



Metrohm Autolab

Instruments' Specifications

Why Metrohm Autolab Potentiostats/Galvanostats?

ESTABLISHED EXCELLENCE

For more than 40 years, we have maintained our position as a market leader in Electrochemistry Instrumentation, fueled by our continuous commitment to innovation. Each instrument was created based upon decades of customer insight to meet the requirements of electrochemical research and improve your day-to-day discoveries.

WIDE APPLICATION RANGE

Our instruments cater to various electrochemistry fields such as Energy, Electrocatalysis, Corrosion, Sensors, and more. Customers utilize our tools for both fundamental and applied research, aiming to understand and enhance electrochemical processes to develop superior materials with future potential.

RELIABILITY

Each component within our instruments undergoes traceable testing, with over 400 quality checks conducted during the manufacturing process. Our installed instruments maintain an average uptime of 99% within the first 5 years of installation.

VERSATILITY

Our instruments are designed to meet the diverse needs of electrochemical research. The built-in features and modular designs allow for flexibility and expansion, while optional modules can be installed to extend the standard specifications, offering additional measurement capabilities.

SUPERIOR SERVICE

We offer an industry-leading warranty and support for all instruments, modules, and accessories. Our dedicated distribution and service network ensures a swift response to any technical, service, or application support questions within 48 hours.

EFFICIENCY

With INTELLO and NOVA software, data acquisition and analysis are streamlined. These robust platforms come equipped with essential procedures and customizable options, enabling maximum laboratory throughput.

QUICK OVERVIEW



Parameter	VIONIC	AUT302N	AUT204/M204	Autolab IMP	AUT101/M101
Compliance voltage	± 50 V	± 30 V	± 20 V	± 10 V	± 10 V
Maximum applied/measured potential	± 10 V	± 10 V	± 10 V	± 10 V	± 10 V
Maximum applied/measured current	± 6 A (up to ± 10 V) ± 3 A (up to ± 50 V), selectable	± 2 A (up to ± 30 V) Booster option: ± 20 A (up to ± 20 V)	± 400 mA (up to ± 20 V) Booster option: ± 10 A (up to ± 20 V)	± 100 mA (up to ± 10 V)	± 100 mA (up to ± 10 V)
Second Sense (S2) availability	Yes, with EIS on S2	Optional, no EIS on S2	Optional, no EIS on S2	No	Optional for M101, no EIS on S2
EIS / Maximum frequency	Yes / 10 MHz	Optional / 1 MHz, 10 MHz	Optional / 1 MHz	Yes / 1 MHz	Optional for M101/ 1 MHz
Analog scan	Yes	Optional	n.a.	n.a.	n.a.
Floating mode	Yes, selectable with 4 options	n.a.	n.a.	n.a.	n.a.
On-board data buffer	Yes, max 10 million data points	n.a.	n.a.	n.a.	n.a.
Control software	INTELLO	NOVA	NOVA	NOVA	NOVA
Dimensions in cm (w x h x d), excl. cables	20 x 27 x 40	52 x 16 x 42	15 x 19 x 26 (AUT204) 52 x 16 x 42 (MAC M204)	15 x 19 x 26	9 x 15 x 21 (AUT101) 52 x 16 x 42 (MAC M101)

