



PG 340 (20V / 2A)
Ring/Disk
Bipotentiostat/Galvanostat



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

...discover PG 340

- Full Computer Control
- Compatible with Windows PC and Mac OS
- Controls two working electrodes independently
- Wide Current Range
- Optional external Preamplifier for low current measurements
- IR compensation
- Variable Hardware Filters
- Suitable for Research and Industry
- For ring/disk and SECM applications

...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, integrated software/hardware system for electrochemical measurement

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



The main feature of the PG 340 ring/disk Bipotentiostat is its design as a double potentiostat which allows the control of two independent working electrodes. This not only provides the tools to control rotating ring/disk electrodes, which are almost essential for the thorough study of mechanisms and kinetics of electrochemical reactions but also allows the control of ultramicro-electrodes and the performance of generator- and collector-electrode techniques for such innovative technologies as the Scanning Electrochemical Microscope (SECM).

In addition to these features the PG 340 offers the same exceptional advantages as the PG 310 or PG 390. The system is **completely controlled by a computer**. This allows for the simplification and automation of experimental procedures and provides enormous flexibility for future extensions. All mechanical switches are replaced by digital control, thus being wear-resistant. Consequently the scan-generator, oscilloscope, and filter-control are also digitized. There is no need for additional and costly hardware.

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 himself can easily run a calibration process whenever it might be necessary.

The automatic, versatile, and easy to use macro-features yield measurements of the highest quality, while retaining the possibility of full manual control of the amplifier on a virtual level.

The PG 340 features **state-of-the-art amplifier technology**. This includes amplification ranges for large currents, new hardware filters and an optional Pre-amplifier to reduce noise levels for very small currents.

The integration of the PG 340 amplifier with the ITC-16 AD/DA interface and the connected computer constitutes a further step in the minimization of total recording noise. The system is completely decoupled by optical isolation. Due to the intrinsic low noise level of the PG 340 itself, complemented by the low current Pre-amplifier, this integrated system effectively eliminates interference, that often arises from ground loops in conventional systems.

The PG 340 controlled by the software POTPULSE and combined with a computer is equivalent to a fully equipped measuring set-up consisting of a double potentiostat/galvanostat, a digital storage oscilloscope, a variable analog filter, a sophisticated pulse generator, and a fully featured data acquisition and analysis system. The **versatility** of the amplifier and its superb technical specifications allow you to perform virtually every electrochemical experiment. Therefore the PG 340 is the instrument of choice for industrial and scientific research.

The amplifier for Ring/Disk or SECM applications

Compare the PG 340 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 340 hardware.
- Potentiostatic or galvanostatic mode can be selected as required.
- Potential and current control amplifier for measurements in three or four electrode mode.
- Ring/disk experiments
- SECM applications, surface investigations, generator- and collector electrode techniques.
- 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.



Two 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** for disk and ring electrode.



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



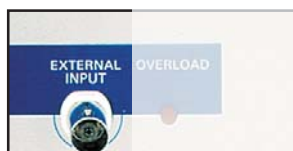
External **PREAMPLIFIERS** can be connected optionally to the ring and disk potentiostat for measurements in the low current range.



Use the PG 340 as potentiostat/galvanostat and connect your **electrodes** to 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 to the ring and disk electrode.

The virtual front panel provided by POTPULSE

Selecting the active amplifier **DISK / RING**

Connection between PG 340 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 340 a defined voltage can be applied with SET.

Adjustment of **INITIAL POTENTIAL** and **CURRENT RANGE** or **CURRENT DENSITY**

ext. Pre-Amplifier setting

The **mode** is selectable.

Sets the PG 340 to the **initial state**. Reset of the charge integrator.

