



Metrohm Hyphenated EC-Raman

Ready, set,
easy hyphenation

PEOPLE
YOU
CAN
TRUST

 **Metrohm**

Metrohm Hyphenated EC-Raman for electrocatalysis

Combining electrochemistry with Raman spectroscopy provides detailed understanding of electrocatalysts in action.

Hyphenated EC-Raman synchronizes your electrochemical measurements with *in situ* Raman spectroscopy providing simultaneous structural and functional information about your catalysts: *operando* measurements allow for tracking changes of the structure, identifying adsorbed products or intermediates.

Metrohm offers two packages for electrocatalysis researchers which will get you measuring quickly: no complicated setups, complex training or worries about synchronizing measurements.

These solutions feature instrumentation from Metrohm Autolab and B&W Tek with the option to add a customized cell for your specific research requirements.



Metrohm EC-Raman Explorer Electrocatlysis Solution

The **Metrohm EC-Raman Explorer Electrocatlysis Solution** has an upgradable potentiostat/galvanostat that can change functionality as your research progresses.

Includes the **Autolab Trigger cable** that synchronizes and controls spectra acquisition through the NOVA software.



B&W Tek **i-Raman Plus 532H System** features the **unique combination** of wide **spectral coverage** and **high resolution**.

- With a **532 nm laser** for higher Raman **scattering efficiency** and the possibility to **enhance the signal** (Surface-Enhanced Raman Spectroscopy, SERS)
- **Small, lightweight** Raman system with **fiber-optic** sample probe for versatile measurement of different sample types

B&W Tek **Raman Video Microsampling System** (532 nm) can **accommodate** a variety of cell sizes **up to 30 mm high**.

- A **video camera** provides **real-time sample observation** and coaxial **LED illuminator** for precise **laser** alignment.
- Two objectives for **macro** and **micro** perspective (20x & 50x).



Autolab modular **PGSTAT302N** with an **Electrochemical Impedance Spectroscopy (EIS)** module included.

- A powerful modular potentiostat/galvanostat with current ranges from 10 nA to 1 A.
- **Future-proof** your research with the ability to add up to **7 additional modules** post-installation (bipotentiostat, low current amplifier, true linear scan generator)

Metrohm EC-Raman Starter Electrocatlysis Solution

The **Metrohm EC-Raman Starter Electrocatlysis Solution** comes with an Autolab PGSTAT204 with EIS that allows you to create the **right experimental conditions** almost anywhere with **this portable, compact solution**.

Includes the **Autolab Trigger cable** that synchronizes and controls spectra acquisition through the NOVA software.

DO YOU ALSO NEED A DEDICATED CELL?
For the Explorer or Starter Solution your local **Metrohm** sales representative can help you **create a customized sample cell** for your specific research requirements.



B&W Tek **i-Raman Plus 532H System**

B&W Tek **Raman Video Microsampling System** (532 nm)

Includes a **PGSTAT204** with an **Electrochemical Impedance Spectroscopy (EIS)** module for high accuracy impedance.



Ready-to-go when you are

HIGHLIGHTS

- Electrochemical workstation with **high accuracy EIS** included.
- Two editable **hyphenated Raman procedures** for the NOVA software, as well as the BWSpec software for extended **data analysis**.
- **Ready-to-go** solution that is **simple** to use.

TECHNIQUES AND METHODS

- Electrochemical Impedance Spectroscopy (EIS) for monitoring adsorption processes
- Electrochemical **SERS** (surface enhanced Raman spectroscopy)
- Raman Microscopy

MATERIALS

- **Organics:** molecular catalysts, adsorbed molecules and intermediates
- **Inorganic compounds:** oxides, carbonaceous materials (graphene, nanotubes), transition metal disulfides

Extend your EC-Raman Explorer solution with electrocatalysis-dedicated modules such as:

- **Bipotentiostat (BA)** module for additional Rotating Ring Disk Electrode (RRDE) measurements.
- **True linear scan generator (SCAN250)** module to observe fast adsorption processes with cyclic voltammetry.
- **Low current amplifier (ECD)** module providing two additional current ranges (1 nA and 100 pA) with a minimum current resolution of 0.3 fA.

SPECIFICATIONS

PGSTAT302N with EIS module

Potential range	± 10 V
Compliance voltage	± 30 V
Maximum current	± 2 A
Current ranges	10 nA to 1 A
Bandwidth	1 MHz
EIS frequency range	10 μ Hz - 1 MHz

PGSTAT204 with EIS module

Potential range	± 10 V
Compliance voltage	± 20 V
Maximum current	± 400 mA
Current ranges	10 nA to 100 mA
Bandwidth	1 MHz
EIS frequency range	10 μ Hz - 1 MHz

i-Raman Plus 532H

Laser	Wavelength	532 nm excitation
	Power	30 mW nominal (at exiting probe)
	Power Control	0 to 100% (adjustable at 1% increments)
Detector	Type	High quantum efficiency CCD Array cooled to -2 °C
	Integration Time	100 ms - 30 mins
Spectrometer	Range	65 – 3400 cm^{-1}
	Resolution	< 3.5 cm^{-1} @ 614 nm

BAC151, Raman Video Microsampling System - 20x objective included

Travel in Z direction	24 mm
XY Stage	Double Layer Mechanical Stage
XY Stage Size	150mm x 140mm
Travel in X/Y direction	75 mm (X), 50 mm (Y)

Video Microscope Objective, 20x

Working distance	12.0 mm
Numerical aperture (NA)	0.4

Video Microscope Objective, 50x (RML150A)

Working distance	9.15 mm
Numerical aperture (NA)	0.55



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ORDERING INFORMATION

Instruments and Accessories

AUT302N.S	PGSTAT302N
AUT204.S	PGSTAT204
FRA32M.MAC.204.S	Electrochemical Impedance Spectroscopy (EIS) module
BWT-840000360	i-Raman Plus 532H
BWT-840000962	BAC151, Raman Video Microsampling System - 20x objective included
BWT-840000325	Video Microscope Objective - 50x (RML 150A)
BWT-840000395	BAC150B, Raman Probe Holder
3500003120	Trigger cable for PGSTAT302N Hyphenated EC-Raman Solutions
3500003130	Trigger cable for PGSTAT204 Hyphenated EC-Raman Solutions