

SEC SYSTEMS WITH LINEAR (x1 AND x10) MODE

General Description

The linear mode of the SEC amplifier is an “unswitched” operation mode of the SEC, working in voltage clamp (VC) and current clamp (CC). In contrast to standard patch clamp amplifiers the electrode voltage is nevertheless measured, also in VC. However, due to current flow during voltage measurement, this measurement is distorted by the series resistance. This is the reason why the linear mode should be used only for recordings where only little current flows.

In the linear mode the background noise of the amplifier is substantially reduced. Therefore, the linear mode is predestined for low-noise recordings in VC and CC mode.

The linear mode allows also **loose-patch** or **macro-patch** recordings and can be used to approach the cell and form a gigaseal in VC mode.

The LIN x10 mode can be used for iontophoresis or electroporation, i.e. juxtacellular, non-invasive filling of cells with or single cell transfection with DNA.

Operation

The linear mode is set through the Linear Mode switch at the front panel. When the switch is set to the middle position, the amplifier is in “switched” (VC or CC) or in BRIDGE mode (CC). Setting the switch to x1 or x10 lets the amplifier work in linear mode either without or with x10 amplification.

Linear Mode - x1/x10 switch

- x1: The amplifier operates in linear, unswitched mode (see below), current and/or voltage are not enhanced. LIN LED lights green.
- x10: The amplifier operates in linear electroporation mode. Command voltage in VC or current stimulus in CC mode are multiplied by the factor of ten. In this operation mode the LIN LED lights red and the voltage output at POTENTIAL OUTPUT x10mV BNC connector) is set to **x1mV**.
- middle: In the middle position of this switch the amplifier works in switched or BRIDGE mode. The LIN LED does not light.

Important: In LIN x10, the voltage output (POTENTIAL OUTPUT x10 mV BNC connector) is set to **x1 mV**, i.e. 1 V is 1 V (and not 100 mV as in LIN mode x1).

Important: The linear mode must be used with low resistance patch pipettes only! Ringing can be avoided by setting the GAIN in VC mode not higher than 1 and by setting the capacity compensation of the electrode to very low values (best close to zero).

Note: Be always aware, that the linear mode introduces a series resistance error that is dependent on the magnitude of series resistance and current that flows during measurement.