

Gear Up Your Patch Clamp System From Single to Multi-Patch Systems – Upgrade Possibilities

HEKA introduced the EPC 9/10 DOUBLE, EPC 9/10 TRIPLE, and EPC 10 QUADRO patch clamp amplifiers to enable investigators to conduct technically complex experiments, such as the study of cell-to-cell interactions. Although either two (EPC 10 DOUBLE), three (EPC 10 TRIPLE), or four (EPC 10 QUADRO) amplifiers are combined in a single housing; each amplifier is completely independent with clearly defined operation and handling.

HEKA's software stimulates the desired amplifier and selected channels without tedious connections of cables by the user. Another very important advantage of the EPC 10 DOUBLE, TRIPLE, or QUADRO amplifiers is the integrated system removes any grounding problems of the different amplifiers.

The EPC 10 DOUBLE, TRIPLE, or QUADRO systems are completely controlled by HEKA's multi-channel stimulation/acquisition software PATCHMASTER. Establishing the measuring configuration of the different amplifiers can be automated as well as e.g. switching between different recording modes, compensating fast and slow capacitance and flexible stimulation with complex patterns to name only a few examples.

HEKA's integrated EPC 10 DOUBLE, TRIPLE, or QUADRO systems are the most sophisticated on the market. They meet the highest standards for electrophysiological data acquisition and are the preferable solution for multi-patch applications (see also data sheets "EPC 10 DOUBLE/EPC 10 TRIPLE", "EPC 10 QUADRO", and "PATCHMASTER").

In addition to a fully integrated approach, HEKA's modular design of its hardware and software products allow various possibilities of extending their existing EPC 9 or EPC 10 patch clamp system. Please see the following possible configurations:

From Single to Double Patch Systems

Patch clamp systems based on an EPC 9 or EPC 10 patch clamp amplifier can be extended as follows to build a double patch system:

- 1) **EPC 10 + EPC 10 controlled by PATCHMASTER:** Two EPC 10 patch clamp amplifiers can be directly connected to a single PCI interface card in the computer. The software PATCHMASTER detects both EPC 10 amplifiers and handles them in the same way as an EPC 10 DOUBLE patch clamp amplifier. A few major advantages of this configuration are: you have full control over both amplifiers, they can be stimulated simultaneously with different protocols and all amplifier parameters are stored together with the data.
- 2) **EPC 10 + EPC 8 controlled by PATCHMASTER or PULSE:** The EPC 8 runs in local mode (manually controlled using the knobs on the EPC 8 front panel), and sends e.g. the gain setting via a digital interface to the PATCHMASTER or PULSE software. Command voltage and current monitor of the EPC 8 are connected to a DA and AD channel of the EPC 10 respectively. In this configuration, e.g. a stimulus can be sent to a single or to both headstages and signals can be recorded from both headstages.
- 3) **EPC 9 + EPC 8 controlled by PATCHMASTER or PULSE:** see 2)
- 4) **EPC 9/10 + other gain-telegraphing amplifier controlled by PATCHMASTER:** The software PATCHMASTER is able to read individual gain settings for additional recording AD channels. The telegraphing amplifier has to be controlled manually, the current monitor signal and the telegraphing gain signal can be sampled via two AD channels of the EPC 10. One free DA channel of the EPC 10 is needed to generate the voltage stimulus signal for the telegraphing amplifier.

From Single/Double to Triple Patch Systems

Triple patch clamp systems can be built by the following combinations:

- 5) **EPC 10 + EPC 10 DOUBLE controlled by PATCHMASTER:** see 3)
- 6) **EPC 9/10 + two other gain telegraphing amplifiers controlled by PATCHMASTER:** see 4); two gain telegraphing amplifiers can be connected to the EPC 10 using 2 free DA and 4 free AD channels of the EPC 10 for stimulation, recording and gain reading of the telegraphing amplifiers respectively.
- 7) **EPC 10 DOUBLE + other gain telegraphing amplifier controlled by PATCHMASTER:** see 4)

Patch Clamp Systems with 4 to 8 Headstages

The EPC 10 offers the convenience that two interfaces can be connected to and controlled by a single PCI board in the computer. Consequently, one can connect two EPC 10 patch clamp amplifiers to one PCI interface card. Both EPC 10 patch clamp amplifiers are detected by PATCHMASTER and can be used in the same way as an EPC 10 Double Patch Clamp Amplifier. This concept also holds for other combinations of amplifiers of the EPC 10 family. This way you can set up systems as combinations of:

- 8) **EPC 10 DOUBLE + EPC 10 DOUBLE** to build a system with **4 headstages**.
- 9) **EPC 10 TRIPLE + EPC 10 DOUBLE** to build a system with **5 headstages**.
- 10) **EPC 10 TRIPLE + EPC 10 TRIPLE** to build a system with **6 headstages**.
- 11) **EPC 10 QUADRO + EPC 10 QUADRO** to build a system with **8 headstages**.

Serial Patch Clamp Systems

HEKA's new EPS 8 or EPS 12 probe selectors are headstage multiplexing devices which can be connected to a headstage port of an EPC 10 (**see data sheet "PROBE SELECTOR"**). Probe selectors are available with 8 or 12 channels allowing up to 8 or 12 probes (headstages) to be connected to an EPC 10 amplifier. Each independent amplifier of the EPC 10, EPC 10 DOUBLE, EPC 10 TRIPLE, or EPC 10 QUADRO can be extended by a single probe selector allowing to set-up systems with 8/12, 16/24, 24/36, or 32/48 channels. The EPC 10 concept allows to calibrate all headstages connected to the probe selector automatically in a complete calibration run. When switching between different probes, the corresponding calibration settings are loaded to guarantee proper recordings. The system is controlled by PATCHMASTER. One headstage per main amplifier channel can be active. That means if you are using an EPC 10 QUADRO, for example, you can measure from 4 headstages simultaneously. All other headstages are set to a common holding potential.

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