DETAILED SPECIFICATIONS



Parameter	VIONIC	AUT302N	AUT204/M204	Autolab IMP	AUT101/M101
Potentiostat: Applied potential					
Compliance voltage	± 50 V	± 30 V	± 20 V	± 10 V	± 10 V
Maximum applied potential	± 10 V ± 50 V with voltage multiplier	± 10 V ± 30 V with voltage multiplier	± 10 V ± 20 V with voltage multiplier	± 10 V	± 10 V
Applied potential: accuracy	± 0.2% of setting ± 2 mV	± 0.2% of setting ± 2 mV	± 0.2% of setting ± 2 mV	± 0.2% of setting ± 2 mV	± 0.2% of setting ± 2 mV
Applied potential: resolution	100 µV	150 µV	150 µV	150 µV	150 µV
Rise time (typical)	< 200 ns	< 250 ns	< 300 ns	< 300 ns	< 300 ns
Control loop bandwidth (typical)	10 kHz / 100 kHz / 1 MHz, selectable	10 kHz / 100 kHz / 1 MHz, selectable	10 kHz / 100 kHz / 1 MHz, selectable	10 kHz / 100 kHz / 1 MHz, selectable	10 kHz / 100 kHz / 1 MHz, selectable
Measured potential (S-RE)					
Maximum measured potential	± 10 V	± 10 V	± 10 V	± 10 V	± 10 V
Measured potential: accuracy	0.2% ± 2 mV	0.2% ± 2 mV	0.2% ± 2 mV	0.2% ± 2 mV	0.2% ± 2 mV
Measured potential: resolution (ADC resolution)	100 µV	300 µV	300 µV	300 µV	300 µV
Measured potential: resolution (system, DC signals)	1.5 µV	0.3 µV, gain 1000	3 µV, gain 100	3 µV, gain 100	3 µV, gain 100
Measured potential: resolution (system, AC signals)	12 nV (< 20 Hz)	FRA32M option: 1.3 µV	FRA32M option: 1.3 µV	1.3 µV	FRA32M option (M101): 1.3 µV
Input impedance of the electrometer	> 1 TΩ	> 1 TΩ	> 100 GΩ	> 100 GΩ	> 100 GΩ
Bandwidth of electrometer (-3 dB)	> 10 MHz	> 4 MHz	> 4 MHz	> 4 MHz	> 4 MHz
Second Sense potential (S2-RE)					
Maximum measured S2 potential	± 50 V	pX1000 option: ± 10 V	pX1000 option: ± 10 V	n.a.	pX1000 option (M101): ± 10 V
Measured S2 potential: accuracy	0.3% ± 5 mV	pX1000 option: 0.2% ± 2 mV	pX1000 option: 0.2% ± 2 mV	n.a.	pX1000 option (M101): 0.2% ± 2 mV
Measured S2 potential: resolution (ADC resolution)	2 mV	pX1000 option: 300 µV	pX1000 option: 300 µV	n.a.	pX1000 option (M101): 300 µV
Measured S2 potential: resolution (system, DC signals)	7.5 µV	pX1000 option: 0.3 µV, gain 1000	pX1000 option: 0.3 µV, gain 1000	n.a.	pX1000 option (M101): 0.3 µV, gain 1000
Measured S2 potential: resolution (system, AC signals, < 20 Hz)	60 nV	n.a	n.a	n.a.	n.a

DETAILED SPECIFICATIONS



Parameter	VIONIC	AUT302N	AUT204/M204	Autolab IMP	AUT101/M101
Galvanostat: Applied current					
Maximum applied current	± 6 A (up to ± 10 V) ± 3 A (up to ± 50 V)	± 2 A (up to ± 30 V) Booster option: ± 20 A (up to ± 20 V)	± 400 mA (up to ± 20 V) Booster option: ± 10 A (up to ± 20 V)	± 100 mA (up to ± 10 V)	± 100 mA (up to ± 10 V)
Applied current: accuracy (10 nA current range or higher)	± 0.2% of current ± 0.2% of current range (CR)	± 0.2% of current ± 0.2% of current range (CR)	± 0.2% of current ± 0.2% of current range (CR)	± 0.2% of current ± 0.2% of current range (CR)	± 0.2% of current ± 0.2% of current range (CR)
Applied current: resolution (10 nA current range)	0.002% of CR (0.2 pA)	0.015% of CR (1.5 pA)	0.015% of CR (1.5 pA)	0.015% of CR (1.5 pA)	0.015% of CR (1.5 pA)
Measured current					
Maximum measured current	± 6 A	± 2 A Booster option: ± 20 A	± 400 mA Booster option: ± 10 A	± 100 mA	± 100 mA
Measured current: accuracy	± 0.2% of current ± 0.2% of CR	± 0.2% of current ± 0.2% of CR	± 0.2% of current ± 0.2% of CR	± 0.2% of current ± 0.2% of CR	± 0.2% of current ± 0.2% of CR
Measured current: resolution (ADC resolution)	20 fA (1 nA CR)	30 fA (10 nA CR)	30 fA (10 nA CR)	30 fA (10 nA CR)	30 fA (10 nA CR)
Measured current: resolution (system, DC signals)	300 aA (1 nA CR)	30 fA (10 nA CR) ECD option: 300 aA (100 pA CR)	30 fA (10 nA CR)	30 fA (10 nA CR)	30 fA (10 nA CR)
Measured current: resolution (system, AC signals)	2.3 aA (< 20 Hz, 1 nA current range)	n.a.	n.a.	n.a.	n.a.
Lowest current range	1 nA	10 nA Optional (ECD): 100 pA	10 nA	10 nA	10 nA
Total number of current ranges (current sensors)	11	9	8	7	7

