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CVP Constant Vacuum Pump Manual

Imprint

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1 Important Information and Instructions

1.1 Operator's Obligations

The operator is obliged to allow only persons to work on the device, who

- are familiar with the safety at work and accident prevention regulations and have been instructed how to use the device;
- are professionally qualified or have specialist knowledge and training and have received instruction in the use of the device;
- have read and understood the chapter on safety and the warning instructions in this manual and confirmed this with their signature.

It must be monitored at regular intervals that the operating personnel are working safely. Personnel still undergoing training may only work on the device under the supervision of an experienced person.

1.2 Guarantee and Liability

The general conditions of sale and delivery of Multi Channel Systems MCS GmbH always apply. The operator will receive these no later than on conclusion of the contract.

Multi Channel Systems MCS GmbH makes no Guarantee as to the accuracy of any and all tests and data generated by the use of the device or the software. It is up to the user to use good laboratory practice to establish the validity of his findings.

Guarantee and liability claims in the event of injury or material damage are excluded when they are the result of one of the following:

- Improper use of the device.
- Improper installation, commissioning, operation or maintenance of the device.
- Operating the device when the safety and protective devices are defective and/or inoperable.
- Non-observance of the instructions in the manual with regard to transport, storage, installation, commissioning, operation or maintenance of the device.
- Unauthorized structural alterations to the device.
- Unauthorized modifications to the system settings.
- Inadequate monitoring of device components subject to wear.
- Improperly executed and unauthorized repairs.
- Unauthorized opening of the device or its components.
- Catastrophic events due to the effect of foreign bodies or acts of God.

1.3 Important Safety Advices



Warning: Make sure to read the following advice prior to install or to use the device and the software. If you do not fulfill all requirements stated below, this may lead to malfunctions or breakage of connected hardware, or even fatal injuries.



Warning: Obey always the rules of local regulations and laws. Only qualified personnel should be allowed to perform laboratory work. Work according to good laboratory practice to obtain best results and to minimize risks.

The product has been built to the state of the art and in accordance with recognized safety engineering rules. The device may only

- be used for its intended purpose;
- be used when in a perfect condition.
- Improper use could lead to serious, even fatal injuries to the user or third parties and damage to the device itself or other material damage.



Warning: The device and the software are not intended for medical uses and must not be used on humans. MCS assumes no responsibility in any case of contravention.

Malfunctions which could impair safety should be rectified immediately.

Requirements for the Installation and Operation

Make sure that the device is not exposed to direct sunlight. Do not place anything on top of the device, and do not place it on top of another heat producing device, so that the air can circulate freely.

- Do not use the constant vacuum pump for perfusion with flammable or aggressive (corrosive) liquids.
- Do not store flammable materials nearby during operation.
- Check in regular intervals that the constant vacuum pump does not overheat.

2 Installation and Operation of the CVP

2.1 Welcome to the Constant Vacuum Pump with Pressure Control

The constant vacuum pump CVP with pressure control is a vacuum pump with a precision pressure sensor and a waste bottle.

The differential sensor measures the pressure in the compartment attached to the waste bottle, and compares it to the ambient pressure. The suction pump is then regulated to maintain the selected negative pressure in this compartment. Hence, with this unit, it is possible to precisely control the suction and to keep the negative pressure stable. The resolution of the pressure control is 0.1 mbar, the maximum negative pressure is -200 mbar below atmospheric pressure.

The selected pressure can be easily changed during the experiment.

The CVP is especially suitable to work with perforated MEAs in MEA-Systems or with the MEA2100-Beta-Screen-System. The MEA2100-Systems or the MEA1060-Systems equipped with perfusion ground plate allow the perfusion of slices on the pMEA from the top and from the bottom, and the vacuum pump is able to maintain suction from below to keep the slice in place. Please see chapter "Example of an Experimental Setup: MEA1060-System with perforated MEA".



Description

The CVP consists of the pump housing with the control panel on top, and the waste bottle with a volume of 5 l. The cup of the waste bottle is equipped with three tube connectors. Two tubes come from to the pump housing, they are connected to the pressure sensor and the pump, respectively. The third one is used to connect the waste bottle to your experimental setup. To remove the connectors, press the metal button and pull out the tube. Take care not to mistake the tubes.

