ET225 Electrophoresis Platform

User Manual

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ET225 C4D MicroChip Electrophoresis Platform

Introduction

The ET255 platform was designed to allow standard 45mm and 90mm Microchips manufactured by: Micronit Microfluidics (see information at the end of this document) to be used as a complete microchip based Electrophoresis system.

The complete ER255 (and ER455) system is composed of the following elements:

ER225 C4D System that provides the excitation and signal acquisition components of the system.
ER230 HV Sequencer that provides the HV necessary for the Electrophoresis function
ET225 the mechanical platform (adapter) that provides the required facilities to load samples and acquire the data generated.
ET145-4 Four 45mm borosilicate glass TYPE T35100C4D microchips
EC 20 Standard test solutions.

Disclaimer: This system is supplied as a research grade instrument and eDAQ does not claim that this system is suitable for any particular Electrophoresis application. The user takes full responsibility for the design of experiments and the interpretation of the resulting data.

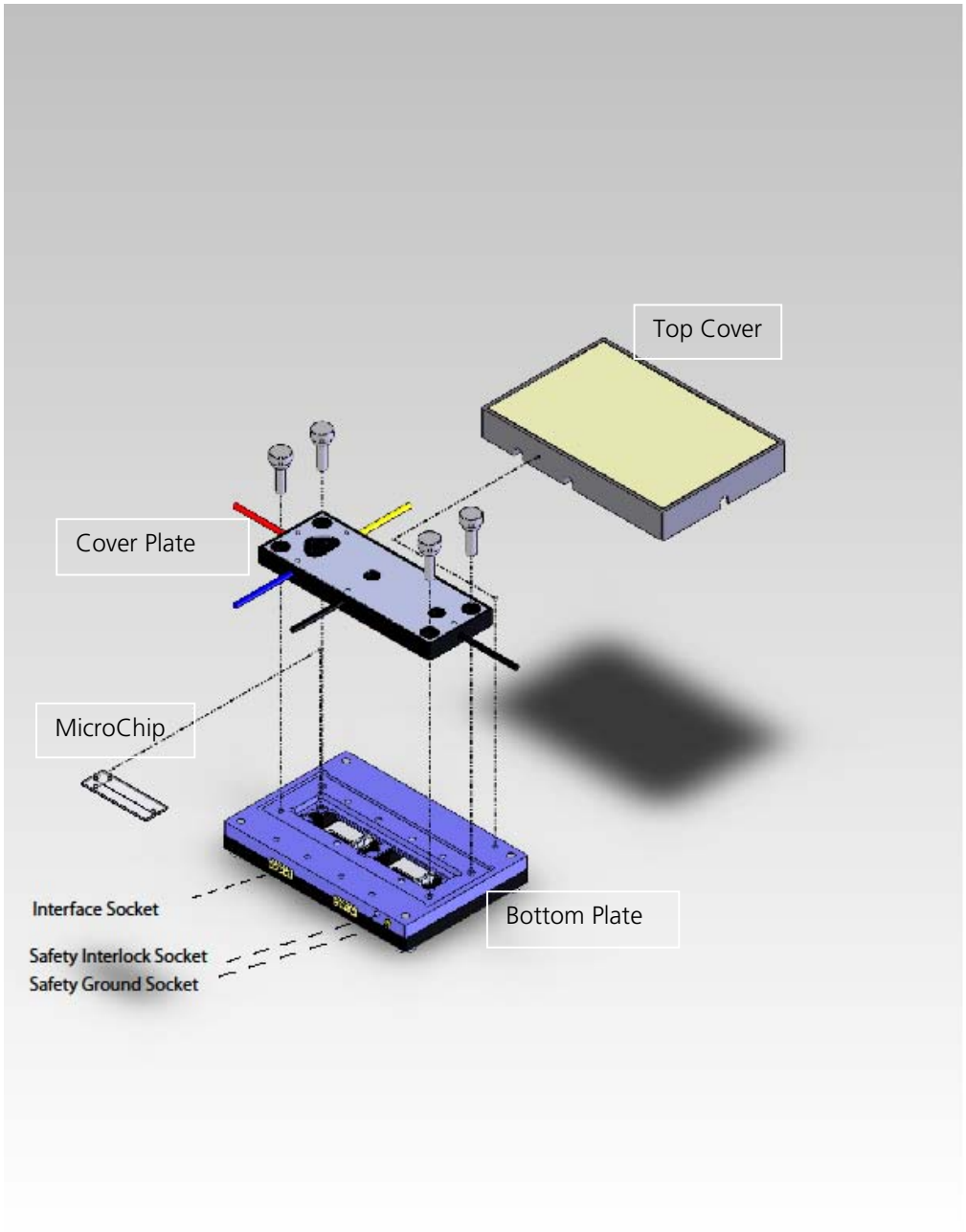
System Description

A fully wired ET225 system is shown below, it consists of:

Five (5) Multicoloured HVcables
Interface cable
Safety Interlock cable
Ground pin

An exploded view of the system is shown below:

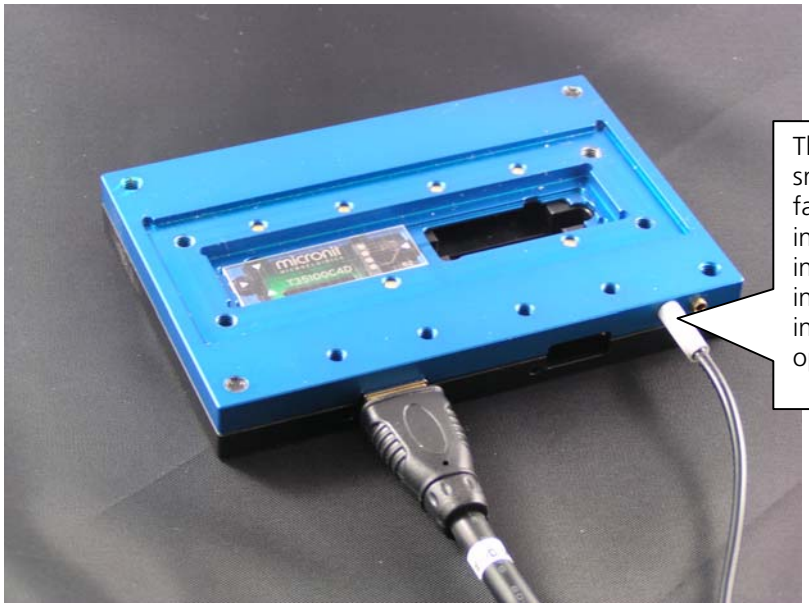
Exploded View



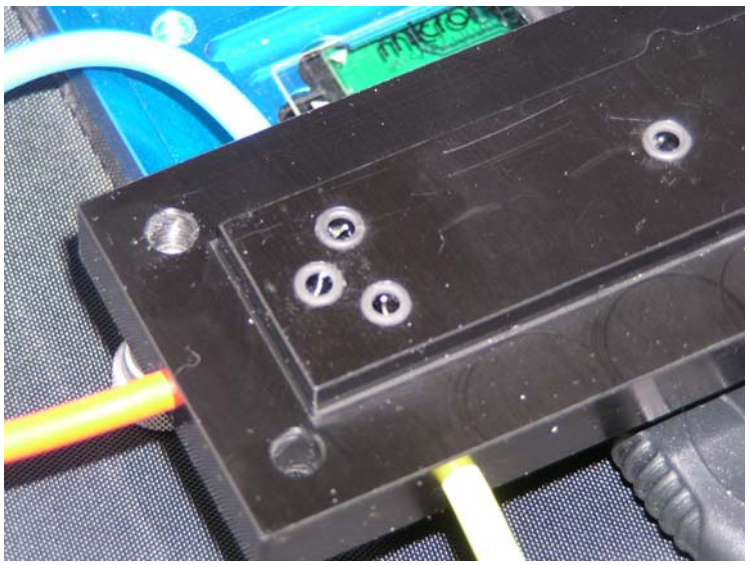
Assembly

CAUTION: Microchips are constructed from glass and should therefore be handled very carefully to prevent breakages. Warranty does not apply to broken or used microchips. Microchips are delivered in a shock proof container.

Step 1 Connect Interface cable and Safety interlock cables.
Step 2 Fit ET145 Microchip as shown – ensure that the chip is mounted correctly.