VIONIC

Highest combined specifications in one single instrument

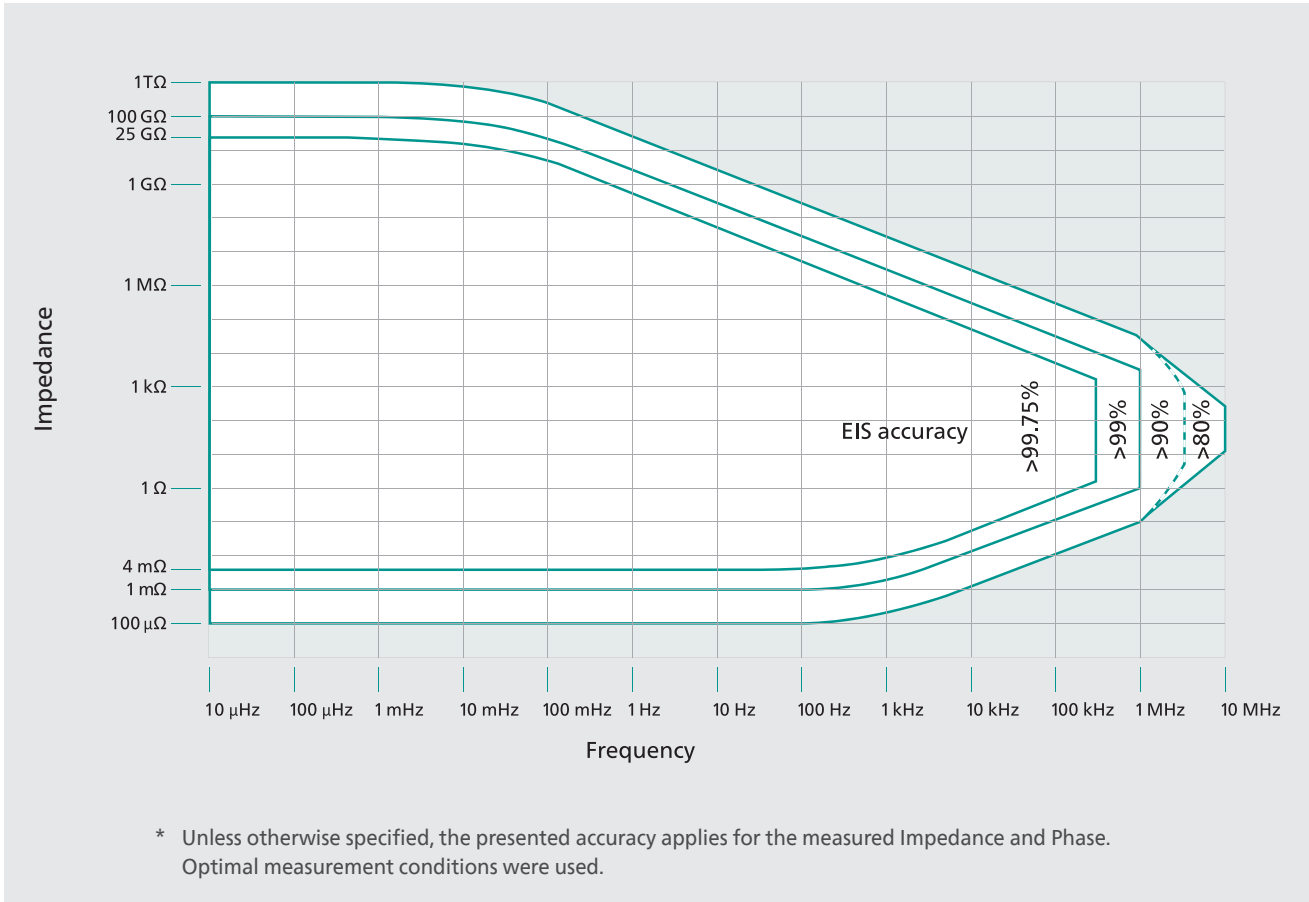
Autolab Multichannel

Maximize throughput without compromising on convenience

IMPEDANCE SPECIFICATION –
VIONIC POWERED BY INTELLLO

Parameter	VIONIC
Electrochemical Impedance Spectroscopy - VIONIC	
Maximum frequency	10 MHz
Minimum frequency	10 μHz
Max AC amplitude P-stat (Top)	± 10 V
Max AC amplitude G-stat (Top)	± 6 A
Minimum AC amplitude P-stat (Top)	± 100 μV