Function

An air pump is switched on and off by the use of a solid-state relay (SSR) with an inherent triac. The air pressure in a 5 l pp-bottle is measured with a precision sensor and compared with the selected pressure. According to the result, the SSR is fired in order to regulate the pressure in the bottle.

2.2 Setting Up and Connecting the CVP



Warning: The suction will start immediately when the device is switched on! It is recommended to insert a valve between the pump and your experimental setup.

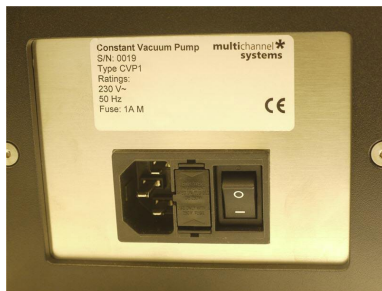


Warning: Do not start the perfusion until you have double checked that the perfusion lines are set up properly and that the inflow and outflow rate are matching. Spilled liquid may irreversibly damage electronic instruments.

Waste Bottle

1. Close the cup of the waste bottle tightly.
2. Connect the flexible tube (OD: 5 mm, ID: 3 mm) to the connector on the cup of the bottle, which is marked with the red arrow. Insert a valve between the bottle and the experimental setup. Close the valve.
3. Connect the tube to the experimental setup.

Rear Panel



4. Connect the CVP with a common power supply cable to the power supply.
5. Switch the CVP via toggle switch I/O on and off.

Top Panel



6. Press the I/O button to switch on the CVP. The LED display lights up. The pump starts working straight away. Press the I/O button again to switch off the CVP. The device will stay in standby mode until you switch off the toggle switch on the rear panel.
7. Select the setpoint pressure in millibar with the up and down buttons. To change the setpoint in single 0.1 mbar steps tip once, press longer for larger steps.
8. If the setpoint of the pressure is changed, the sensor needs only a very short time to respond. If the device is switched on again after standby mode, the pressure selected before standby will be applied.
9. Open the valve.

2.3 Calibration

To ensure optimal precision, it is recommended to calibrate the pump to the current atmospheric pressure each day before use.

Please execute the following steps:

- Switch the main power off. Please use the toggle switch I/O on the rear panel of the device.
- Open the valve, so inside the bottle is normal atmospheric pressure.
- Press and hold the I/O button on the top of the device.



- Switch main power on, hold the I/O button till you get the reading "REF".

2.4 Cleaning and Maintenance

Cleaning

To clean the system after use, suck water and then 70 % Ethanol (EtOH) through the tube connected to the experimental setup. Suck the tube dry. Disconnect all tube connectors and unscrew the cap. Empty the waste bottle and wash it out. Take care not to interchange the tube connectors when reconnecting the tubing.



Warning: Make sure no liquid is sucked into the pump! This can lead to irreversible damage. Empty the bottle after each experiment. Avoid remaining liquid in the bottle and tubing, this can result in contamination.

