



PG 310 ($\pm 20\text{V}/2\text{A}$)

PG 390 ($\pm 90\text{V}/1\text{A}$)

Potentiostat / Galvanostat



If you believe your job is to
make new discoveries...

...discover PG 310 and 390

- Full Computer Control
- Compatible with Windows PC and Mac OS
- Wide Current Range
- IR compensation
- Variable Hardware Filters
- Suitable for Research and Industry

...and POTPULSE Software

- Programmable Free-Waveform Generator
- Digital Oscilloscope
- Sweep and Continuous Data Acquisition
- Online Analysis
- Macro Programming

HEKA

HEKA provides the finest instruments today to achieve the needed progress of tomorrow...

A complete system for electrochemical measurement

To keep pace with today's rapidly changing demands in electrochemical research you need powerful, flexible, user-friendly instruments.



The PG 300 features **state-of-the-art amplifier technology**. It includes amplification ranges for large currents, new hardware filters and an external preamplifier design (optional) to reduce noise levels for small currents. The most significant advance is the **complete software controlled** adjustment of the amplifier. This provides the tools necessary to perform virtually every electrochemical experiment. This also allows for the simplification and automation of experimental procedures and gives enormous flexibility for future extensions. The instant automatic versatile and easy-to-use macro features yield measurements of the highest quality, all while retaining the possibility of full manual control of the amplifier. Therefore, this instrument fulfills the needs of testing industrial electrodes and scientific research. The **versatility** of the amplifier and its superb technical specifications make the PG 300 the instrument of choice for all electrochemical experiments.

The integration of the PG 300 amplifier with the ITC-16 AD/DA interface and the connected computer constitutes a further step in the minimization of total recording noise. Complemented by the intrinsic **low noise** level of the PG 300 itself with the low current preamplifier, this integrated system effectively eliminates all interferences because it is fully decoupled by optical isolation that in conventional systems often arise from ground loops. Furthermore, the full digital control by a computer running our dedicated software achieves a well-compensated measuring arrangement necessary for a minimum of noise.

Automatic calibration and testing procedures implemented in the software control of the PG 300 guarantees exact functioning of the amplifier at all times. The user can easily run a calibration process whenever it might be necessary. The highly advanced integration of hardware and software of the PG 300 system eliminates compatibility problems, time-consuming set-up operations, and training time. Furthermore, it saves the expenses for additional instruments. The PG 300 controlled by the software POTPULSE and combined with a computer is equivalent to a **fully equipped set-up** which includes a potentiostat/galvanostat, digital storage oscilloscope, variable analog filter, sophisticated pulse generator, and a full featured data acquisition and analysis system.

Compare the PG 300 with any other amplifier system on the market and prepare yourself for an amazing experience!

- Fully controllable with the software POTPULSE.
- Sophisticated software controlled calibration of the complete PG 300 hardware.
- Potentiostatic or galvanostatic mode can be selected as required.
- Potential and current control amplifier for measurements in three or four electrode mode.
- Four high quality hardware built-in filters are available for optimal stimulus and signal conditioning.
- The bandwidth of the current filter can be set in 8 steps.
- The resistance between the reference and working electrode can be compensated with the positive feedback IR adjustment. The IR compensation ranges from 1 Ohm to 1 MOhm depending on the selected current range.
- The power outputs are protected against short circuiting.
- Inputs and outputs are provided by BNC connectors.
- Additional D/A outputs are available for controlling external devices.
- Additional A/D inputs allow recording signals from other devices.
- The optional TIB 14 trigger interface box provides digital output channels.
- The potentiostat can also be operated in the floating mode; that is, the chassis ground is isolated from that of the electric power.



Three free 16-bit **D/A output** channels for control of external devices, TEST is also used internally during calibration process.



Output of the **SCAN voltage**.



Five additional 16-bit **A/D input** channels to record signals from other devices.



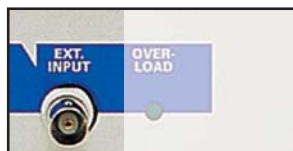
An external **PREAMPLIFIER** can be connected optionally for measurements in the low current range.



Connect your **electrodes** of the chemical cell to perform measurements in three or four electrode mode.



MONITOR the filtered voltage and current through the cell at BNC analog outputs.



External SCAN Input: An analog scan voltage can be applied externally.

The virtual front panel provided by POTPULSE

Connection between PG 300 and measuring cell. SET determines the OCP as INITIAL POTENTIAL.

The actual **measured values** allow continuous monitoring of the experiment.