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

PotPulse File Edit PotPulse SECM PGF-Editor Tree Buffer Marks Display Notebook

Replay show Root to Sweep

Online Analysis

Range 1 Time Left B. Right B. (Fit) (Ref) Extremum 0.0 % 100.0 %

Parameters

Solution 0

Current Range

Bandwidth

OCP

Electrode Area

SECM: Motors

XX	YY	
0.000	0.000	0
abs	0.000	0
rel	0.000	0

Ida2um / Scan

Gr/Se/Sw 1 / 1 / 41 (41) Time Aug 07 12:53:08 2000 00:05:02

Comment SCE

Store I and E vs. t Filter Off Aver. 1 E-initial 0.000 V

200 pA

10 um

37 0.0000 101.00m -1.3825n 6.279

38 0.0000 101.00m -1.3863n 6.459

39 0.0000 101.00m -1.3838n 6.630

40 0.0000 101.00m -1.3563n 6.800

41 0.0000 101.00m -1.3488n 6.980

The **SECM** is an electrochemical microscope related to the familiar scanning tunneling and atomic force microscopes. This type of microscope can be used to perform surface characterization and modification with high flexibility.

Technical specifications

DC characteristics*Counter electrode:*compliance voltage: ± 20 Voutput current: ± 2 A*Continuous power:*

20 W

*Resolution: A/D*accuracy: $\pm 0.05\%$, 0.5 mV,

16384 steps (14bit)

*Input specifications (reference**electrode):*

impedance: 100 GOhm // 1.5 pF

Potentiostatic Mode*Counter electrode:*Potential range: ± 20 V

Resolution:

1 mV, accuracy 1 mV

*Working electrode: Disk and**Ring*

input current ranges:

 ± 1 μ A, 10 μ A, 100 μ A, 1 mA,

10 mA, 100 mA, 1 A, 10 A

(with optional Preamplifier

additional ranges: ± 100 pA,

1 nA, 10 nA, 100 nA)

maximum input current: ± 2 A

current resolution:

0.0015% of full range

minimum current resolution:

30 pA (with optional Preamplifier

3 fA in ± 100 pA range)*Reference electrode:*Potential range: ± 10 V**Galvanostatic Mode***Current range:* ± 1 μ A to 10 A in 8 steps

(with optional Preamplifier

additional four ranges from ± 100

pA to 100 nA)

maximum current:

 ± 2 A

minimum resolution:

0.1% of full range

Dynamic Data*Signal rise time:*

Controlled by 3-pole Bessel filter

in 4 steps from 0.1 μ s to 200 μ s

or not filtered.

*Slew rate:*10 V/ μ s*Bandwidth:* > 1 MHz in 1 mA-range at -3 dB*Phase shift:* $< 10^\circ$ at 200 kHz**Low Current Pre-Amplifier**

The input circuitry is contained

in a hybrid integrated circuit.

Current measuring resistors:

50 GOhm (100 pA)

500 MOhm (1 nA; 10 nA)

5 MOhm (100 nA)

*Noise measured with open**input:*

(8-pole Bessel filter,

1 nA - 100 pA, 500 MOhm

feedback resistor):

DC to 10 kHz: < 400 fA (RMS)*Maximum bandwidth:*

100 kHz (500 MOhm Range)

Filters

The PG 340 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, Ring and Disk:

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 μ s*Stimulation range:* -10.24 V to $+10.23$ 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 340 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 26.0) cm / (13.8 x

19.0 x 10.2) inch

Mounts in 19" rack.

Weight:

15.2 kg / 33.0 lbs

Power requirements:

170 W

Operates on standard 110 VAC

or 230 VAC

Related Products**POTPULSE**

Electrochemistry data acquisition

and analysis software for

Windows 95/98/NT/2000/XP and

Mac OS.

X-CHART

Software implemented chart

recorder.

Preamplifier

For low noise measurements of

currents smaller than 100 nA.

HCB 20

Current booster compatible with

potentiostats/galvanostats of the

PG 300, PG 400, and PG 500

series for currents up to

20 A / ± 10 V or 10 A / ± 20 V.**PG 310/390**

Fully computer controlled

potentiostat/galvanostat with

built-in data acquisition interface

and a maximal compliance

voltage of ± 20 V / ± 90 V and a

current of 2 A / 1 A.

PG 410/490

A manually or remote controllable

potentiostat/galvanostat with a

maximal compliance voltage of

 ± 20 V / ± 90 V and a current of

2 A / 1 A.

PG 510/590

Manually or remote controllable

potentiostat/galvanostat with a

maximal compliance voltage of

 ± 20 V / ± 90 V and a current of

2 A / 1 A with built-in analog

scan generator.

EVA 8

Stand-alone Voltammetric

Amplifier for microelectrode

technology.



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A guarantee of one year applies on all instruments.

