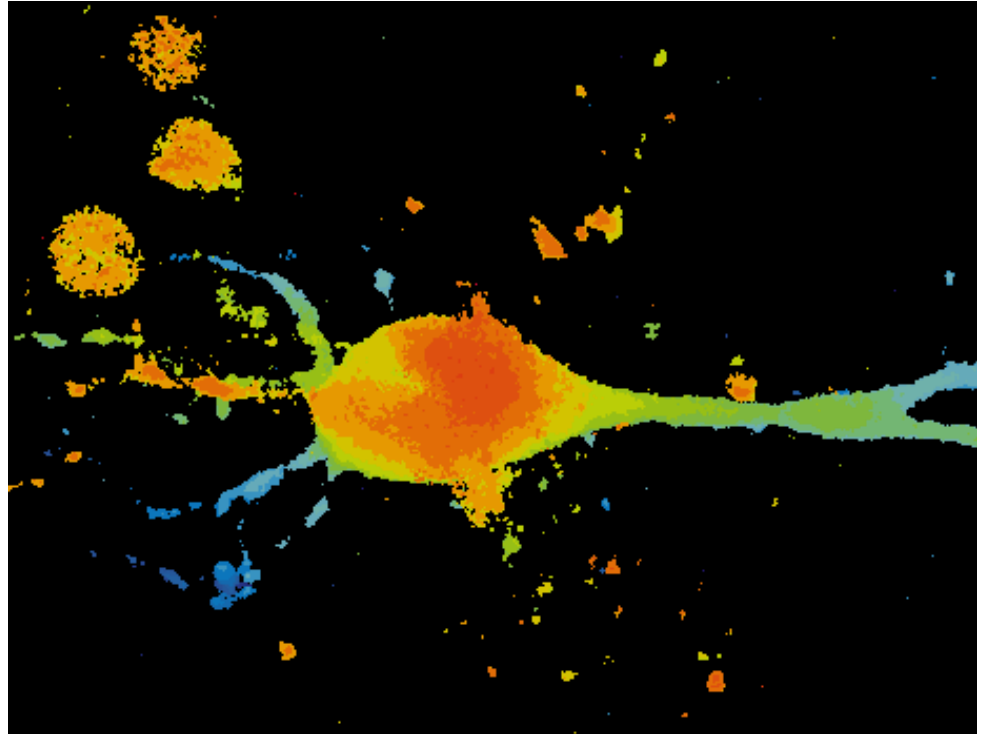


EPC 9 Double

EPC 9 Triple

Patch Clamp
Amplifier

Patch Clamp
Amplifier



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

...discover EPC 9 Double Patch Clamp Amplifier and EPC 9 Triple Patch Clamp Amplifier,
The highly integrated patch clamp amplifier system
EPC 9 Double: 2 Amplifiers with 2 Headstages in one housing
EPC 9 Triple: 3 Amplifiers with 3 Headstages in one housing

Fully computer-controlled (Windows NT, Windows 95, Windows 3.1 or MacOS)
Easy, clear and user friendly handling
Automatic selftest and calibration
Automatic capacitance Neutralization



To keep pace with today's rapidly changing demands in electrophysiological research you need flexible, easy-to-use and powerful instruments.



The EPC 9 Double and EPC 9 Triple represent a new development in the field of patch clamp amplifiers. The experience of HEKA as the first manufacturer of patch clamp amplifiers in the world (EPC 5, EPC 7, EPC 9) combined with the practical experience obtained in the Göttingen Nobel-Prize laboratories of Prof. Neher rendered this step into the future possible. The EPC 9 Double and EPC 9 Triple unifies all of this experience and in addition offers many detailed improvements (implemented according to our customers wishes and proposals). The EPC 9 Double and the EPC 9 Triple offer the same great advantages as the EPC 9 itself.

If you wish to perform double or triple patch experiments, the EPC 9 Double or EPC 9 Triple patch clamp amplifiers are the optimal solution for you. They multiply all properties which have made the EPC 9 the world's most efficient patch-clamp amplifier by combining two or three amplifiers in a single instrument. The operation and handling are clearly defined and simple. The software stimulates the desired amplifier and enters the selected channels without tedious connecting of cables by the user. The amplifiers and the associated headstages are unambiguously identified; thus, the operator can immediately assign the amplifiers to the patched cells. The software automatically recognises the amplifier type (EPC 9, EPC 9 Double or EPC 9 Triple); hence, the various instruments can be actuated, and data can be recorded, with the same software.