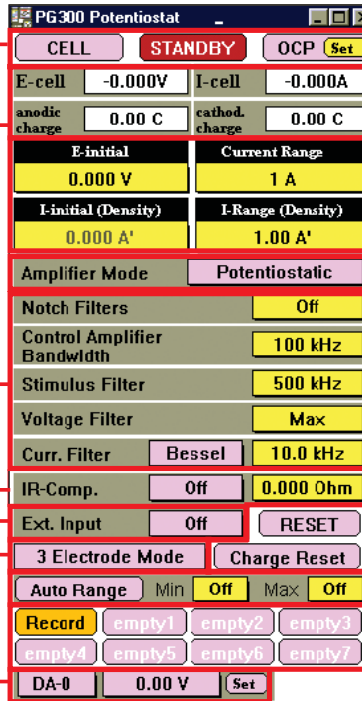
Hardware filters for the current and potential outputs as well as the bandwidth of the amplifier can be set within a wide range.

Built in **IR compensation**.

An **external input** allows the use of an additional, scaled external voltage generator.

A **3- or 4-electrode mode** can be selected.

At one of the **D/A outputs** of the PG 300 a defined voltage can be applied with SET, for instance, for the operation of bipotentiostats.



- 1 A
- 100 mA
- 10 mA
- 1 mA
- 100 µA
- 10 µA
- ✓ 1 µA
- 100 nA
- 10 nA
- 1 nA
- 100 pA

Adjustment of **INITIAL POTENTIAL** and **CURRENT RANGE**.

- ✓ Potentiostatic
- Galvanostatic

The **mode** is selectable.

Sets the PG 300 to the **initial state**. Reset of the charge integrator.

The **test generator** produces a user-defined sequence. All PG 300 settings can be selected, and the effect can be observed on the oscilloscope window.

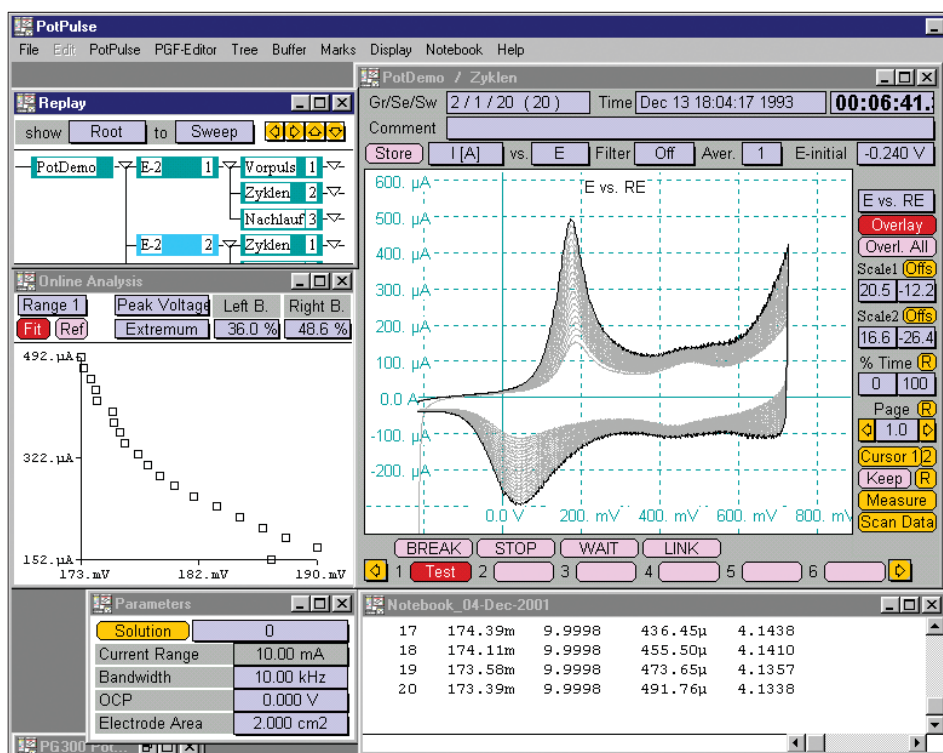
Macros allow combining of all settings from the windows and triggering of a measurement with the press of a single button.

Experiment control with POTPULSE

The PG 300 is completely controlled by the software POTPULSE which features a flexible digital Free-Waveform Generator, on-line analysis, oscilloscope window, data handling and processing, macro programming and more.

High versatility makes the combination of the PG 300 and POTPULSE to the right instrument for research and industry.

For details please refer to our separate POTPULSE brochure.



