up to a practical limit of 250 kV/s, making it a powerful tool for studying fast kinetic processes.



BA **Dual mode bipotentiostat module**

The BA is a dual-mode bipotentiostat module that converts the Autolab into a double channel potentiostat with which measurements on 2 working electrodes can be performed sharing the same counter and reference electrode.

In the Bipotentiostat mode, a fixed potential is applied to the second channel (second Working Electrode) while applying a potential step or a sweep to the first channel (first Working Electrode). In the Scanning Bipotentiostat mode, a potential offset with respect to the first channel is applied to the second channel.



Booster10A **Booster10A**

The Booster10A module increases the maximum current of the PGSTAT100N, PGSTAT128N, PGSTAT302N, PGSTAT204 or M204 to 10 Ampere. The compliance voltage of the system is 20 V in combination with the Booster10A.

With its fast response time, the Autolab Booster10A has been optimized to perform electrochemical impedance measurements, in combination with the FRA32M module, on fuel cells, batteries and super-capacitors. The booster is able to handle active as well as passive cells. The Booster10A can be used to measure the charge and discharge characteristics of super-capacitors, perform measurements on fuel cells or perform DC or AC measurements on large area electrodes.



ECD **Low current amplifier module**

The lowest current range available on the standard Autolab is 10 nA. At this current range, the Autolab has a current resolution of 30 fA. When doing measurements on micro-electrodes sometimes even higher resolution is needed. Originally designed for electrochemical detection in HPLC and FIA, the ECD module makes the measurement of such low currents possible.

The ECD module provides 2 additional current ranges of 1 nA and 100 pA giving a minimum current resolution of 0.3 fA. The ECD module also has a built in third order Sallen-Key filter, with 3 RC-time constants that help to filter out noise.



ECI10M **High frequency impedance spectroscopy**

The ECI10M extends the measurable range for electrochemical impedance spectroscopy to a maximum of 10 MHz.

The ECI10M consists of a module, installed in the Autolab potentiostat/galvanostat and coupled to the FRA32M module and an external interface designed to be placed in close proximity of the electrochemical cell in order to minimize the effects from the electrode cables.

The small form factor of the external interface allows measurements in a glove box or Faraday cage. The ECI10M uses the Automatic Amplitude Correction algorithm (AAC) to ensure that the amplitude applied on the cell corresponds to the required amplitude at all times, thus maximizing the resolution while respecting the linearity and stability conditions during the measurement.



ECN **Electrochemical noise module**

Electrochemical noise (ECN) is an in-situ technique for measuring these localized corrosion processes on bare or coated metal samples. During measurements with the ECN module no external perturbation (potential or current) is applied to the electrode. The potential and current signals are measured as a function of time.

The accompanying analysis software allows the current and potential versus time data to be analyzed using Fast Fourier Transform (FFT). The software also provides several filtering and mathematical methods for treating electrochemical noise signals.



EQCM **Electrochemical Quartz Crystal Microbalance module**

The EQCM module provides the means to perform Electrochemical Quartz Crystal Microbalance experiments. The EQCM module measures a mass change per unit area by recording the change in resonant frequency of a quartz crystal oscillator.

Measurements in the sub $\mu\text{g}/\text{cm}^2$ are possible. The EQCM can be fitted with 6 MHz, AT-cut crystals.

The EQCM module is supplied with a suitable electrochemical cell, reference and counter electrode and two 6 MHz gold-coated crystals.



FI20 **Analog filter and integrator module**

The FI20 filter and integrator module allows the Autolab users to do coulometric and chrono-coulometric experiments. The analog integrator gives you the possibility to measure charge instead of current and can be used both in cyclic voltammetry as well as in potential step experiments.

With this module it is easy to separate the capacitive current from the faradaic current. In addition the integrator is effective in reducing signal noise by averaging it out.

The third order Sallen-Key filter with selectable RC-times between 0 and 500 ms, can be used to filter out noise. The filter of the FI20 module is also useful in cases where the background noise (50 or 60 Hz for example) cannot be removed by using measures like a Faraday cage.



FRA32M **Electrochemical impedance spectroscopy module**

The FRA32M provides the means to perform impedance and electrochemical impedance measurements in combination with the Autolab. This module allows one to perform both potentiostatic and galvanostatic impedance measurements over a wide frequency range of 10 μHz to 32 MHz (limited to 1 MHz in combination with the Autolab PGSTAT). In addition to the classical EIS, the NOVA software also allows the users to modulate other outside signals such as rotation speed of a rotating disk electrode or the frequency of a light source to perform Electro-hydrodynamic or Photo-modulated impedance spectroscopy.

The FRA32M module comes with a powerful fit and simulation software for the analysis of impedance data.



IME663 **Interface for Metrohm 663 VA Stand**

Interface for Metrohm 663 VA Stand.



MUX **Multiplexer module**

The MUX module series allows you to perform electrochemical experiments on multiple cells or multiple working electrodes, sequentially. The cell to perform measurement on can be selected either manually or automatically using the sequencing option of NOVA. Metrohm Autolab offers two types of MUX modules.

- MUX.MULTI4 - Used to multiplex all four connections from the Autolab. This allows sequential measurements on complete electrochemical cells, up to 64 cells with increments of 4.
- MUX.SCNR16 - Used to multiplex the working electrode connection of the Autolab. This allows sequential measurements on cells that share the same counter, reference and sense electrode but different working electrode, up to 255 different working electrodes with increments of 16.
- MUX.SCNR8 - Used to multiplex the reference and sense electrode connections of the Autolab. This allows sequential voltage sensing across different electrochemical cells, up to 128 cells with increments of 8.



pX1000 **Voltage and pH measurement module**

The pX1000 allows the measurements of pH or pX values during electrochemical experiments. This module also provides an additional Pt1000 input which allows recording of the temperature during the experiments, either through a Pt1000 sensor or through a combined pH/Pt1000 sensor. The temperature measurement allows automatic pH corrections.

The pX1000 module can also be used as an additional differential electrometer, with the same specifications as the main Autolab electrometer. The pX1000 module is compatible with the Metrohm pH and temperature sensors.

The user can connect any pH, pX or 'double' electrode to the pX1000 module. In case an electrode other than a pH electrode is used, the output is given as the voltage difference that is measured between the electrodes making it possible to connect a detection electrode to perform coulometric titration. The pX1000 module also works as an independent pH meter.



SCAN250 **True linear scan generator module**

When the processes exhibit very fast transient behavior, such as hydrogen adsorption, digital sweep can lead to loss of information regarding the adsorption process. The SCAN250 module, which has the capability of applying a true analog sweep to the sample, was specially designed to overcome this problem. The true linear scan rate range is from 10 mV/s to 250 kV/s. The SCAN250 module in combination with ADC10M is a very powerful tool for studying fast transients.



SDK **Software development kit**

The Autolab Software Development Kit (Autolab SDK) is designed to control the Autolab instrument from different external applications such as LabVIEW, Visual Basic for Applications (VBA), scripting etc. With the Autolab SDK the external application can be used to measure complete procedures or control individual Autolab modules.

In order to use the Autolab SDK from other applications, these applications must have the possibility to use .NET assemblies or in the case of 'older' applications to use COM assemblies. How to integrate these assemblies is explained in the manual of the application.

The Autolab SDK is compatible with Autolab NOVA however it does not require NOVA to be installed.