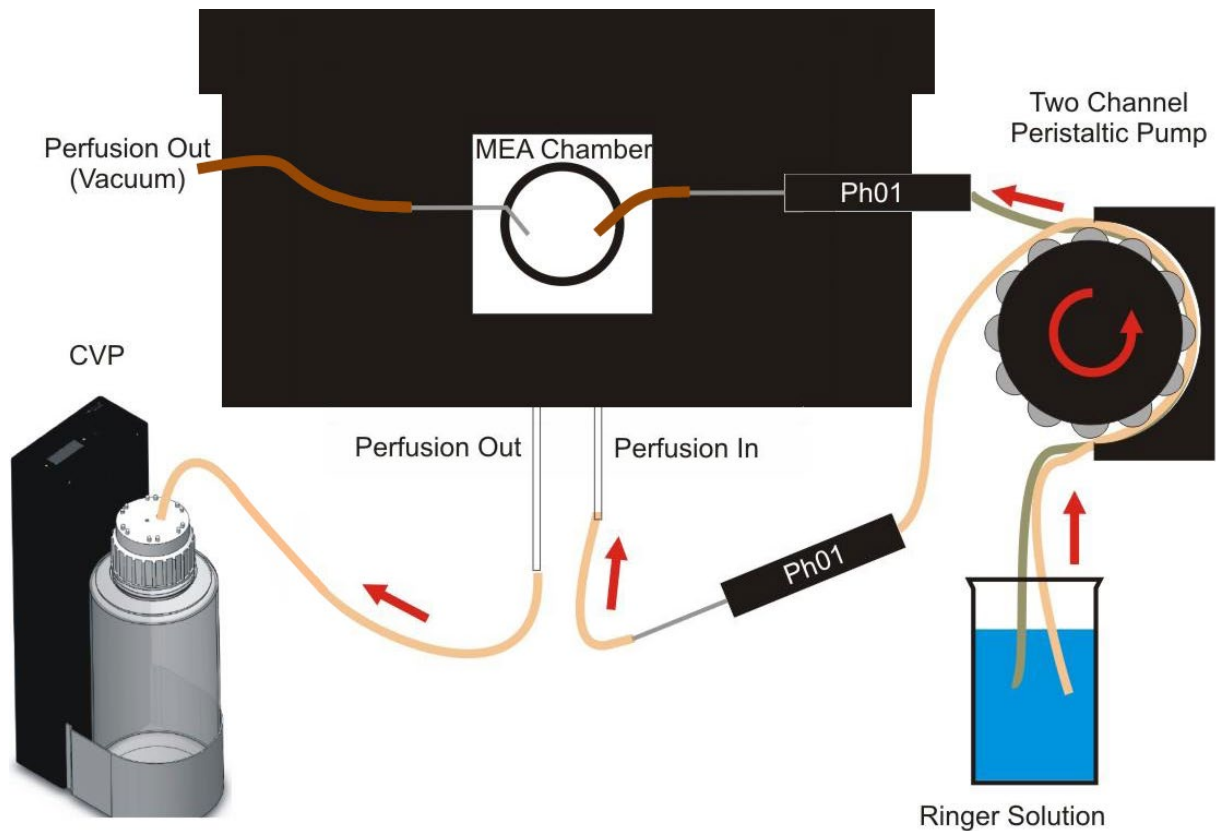
Error Message

If the selected pressure is not reached within one minute the sensor assumes a leakage somewhere in the system and shows "Err" alternating with the measured pressure. After another minute, you will hear an audio signal additionally. Please check if the connection of the tubing is correct, and the cup of the bottle is closed.

Offset Calibration

If the connection from the sensor to the bottle is left open, the display must show "0.0" because there is no pressure applied to the sensor. Pressing the I / O button while switching on the power in the back of the device compensates any offset error. This should be done from time to time in order to maintain the performance of the regulator.

2.5 Example of Experimental Setup: MEA2100-System with perforated MEA



Please read MEA Application Note "[Acute Hippocampal Slices on perforated MEAs](#)" for more information.

1. Provide a power supply in the immediate vicinity of the installation site.
2. Place all devices on a stable and dry surface, where the air can circulate freely and the devices are not exposed to direct sunlight.
3. Set up the computer with installed data acquisition software program.
4. Set up the MEA amplifier equipped with a Perfusion Ground Plate PGP as described in the MEA2100-System or MEA1060 manual.
5. Connect the MEA amplifier with a MCS high grade cable to the computer.
6. Connect the CVP to the Perfusion Out of the PGP. Use the designated connector for connecting the experimental setup. Please do not interchange the tube connectors on the cup of the bottle.
7. Connect the PH01 to the Perfusion In of the PGP.
8. Ground the system.
9. Check the power toggle switch on the rear panel.
10. Press the I/O button to switch the CVP on. The display on top of the CVP should light up as soon as the power line is connected. If not, check the power source and cabling.
11. Select the target value of pressure by pressing the up and down buttons.

3 Appendix

3.1 Technical Specifications

Operating temperature	10 °C to 40 °C
Storage temperature	10 °C to 50 °C
Dimensions (H x W x D)	0.47 m x 0.15 m x 0.23 m
Weight	7.4 kg
Maximum pressure	- 200 mbar below atmospheric pressure
Resolution	± 0.1 mbar
Supply voltage	110 V AC - OR - 230 V AC
Sensor type	Differential: Target pressure in relation to actual ambient pressure
Sensor accuracy	± 2.5 %
Fuse	1 A M
Capacity of the pp-bottle	5 l

1.2 Contact Information

Local retailer

Please see the list of official [MCS distributors](#) on the MCS web site.

Mailing list

If you have subscribed to the [Mailing List](#), you will be automatically informed about new software releases, upcoming events, and other news on the product line. You can subscribe to the list on the contact form of the MCS web site.

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