Technical specifications

DC Characteristics

PG 310	PG 390
<i>Counter electrode:</i>	
compliance voltage: ±20 V	±90 V
output current: ±2 A	±1 A
<i>Continuous power:</i>	
20 W	90 W
<i>Input specifications (REFERENCE electrode):</i>	
Impedance: >100 GΩ // 1.5 pF	>100 GΩ // 1.5 pF

Potentiostatic Mode

PG 310	PG 390
<i>Counter electrode:</i>	
Potential range: ±20 V	±90 V
resolution: 1 mV, accuracy 1 mV	
<i>Working electrode:</i>	
input current range: ±1 µA, 10 µA, 100 µA, 1 mA, 10 mA, 100 mA, 1 A, 10 A (with optional preamplifier additional ranges: ±100 pA, 1 nA, 10 nA, 100 nA)	±1 µA, 10 µA, 100 µA, 1 mA, 10 mA, 100 mA, 1 A
maximum input current: ±2 A	±1 A
current resolution: 0.0015 % of full range	
minimum current resolution: 30 pA (with optional preamplifier 3 fA in ±100 pA range)	30 pA
<i>Reference electrode:</i>	
Potential range: ±10 V	

Galvanostatic Mode

PG 310	PG 390
<i>Current range:</i>	
±1 µA to 10 A in 8 steps (with optional preamplifier additional four ranges from ±100 pA to 100 nA)	±1 µA to 1 A in 7 steps
maximum current: ±2 A	
minimum resolution: 0.1 % of full range	±1 A

Dynamic Data

<i>Signal rise time:</i>	Controlled by 3-pole Bessel filter in 4 steps from 0.1 µs to 200 µs or not filtered.
<i>Slew rate:</i>	10 V/µs
<i>Bandwidth:</i>	> 1 MHz in 1 mA-range at -3 dB
<i>Phase shift:</i>	< 10° at 200 kHz

Filters

The PG 310/390 contains four built-in filters.

Voltage filter:
A 3-pole Bessel filter with three bandwidth settings of 10, 100, and 1000 Hz.

Notch filter:
Eliminates 50 or 60 Hz power supply frequency ripple.

Current filter:
A 4-pole filter with selectable Bessel or Butterworth characteristic with bandwidth from 0.5 to 15 kHz.

Amplifier bandwidth control:
8 ranges from 0.1 to 300 kHz

Initial Potential

Software controlled initial potential with a total range of ±10 V.

Stimulation

Four digital-to-analogue (D/A) converters are provided by the built-in data acquisition interface.

Resolution: 16 bits
Settling time: 2 µs
Stimulation range: ±10 V

Data Acquisition

One 16-bit analog-to-digital (A/D) converter provided by the built-in data acquisition interface is multiplexed into eight differential input channels.

A/D resolution: 16 bit
Maximum acquisition rate: 200 kHz

Included Accessories

PCI-16 board for interfacing the PG 310/390 to PC or Macintosh computers with PCI bus.
Power cable
3 cables BNC to banana plug
Manual
Calibration files for PC and Mac

Additional Requirements

Software POTPULSE
Computer: See data sheet "Recommended Configurations"
optional: Preamplifier
optional: HCB 20 Current Booster

Chassis

Dimensions (D x W x H):
(35.0 x 48.3 x 18.0) cm / (13.8 x 19.0 x 7.1) inch
Mounts in 19" rack.
Weight:
12.2 kg / 27.5 lbs
Power requirements:
170 W (PG 310) 260 W (PG 390)
Operates on standard 110 VAC or 230 VAC



HEKA Elektronik
Dr. Schulze GmbH
Wiesenstraße 71
D-67466 Lambrecht/Pfalz
Germany

Phone +49 (0) 63 25 / 95 53-0
Fax +49 (0) 63 25 / 95 53-50
Web Site <http://www.heka.com>
Email sales@heka.com
support@heka.com

HEKA Electronics Incorporated
47 Keddy Bridge Road
R.R. #2
Mahone Bay, NS B0J 2E0
Canada

Phone +1 902 624 0606
Fax +1 902 624 0310
Web Site <http://www.heka.com>
Email nasales@heka.com
support@heka.com

HEKA Instruments Inc.
33 Valley Road
Southboro, MA 01772
USA

Phone +1 866 742 0606 (Toll Free)
Fax +1 508 481 8945
Web Site <http://www.heka.com>
Email nasales@heka.com
support@heka.com

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We reserve the right to effect technical changes as development progresses.

Special versions are available on request. Further technical data are provided by a detailed description, which is available on request.

A guarantee of one year applies on all instruments.