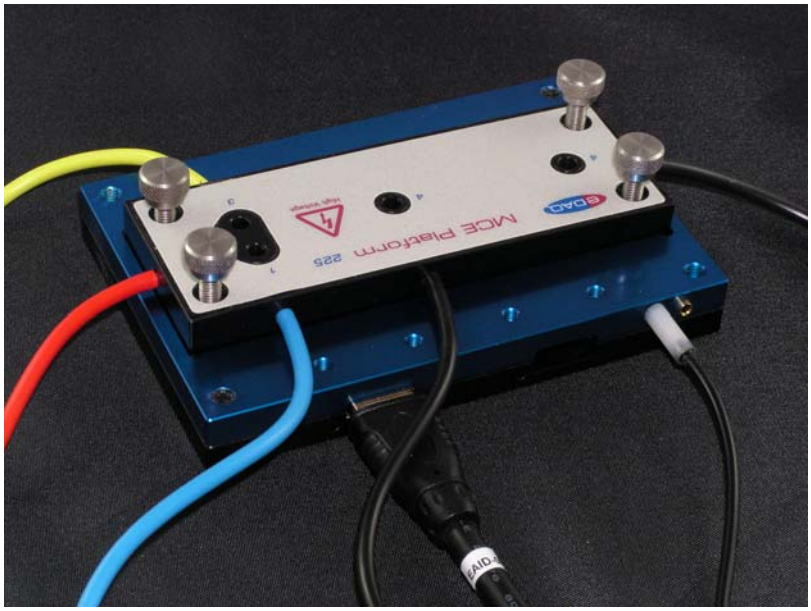


Step 3 Check that the O-rings are in place before fitting the cover plate – spare O-rings are provided

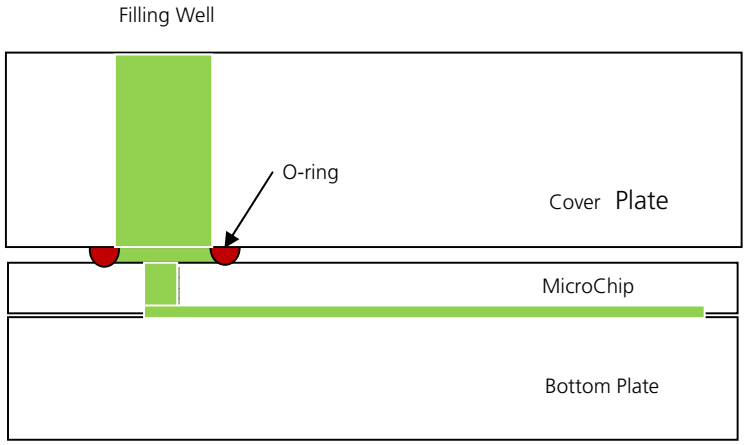


Step 4 Carefully fit the cover plate using the knurled bolts.
These bolts should be tightened evenly and in turn and **should not be over tightened since this WILL damage the microchips.**

Light finger pressure on the bolts is sufficient to create a good seal between the O-rings and the chip.



The diagram below (NOT TO SCALE) shows diagrammatically the fluid circuit from the Filling well to the microchip fluid channel. The O- ring represents the only contact between the microchip and the cover plate.