The EPC 9 Double and EPC 9 Triple provide an economical solution in comparison with the combination of several individual instruments, and offers complete control of each individual amplifier and optimized noise performance and grounding.

Compare the EPC 9 Double and EPC 9 Triple with any other amplifier system on the market and prepare yourself for an amazing experience!

The software PULSE automatically recognizes the type of amplifier (EPC 9, EPC 9 Double or EPC 9 Triple). Each amplifier can be stimulated automatically and separately. One stimulation channel and two data acquisition channels. 4 resp. 6 possible data acquisition channels internally connected.

Test Pulse

There are two test pulse modes: built-in test pulses (double or single) and use of a stimulation template from the pulse generator as test pulse.

Controls

All values can be set automatically or manually by either the mouse or the keyboard.

Filters

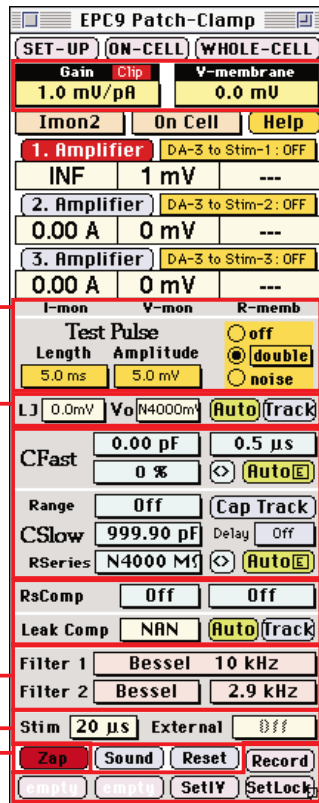
Two built-in high quality hardware filters (Butterworth/Bessel) perform excellent signal conditioning and remove the expense of purchasing additional filter instruments.

Stimulus

The stimulus can be filtered by activating the stimulus switch.

Zap Pulse

A high voltage pulse is applied to the pipette in order to rupture the patch membrane. The parameters (duration and amplitude) can be specified.



Documentation

All EPC 9 settings will be stored with the raw data for easy reconstruction, analysis, and documentation of your experimental procedures. (Window for EPC 9 Triple)

Automatic Compensations

Automatic routines for leak and capacitive transient compensations, performing these tasks faster and more accurate than even the most experienced experimenter. Capacitance tracking allows continuous updating of membrane capacitance and series resistance compensation during recording sessions.

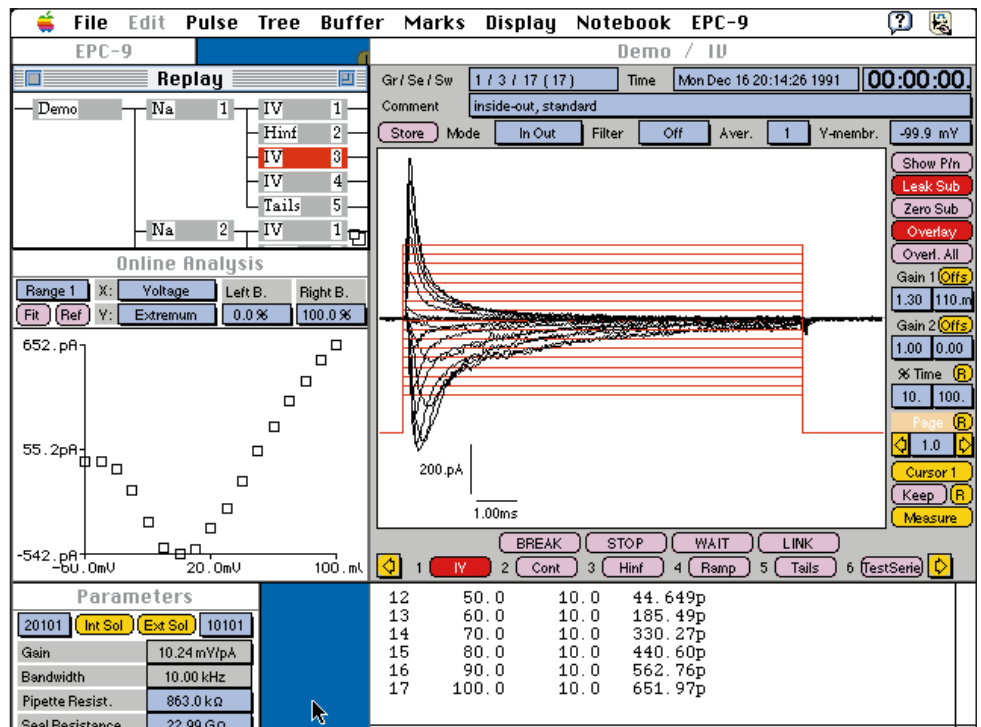
Leak and Rs Compensation

This controls a hardware leak compensation. The series resistance compensation corrects for membrane voltage errors under conditions of high access resistance between pipette and cell interior.

