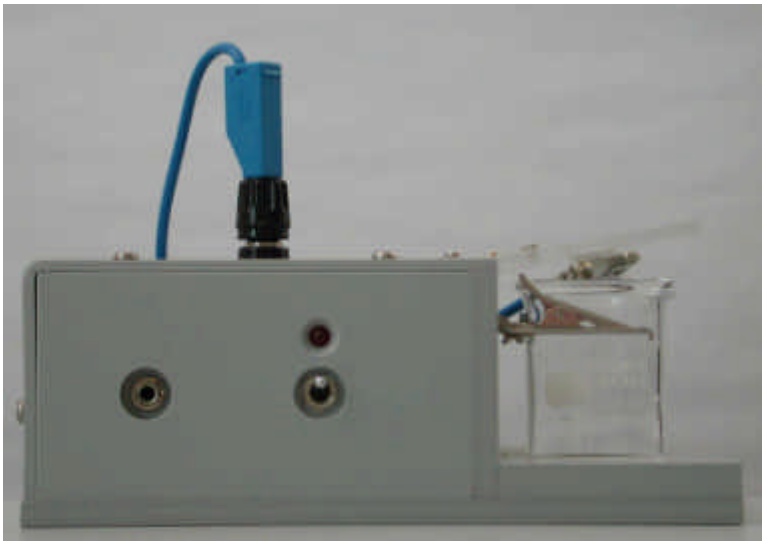
Electronic Instruments for the Life Sciences

OPERATING INSTRUCTIONS AND SYSTEM DESCRIPTION FOR THE

***ACl*-01**

AUTOMATIC APPARATUS FOR CHLORINATING AG WIRES BY ELECTROLYSIS



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1. Safety Regulations

VERY IMPORTANT: Instruments and components supplied by npi electronic are NOT intended for clinical use or medical purposes (e.g. for diagnosis or treatment of humans) or for any other life-supporting system. npi electronic disclaims any warranties for such purpose. Equipment supplied by npi electronic must be operated only by selected, trained and adequately instructed personnel. For details please consult the GENERAL TERMS OF DELIVERY AND CONDITIONS OF BUSINESS of npi electronic, D-71732 Tamm, Germany.

1. Any contact with the chloriding solution must be avoided. Always adhere to the appropriate safety measures for handling toxic or aggressive chemical solutions.
2. Always adhere to the appropriate safety measures for handling electronic mains powered devices. Always use a three-wire line cord and a mains power-plug with a protection contact connected to ground.

2. General System Description

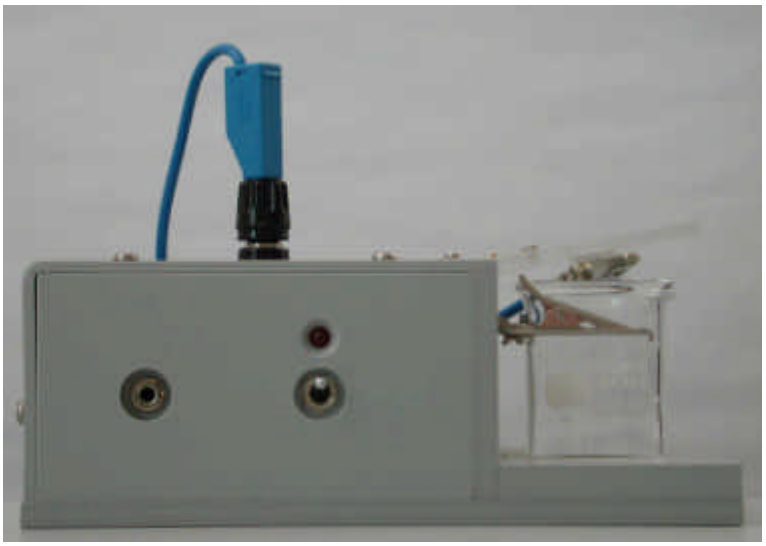

Figure 1: front view of the A*Cl*-01

The A*Cl*-01 apparatus is a low-cost, fully automatic system for manufacturing chlorinated silver wires as reference electrodes, which are widely used in electrophysiology (Ag-AgCl electrodes). The quality of recorded signals relies on a thorough preparation of the Ag-AgCl electrodes (see references).
The A*Cl*-01 apparatus provides all the necessary equipment and an electronic control unit to automatically chloride silver wires by electrolysis. The system is batteries operated and has an auto power off function. The A*Cl*-01 system is housed in a small plastic enclosure where a glass solution dish can be placed. A holder for the Ag and silver reference wire electrode is attached for easy handling. The recommended solution is 2 molar KCl.
The currents needed for cleaning and chlorinating the Ag wire are controlled electronically (see Figure 2). The eight minutes chlorinating procedure is electronically timed.
Chlorinating of silver wires is sufficient for typical electrophysiological recordings, equivalent to several mA/h of Ag-AgCl coating. In general, the coating is thicker than conventional chlorinating with chlorinating agents. It is thinner than dipping in hot, liquid AgCl, but the coating is more uniform. Typically silver wires of 0.15 mm to 0.5 mm diameter are used and these will be coated efficiently.
The A*Cl*-01 is fully automated. Once the START button is pressed, the ON LED lights and all functions are performed under electronic control. After the chlorinating procedure the system turns off automatically.