Minimum AC amplitude G-stat (Top)	± 0.5 pA
Maximum measurable impedance (accuracy %)	25 GΩ (>99.75%) 100 GΩ (>99%) 1 TΩ (>90%) See Contour Plot
Minimum measurable impedance (accuracy %)	4 mΩ (>99.75%) 1 mΩ (>99%) 100 μΩ (>90%) See Contour Plot
Full EIS accuracy	See Contour Plot

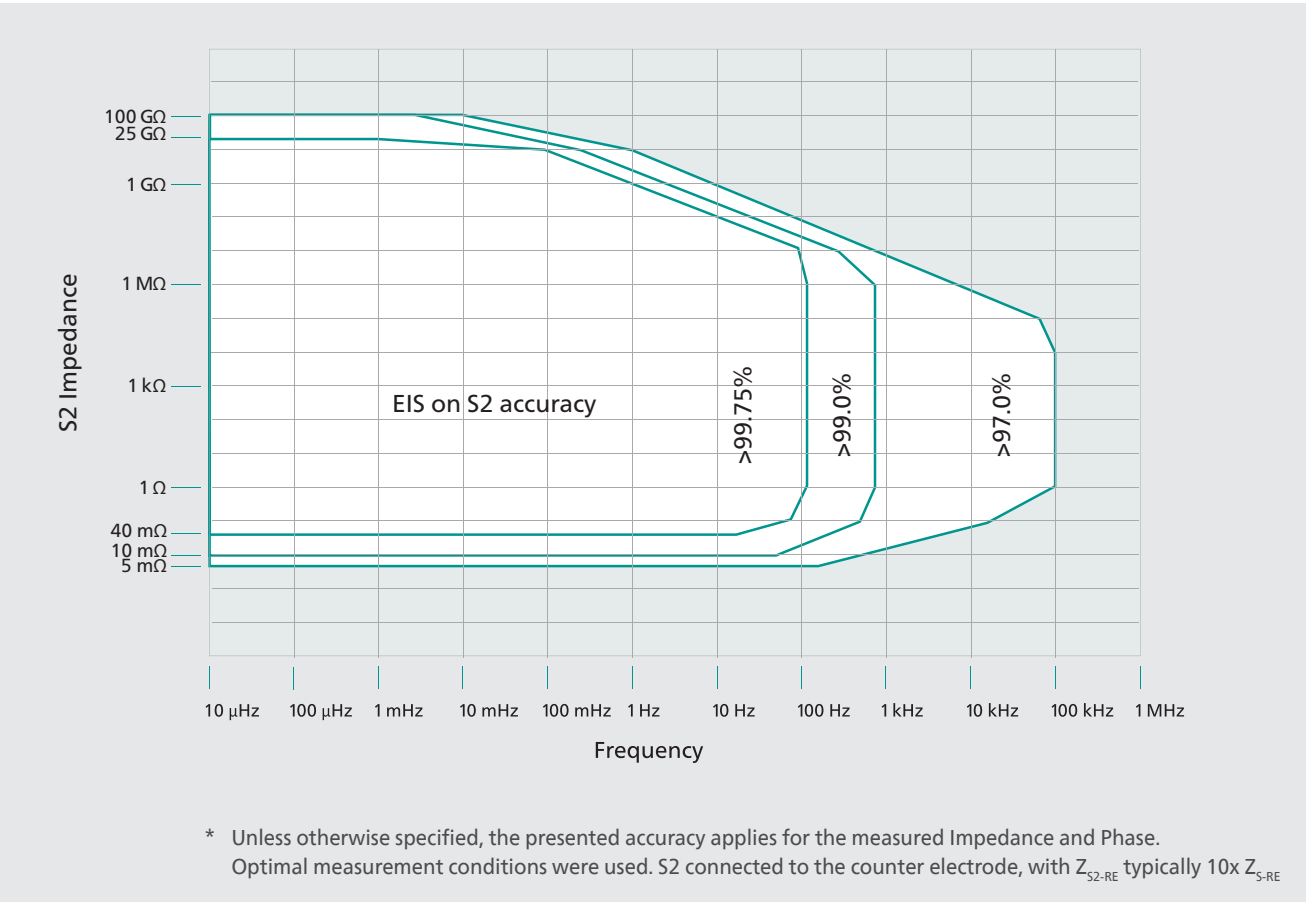
EIS CONTOUR PLOT – VIONIC



* Unless otherwise specified, the presented accuracy applies for the measured Impedance and Phase. Optimal measurement conditions were used.