Macros

Macro features allow the recording of routine functions and then accessing these Macros by a simple click of a button.

For further features of PULSE, the program for data acquisition and analysis in electrophysiology, such as pulse generator, on-line analysis, oscilloscope window, data processing, and many others, please refer to our separate brochure.



Headstage

The input circuitry is contained in a hybrid integrated circuit.

Current measuring resistors:

50 GOhm (high range)
500 MOhm (medium range)
5 MOhm (low range)

Injection/compensation capacitors:

1 pF (all ranges)
10 pF (medium and low range)

Noise measured with open input: (8-pole Bessel filter, high range)

DC to 1 kHz: 0.03 pA RMS
DC to 3 kHz: 0.08 pA RMS
DC to 10 kHz: 0.25 pA RMS

Maximum bandwidth:

100 kHz (medium and low ranges)
60 kHz (high range)

Filters

The EPC 9 contains two built-in filters for the current-monitor signal. Filter 1 is a 3-pole prefilter with 10 to 100 kHz, Bessel responses. Filter 2 is a 4-pole, 500 Hz to 15 kHz filter with selectable Bessel or Butterworth characteristic.

Capacitance Compensation

Automatic or manual adjustment of the fast and slow capacitance cancellation. Capacitance tracking for measuring cell surface area.

C-fast:

0 to 15 pF, 0 to 8 μ s time constant

C-slow:

0.2 to >1000 pF, limited only by the voltage step size

R-series:

1 MOhm to 1 GOhm

Series Resistance Compensation

Automatic trimming is also available as manual adjustment. The maximum compensation is 95 %; the optimum setting depends on the cell capacitance.

Equivalent time constant:

1 μ s
10 μ s
100 μ s

Range:

1 to 1000 MOhm (medium range)
0.1 to 10 MOhm (low range)

Leak Subtraction

Linear leak subtraction can be performed either manually or automatically.

Range:

0 to 2 nS (high range)
0 to 200 nS (medium range)
0 to 20 μ S (low range)

Pipette Offset

Automatic or manual adjustment of the pipette offset in a range of +/- 200 mV.

Holding Potential

Software controlled holding potential with a total range of +/- 1 Volt.

Current Clamp

Commanded CC:
1 pA/mV input; up to 10 nA
Mode:
Fast and slow

Stimulation

Four 16-bit Digital-to-Analog (DA) converters are provided by the built-in data acquisition interface.

DA-Resolution:

16 bits

Settling Time:

2 μ s

Update rate:

200 kHz maximum

Stimulation range:

+/- 10 Volts

Data Acquisition

One 16-bit Analog-to-Digital (A/D) converter provided by the built-in data acquisition interface with eight differential inputs.

A/D-resolution:

14,5 bits, for sampling rates up to 100 kHz
12 bits, for sampling rates up to 200 kHz

ZAP

A ZAP pulse is provided by the stimulator software. Amplitude (up to 1 Volt) and duration are programmable.

Audio Monitor

Also provided by software.

Noise Measurement

True RMS measurements from 100 Hz to 15 kHz.

Related Products

PULSE / PULSEFIT

Patch clamp data acquisition and analysis software for Windows NT/95/3.1 and MacOS.

X-CHART

Software implemented chart-recorder for Windows NT/95/3.1 and MacOS.

TIDA

Electrophysiological data acquisition and analysis for personal computers under MS-Windows NT/95.

EPC 7

The classic patch-clamp amplifier for single channel and whole-cell measurements.

EPC 8

The successor of the EPC 7. Manual or digital control selectable.

PIP 5

Temperature controlled micro pipette puller.

Service & Support

As the first manufacturer of patch clamp amplifiers in the world HEKA knows the needs of scientists. We provide exceptional pre and post sales customer support from our trained international sales representatives and our own technical support advisors. With thousands of high performance hardware and software products in daily use worldwide we understand all aspects of data acquisition systems not just the software. You can get everything from signal conditioning and acquisition to analyzing and data backup systems from one supplier, to avoid compatibility headaches.



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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.

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