

## Electrostatic discharge (ESD): Damage and protection

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### What is ESD?

General electrostatic discharge (ESD) protection procedures should be observed when handling any kind of electronic equipment, including the Oroboros O2k. While just slightly unpleasant or even unrecognizable to us, ESD sparks may cause severe damage to integrated circuits and other electronic devices.

The best known experience of an ESD is feeling a spark when touching some object or another person. ESD is the sudden and momentary electric current that flows between two objects at different electrical potentials. Such a potential difference may commonly build up by

- Walking across the floor,
- Handling packaging material such as styrofoam and other plastic materials,
- Removing adhesive tape from a roll or container,
- Transporting equipment on trays or carts,
- Sliding items on a work bench.

More information:

[http://en.wikipedia.org/wiki/Electrostatic\\_discharge](http://en.wikipedia.org/wiki/Electrostatic_discharge)

### Potential Damage of the O2k by ESD



Within the stainless steel O2k housing, internal electronic components are well protected from ESD. However, during chamber assembly, membrane change, or trouble shooting, the polarographic oxygen sensor (POS) has to be disconnected from the POS connector and the POS connector is disconnected from the main unit. This means that one or both electric connections of the POS connector are exposed to the environment and ESD damage is possible.

During such operations special care must be taken to observe ESD prevention procedures.

For oxygraphs with MultiSensor extension the additional channels by definition open up additional routes how an ESD discharge can



reach the inside of the oxygraph. BNC type connectors are used frequently for attaching potentiometric electrodes (pH) and therefore also used for the pX channel in the MultiSensor extension. By the nature of the BNC plug it is possible for the operator to touch the outside channel and thereby cause an ESD.

## ESD Protection Procedures

The simplest and most effective way to prevent damage by ESD is to get rid of your electric charge before handling the POS connector, the BNC plug of the pX channel or other electronic connections. Preventive ESD is achieved simply by touching a well grounded object, such as the stainless steel **housing** of the O2k. Touching the O2k housing does not cause any damage, and should be done **before** handling the electrical connectors. This will be sufficient in most cases to prevent damage.

Leaving POC connectors attached to the main unit while cleaning or servicing them and while membrane mounting will, to a certain degree, also protect the electronics inside from damage by ESD. Protecting POS connectors from ESD is especially important for oxygraphs Series A to C, because more electronic modules are in these connectors.

Do not touch the BNC plug of oxygraphs equipped with a MultiSensor extension, unless necessary. Hypothetically an ESD might also be transmitted via the pX channel by touching the needles of the TIP syringes while an electrode in the chamber is connected to the pX electronics. Therefore the oxygraph housing should be touched before touching the TIP syringes when working with an electrode attached to the pX channel (pH, TPP<sup>+</sup>, Ca<sup>2+</sup>).

For oxygraph Series A to C requiring a MultiSensor Connector, the guidelines also apply to the BNC port on the MultiSensor Connector.

It is general good laboratory practice to avoid excessive build-up of electrostatic charges. If you experience frequent sparks while touching objects or other persons in your lab, it might be a good idea to consult an electronic expert in your institution, to protect all kind of electronic equipment with preventive measures. The magnitude of the ESD problem depends strongly on conditions in a lab, such as floor material or humidity on one hand and clothing - especially footwear - on the other.

A special topic are the shoes known as "Crocs" and similar products. With these shoes it is possible to generate extremely high potentials. In some hospitals such shoes have already been banned, because they apparently destroyed a lot of expensive equipment. Therefore, such shoes should not be worn in any laboratory.