Parameter	VIONIC
Electrochemical Impedance Spectroscopy on Second Sense (S2-RE) - VIONIC	
Maximum frequency	100 kHz
Minimum frequency	10 μHz
Maximum S2 potential (AC + DC)	± 50 V See specifications of Second Sense potential
Maximum measurable S2 impedance (accuracy %)	25 GΩ (>99.75%) 100 GΩ (>99%) See EIS on S2 Contour Plot
Minimum measurable S2 impedance (accuracy %)	40 mΩ (>99.75%) 10 mΩ (>99%) 5 mΩ (>97%) See EIS on S2 Contour Plot
Full EIS on S2 accuracy	See EIS on S2 Contour Plot

EIS CONTOUR PLOT – VIONIC IN S2

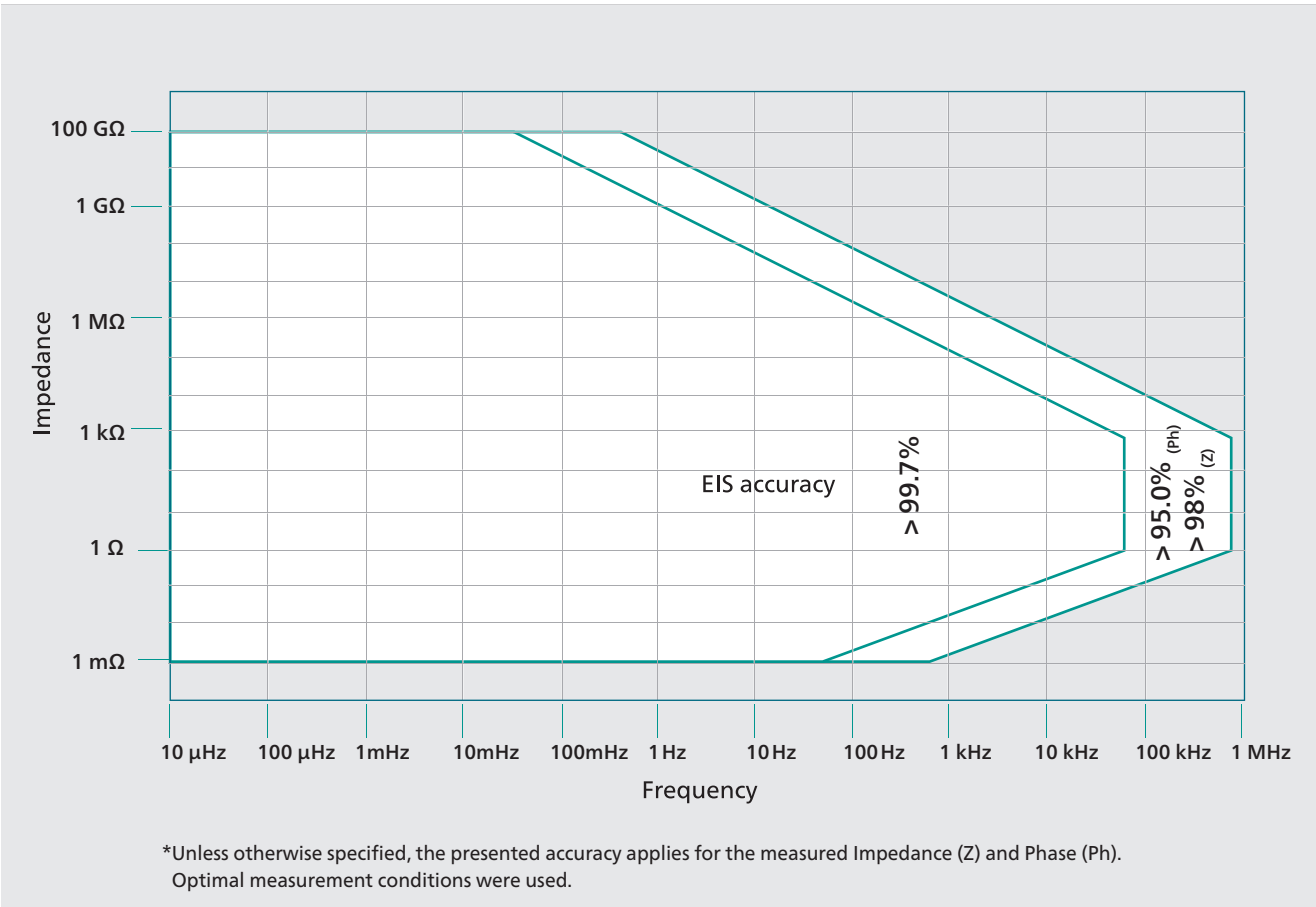


* Unless otherwise specified, the presented accuracy applies for the measured Impedance and Phase. Optimal measurement conditions were used. S2 connected to the counter electrode, with Z_{S2-RE} typically $10 \times Z_{S-RE}$.