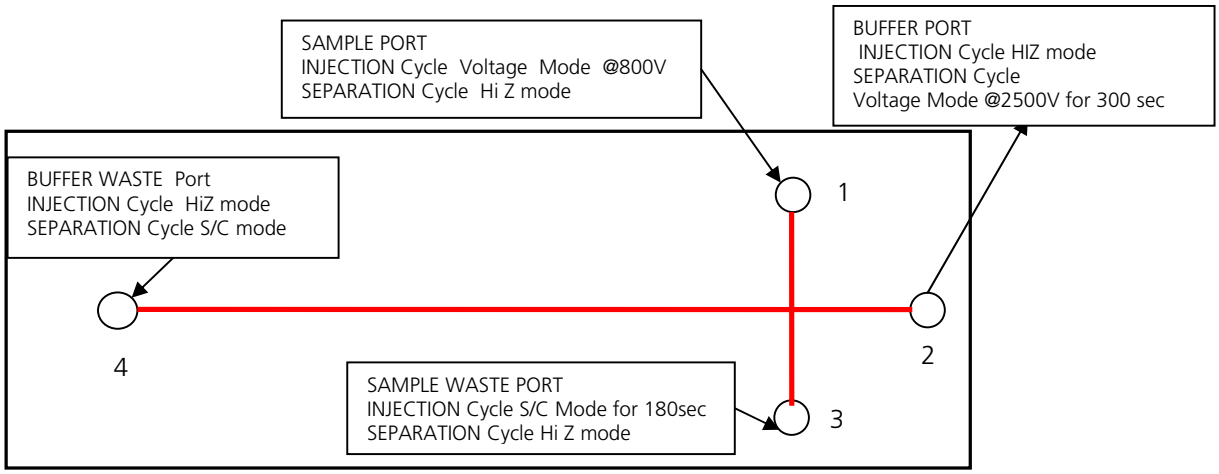
The top cover should now be located, a weak magnetic attraction is provided to keep the Top cover in place and a magnet located in the Top cover over the safety interlock causes the safety switch to be closed thus enabling the safe application of high voltages to the system.

HV Connections

The Microchip wells are numbered 1 to 4 and since the system is symmetrical different arrangements will provide similar results however it is good practice to set a standard connection configuration and stick to it in order to ensure consistency.

Typically the following HV connections will be made as shown in the diagram below

SAMPLE PORT (1): This will have a high voltage applied during the injection or loading phase and then a HiZ mode during the Separation phase.
CONNECT BLUE cable to Output 1



BUFFER PORT (2) Hi Z during injection and a Hi Voltage during separation phase.
Connect RED cable to Output 2

SAMPLE WASTE PORT (3) S/C during injection and HiZ during separation phase.
Connect YELLOW cable to Meter 1

BUFFER WASTE PORT (4) HiZ during Injection and S/C during separation phase.
Connect BLACK cable to Meter 2

Note 1: Two BLACK Cables are provided – Number 4 is used with 45mm microchips and Number 5 is used with 90mm microchips.

Note 2: the detection electronics can be fitted either in the 45mm position or the 90mm position. If both types of microchips will be used routinely then duplicate the detection electronics

Micronit chip cleaning procedure

micronit MICROFLUIDICS

Microchip cleaning procedures

One simple but very effective way to clean a microchip is to flush an alkaline solution through the channels. A solution of 1 M sodium hydroxide in water works well but a lower concentration might also be sufficient. If traces of the cleaning solution remaining inside the chip after cleaning and rinsing with water pose a problem then ammonia can be used instead.

Note that the these solutions are caustic and can cause damage to e.g. the polyimide coating of fused silica capillaries. Also the plastic parts of the EOF kit should not be exposed to very alkaline solutions.

In order to aid in the removal of particulate matter a water bath with ultrasonic agitation in can be used, preferably while flushing a watery solution through the channels using an Fluidic connect kit.

Glass microchips can be heated (e.g. >400° C) causi ng any organic material adsorbed on the glass surface to degrade.

Concentrated sulphuric acid works well to dissolve organic material such as fibres which are difficult to remove with alkaline solutions, but because of the extremely corrosive nature of the material a cleaning procedure is not so easily implemented.

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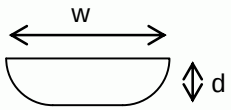
Micronit Chip Specification

See next Page

Specification document T35100C4D chip

Chip:
Material: D263 T borosilicate glass
Chip size (w x h): 15.0 x 45.0 +/- 0.3 mm
Thickness: 1.1 +/- 0.050 mm cover and 0.100 +/- 0.015 mm bottom
On-chip reservoir volume: <1 µL

Channels:
Width: 100 +/- 5 µm
Depth: 10.0 +/- 0.5 µm
Length of the double-T: 100 µm between center lines
Channel length (2-4): 40mm
Separation length: 33mm
Cross Arm length: 9mm



Electrodes:
Material: platinum, tantalum adhesion layer deposited on the bottom surface
Electrode thickness: 200 nm
Size (wxh): 200 x 500 µm
Distance between excitation and detection electrode: 250 µm
Distance between electrode pairs: 2.9 mm