3. Operation

3.1. External Power Supply

The A*Cl*-01 can be powered from an external DC power supply (9 Volt, stabilized, 100 mA, e.g. power adapter for a Walkman or a similar electronic device). The power supply is connected via a standard connector (usually supplied with the AC-DC power adapter). The inner (front) pin is connected to plus. The A*Cl*-01 system is protected internally against reverse polarity. First connect A*Cl*-01 system to the power adapter and then power the adapter to mains. If the A*Cl*-01 system does not work reverse polarity following instructions of the power adapter supplier.

Caution: Always adhere to the appropriate safety measures for handling electronic mains powered devices. Always use a three-wire line cord and a mains power-plug with a protection contact connected to ground.

3.2. Solution

The 2 molar KCl solution is held in a small glass dish covered by a plastic lid with a hole for the silver wire which will be chlorinated.

Caution: Any contact with the solution must be avoided. Always adhere to the appropriate safety measures for handling toxic or corrosive chemical solutions.

3.3. Operation

First, the silver wire must be cleaned carefully (e.g. with emery paper and alcohol to remove grease). This is important because a badly cleaned silver wire will result in a non-uniform deposit of chloride. Then, insert a large silver wire or plate into the solution and connect it to the alligator clip located near the glass dish. This is the „reference“ (= neutral) electrode for the electrolysis circuit. The „active“ electrode (i.e. the silver wire which will be chlorinated) is connected to the black connector on top of the gray box by means of a blue wire with an alligator clip. The silver wire is inserted through the hole on top of the protecting lid which covers the solution dish.

***Important*:** During operation the solution dish must be covered with the plastic protection lid to avoid accidents.

After immersing the silver wire in the solution, the chlorinating process is started by pressing the switch located on the left side of the box downwards. A red LED indicates that the chlorinating process has been started. The duration of the chlorinating procedure is indicated by this red lamp.

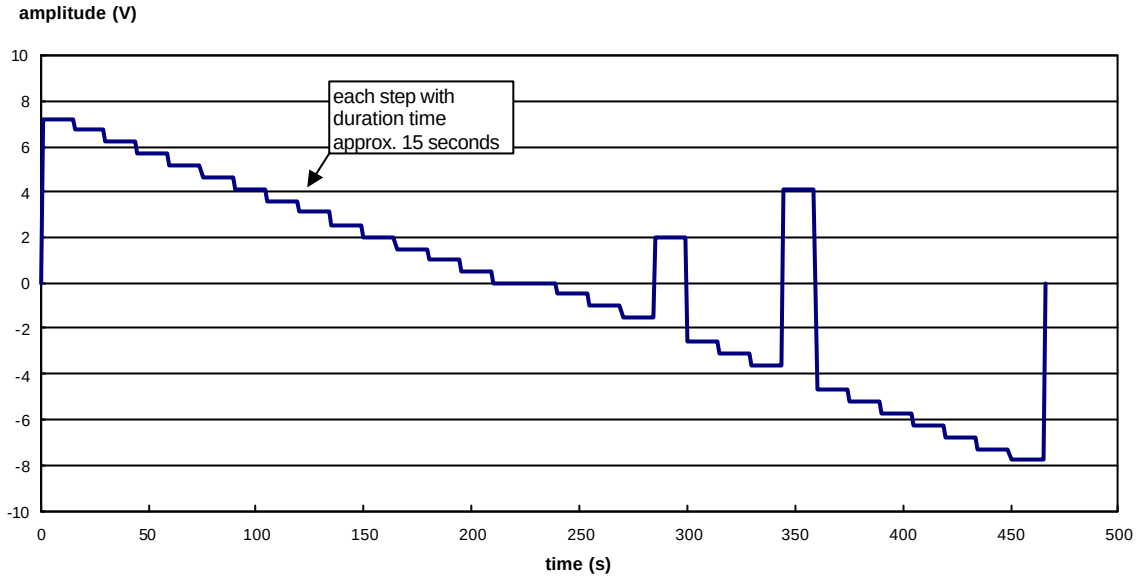

Figure 2: working scheme of the ACl-01

The chlorinating procedure that has been developed at the MPI in Göttingen, Germany, lasts several minutes. The voltage course at the silver wire is shown in Figure 2. The system is shut down automatically by the internal electronics (LED off).

4. Literature

1.) F. J. Alvares-Leefmans (1992) Extracellular Reference Electrodes, in Kettenmann, H. and R. Grantyn (eds.) Practical Electrophysiological Methods, Wiley-Liss, New York.

2.) E. Neher (1992) Correction for Liquid Junction Potentials in Patch Clamp Experiments, in: Rudy, B. and L.E. Iverson (eds.) Ion Channels, Meth. In Enzymol. 207:123-130, Academic Press, San Diego, Ca.