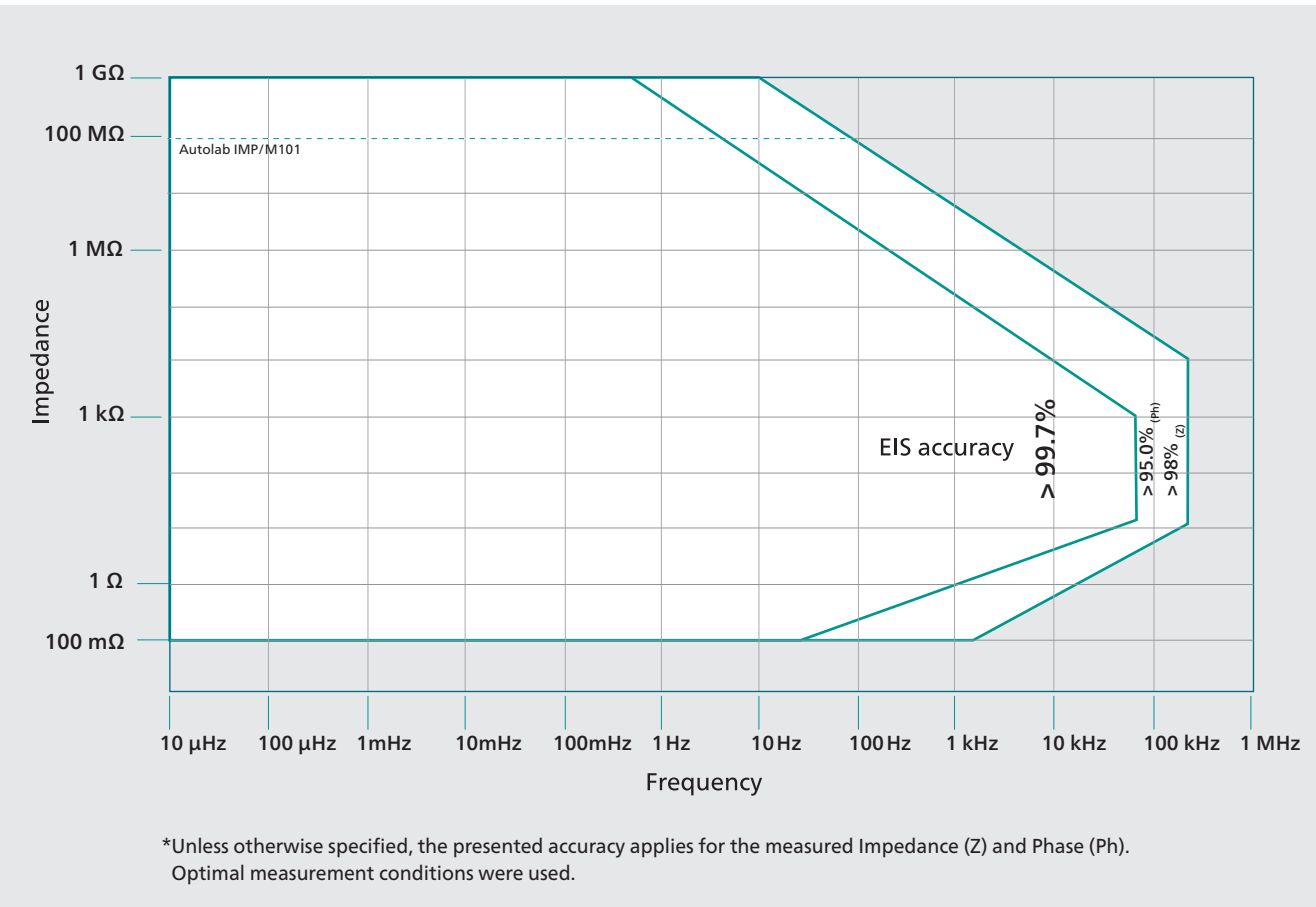
IMPEDANCE SPECIFICATION –
OTHER AUTOLAB INSTRUMENTS

	AUT302N	AUT204/M204	Autolab IMP	AUT101/M101
Electrochemical Impedance Spectroscopy	FRA32M option	FRA32M option	Yes	n.a. / FRA32M option (M101)
Maximum frequency	1 MHz, ECI10M option: 10 MHz	1 MHz	1 MHz	n.a. / 1 MHz
Minimum frequency	10 µHz	10 µHz	10 µHz	n.a. / 10 µHz
Max AC amplitude P-stat (Top)	± 500 mV	± 500 mV	± 500 mV	n.a. / ± 500 mV
Max AC amplitude G-stat (Top)	± 500 mA	± 50 mA	± 5 mA	n.a. / ± 5 mA
Minimum AC amplitude P-stat (Top)	± 300 µV	± 300 µV	± 300 µV	n.a. / ± 300 µV
Minimum AC amplitude G-stat (Top)	± 2 pA	± 2 pA	± 2 pA	n.a. / ± 2 pA
Maximum measurable impedance (accuracy %)	100 GΩ (>99.7%) See Contour Plot	1 GΩ (>99.7%) See Contour Plot	100 MΩ (>99.7%) See Contour Plot	100 MΩ (>99.7%) See Contour Plot
Minimum measurable impedance (accuracy %)	1 mΩ (>99.7%) See Contour Plot	100 mΩ (>99.7%) See Contour Plot	100 mΩ (>99.7%) See Contour Plot	100 mΩ (>99.7%) See Contour Plot
Full EIS accuracy	See Contour Plot	See Contour Plot	See Contour Plot	See Contour Plot

EIS CONTOUR PLOT – AUT302N WITH FRA32M



EIS CONTOUR PLOT – AUT IMP, AUT204/M204/M101 WITH FRA32M



ADDITIONAL SPECIFICATIONS



Parameter	VIONIC	AUT302N	AUT204/M204	Autolab IMP	AUT101/M101
General					
EIS	Yes	Optional: FRA32M	Optional: FRA32M	Yes	n.a. / FRA32M option (M101)
Analog scan	Yes	Optional: SCAN250	n.a.	n.a.	n.a.
Floating mode	Selectable with 4 options	n.a.	n.a.	n.a.	n.a.
Bipotentiostat	n.a.	BA option	BA option	n.a.	n.a. / BA option (M101)
iR drop (R_u) measurement	Yes, based on EIS	Yes, i-interrupt and positive feedback	Yes, i-interrupt and positive feedback	Yes, i-interrupt and positive feedback	Yes, i-interrupt and positive feedback
iR drop (R_u) compensation	Yes, manual and automatic	Yes, manual and automatic	Yes, manual and automatic	Yes, manual and automatic	Yes, manual and automatic
Cell cables	1 m fixed + 0.5 m removable Adaptive Cables with 4 mm banana conn. Optional: 2 mm banana, alligator, BNC	1.5 m detachable with 4 mm banana connectors. Optional: BNC connectors	1.5 m detachable with 4 mm banana connectors	1.5 m detachable with 4 mm banana connectors	1.5 m detachable with 4 mm banana connectors
Analog signal output	Yes, E_{out} , i_{out}	Yes, E_{out} , i_{out}	Monitor cable option: E_{out} , i_{out}	Monitor cable option: E_{out} , i_{out}	Monitor cable option: E_{out} , i_{out}
Maximum scan rate – analog scan	10 kV/s	SCAN250 option: 250 kV/s	n.a.	n.a.	n.a.
Minimum scan rate – analog scan	50 μ V/s	SCAN250 option: 10 mV/s	n.a.	n.a.	n.a.
Maximum scan rate – staircase scan	100 V/s (10 mV step potential & 100 μ s duration)	145 V/s (25 mV step potential and fixed gain)	145 V/s (25 mV step potential and fixed gain)	145 V/s (25 mV step potential and fixed gain)	145 V/s (25 mV step potential and fixed gain)
Minimum scan rate – staircase scan	100 μ V/s (100 μ V step potential & 1 s duration)	0.1 μ V/s	0.1 μ V/s	0.1 μ V/s	0.1 μ V/s
Number of cell connections	5 (WE, CE, RE, S, S2)	4 (WE, CE, RE, S)	4 (WE, CE, RE, S)	4 (WE, CE, RE, S)	4 (WE, CE, RE, S)
Temperature measurement	Yes, K-type Thermocouple	Optional: pX1000	Optional: pX1000	n.a	n.a. / Optional: pX1000 (M101)
Earth ground connection	Yes	Yes	Yes	Yes	Yes
Analog ground connection	Yes	Yes	Yes	Yes	Yes
Maximum output power (maximum power applied to a passive cell)	150 W	60 W	8 W	1 W	1 W
Analog (remote) control of the Autolab RDE	Yes	Yes	Yes, with optional monitor cable	Yes, with optional monitor cable	Yes, with optional monitor cable
DIO (TTL) triggering	Yes	Yes	Yes	Yes	Yes
Maximum input power (maximum dissipated power from active cells)	50 W @ 25 °C	20 W @ 25 °C	4 W @ 25 °C	1 W @ 25 °C	1 W @ 25 °C
Cell isolation	Automatic	n.a.	n.a.	n.a.	n.a.
Dynamic interface	7-segment LED with color signage	LCD	n.a.	n.a.	n.a.
Connection type	Ethernet	USB	USB	USB	USB

ADDITIONAL SPECIFICATIONS

Parameter	VIONIC	AUT302N	AUT204/M204	Autolab IMP	AUT101/M101
True parallel data acquisition	Yes	multiplexed AD conversion	multiplexed AD conversion	multiplexed AD conversion	multiplexed AD conversion
Seamless measurements	Yes	n.a.	n.a.	n.a.	n.a.
Time gap between 2 seamless measurement commands	0 ns (no gap)	n.a	n.a	n.a	n.a
Timing resolution	10 ns	1 μs	1 μs	1 μs	1 μs
Lowest sampling interval (acquisition) time	1 μs	20 μs ADC10M option: 100 ns	20 μs	20 μs	20 μs
Untethering (Remove and use the computer for other tasks while the experiment is in progress)	Yes	n.a.	n.a.	n.a.	n.a.
On-board data buffer (with sampling rate <10000 data points/s)	10 million data points (samples)	n.a.	n.a.	n.a.	n.a.
On-board data buffer (with sampling rate ≥10000 data points/s)	1 million data points (samples)	n.a.	n.a.	n.a.	n.a.
Control software	INTELLO	NOVA	NOVA	NOVA	NOVA
Footprint					
Dimensions in cm (w x h x d), excl. cables	20 x 27 x 40	52 x 16 x 42	15 x 19 x 26 (AUT204) 52 x 16 x 42 (MAC M204)	15 x 19 x 26	9 x 15 x 21 (AUT101) 52 x 16 x 42 (MAC M101)
Weight	13 kg	18 kg	4.5 kg (AUT204)	4.5 kg	2.1 kg (AUT101)
Power requirements	300 W, 100..240 V, 50/60 Hz	300 W, 100..240 V, 50/60 Hz	75 W, 100..240 V, 50/60 Hz (AUT204)	75 W, 100..240 V, 50/60 Hz (AUT204)	40 W, 100..240 V, 50/60 Hz (AUT101)



3 year
instrument warranty
Conditions apply



VIONIC powered by INTELLO
Compliance voltage: ± 50 V
Max Current: ± 6 A
EIS: 10 MHz, standard



Autolab AUT302N
Compliance voltage: ± 30 V Max
Current: ± 2 A, 20 A, optional
EIS: 1 MHz, 10 MHz, optional



AUTOLAB AUT204/M204
Compliance voltage: ± 20 V
Max Current: ± 400 mA, 10 A, optional
EIS: 1 MHz, optional



Autolab IMP
Compliance voltage: ± 10 V
Max Current: ± 100 mA
EIS: 1 MHz, standard



AUTOLAB AUT101/M101
Compliance voltage: ± 10 V
Max Current: ± 100 mA
EIS: N/A

