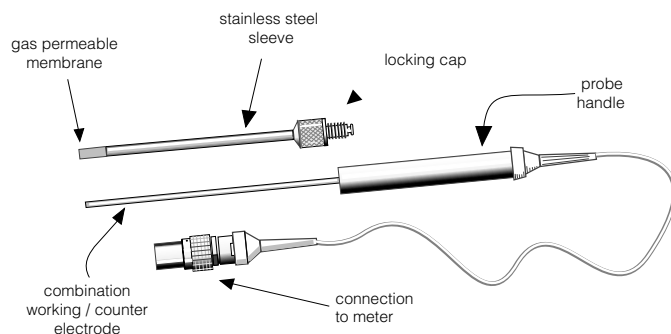




The ISO-NO meter and probes, if well cared for, will require very little maintenance. There are two types of periodic maintenance required; one for the 2.0 mm stainless steel ISO-NOP, and one for all other sensors. These are discussed separately below.

### Maintenance of the ISO-NOP

When the ISO-NOP sensor is not being used it should be left connected to the ISO-NO with the tip immersed in distilled water. The basic structure of the ISO-NOP sensor is quite simple (see figure). It consists of an internal NO-sensing working/counter electrode combination. This electrode fits inside a



disposable protective stainless steel sleeve (WPI #5436) which must contain fresh electrolyte (WPI #7325), and is separated from the external environment by a gas permeable polymeric membrane covering the end of the stainless sleeve. The other end of the sleeve is flanged. The locking cap is used to attach the sleeve to the probe handle.

When the sensor is fully assembled (*i.e.*, with locking cap and sleeve in place) the internal electrode should be seen to press gently against the polymeric membrane, which will then be slightly stretched. This ensures that the electrolyte diffusion layer will be as thin as possible, which is necessary to minimize sensor response time. Once a membrane is stretched it is permanently deformed and cannot usually be reused if the sleeve is removed from the electrode. Four additional membrane sleeves accompany the ISO-NO in the start-up kit, together

with a MicroFil™ electrolyte filling needle (WPI #MF28G67-5) and 1 ml syringe. With proper care and by following the instructions below a membrane sleeve should last more than one month.

### Cleaning the Membrane

The membrane sleeve itself requires very little maintenance. The primary concern is to avoid damage to the membrane and to keep it as clean as possible. After each use the membrane should be cleaned by immersing the tip in distilled water for 20-30 minutes to dissolve salts and remove particles, which may have accumulated on the membrane. If the probe was used in a protein rich solution the membrane tip should first be soaked in a protease solution for several minutes to remove protein build-up, and then in distilled water. Enzymatic detergent (*e.g.*, Enzol, WPI #7363) can also be used. The membrane sleeves can also be sterilized chemically using an appropriate disinfectant (*e.g.*, Cidex, WPI #7364). Accumulated organic matter can be removed by briefly immersing the tip in an acid or base solution (at times both may be necessary) for 10 seconds. A good indication of a dirty membrane sleeve is a sluggish response or an unusually low sensitivity. If these problems are not rectified by the above cleaning procedures then the membrane sleeve should be replaced. **The probe cannot be used in organic solvents.**

### Replacing a Membrane Sleeve

All membrane sleeves will eventually have to be replaced by the user. The procedure for doing so is simple and straightforward.

1. Unscrew the locking cap from the handle.
2. Hold the stainless steel sleeve and remove it with the locking cap from the internal electrode assembly, being careful not to bend the electrode assembly when doing so.
3. Rinse the internal electrode with distilled water (particularly the tip) and let it soak for at least 15 minutes. Be careful not to let water get into the handle. The current on the ISO-NO meter should go offscale when the electrode is being rinsed.



## ISO-NOP Maintenance

4. Gently dry the electrode with a soft tissue (Kimwipes). Be sure to dry thoroughly the flat surface at the tip of the electrode. After drying the current should stabilize fairly quickly to a low value (e.g., 0 - 20 pA). If this occurs then the electrode is in good working order.
5. If the electrode is not clean, repeat steps 3 and 4. If necessary the ISO-NOP Rejuvenator (WPI Part # **JUV**) can be used restore sensitivity of an old electrode (contact WPI for details).
6. Remove the locking cap from the old used sleeve, and gently slide it onto the new replacement sleeve.
7. Dip the internal electrode 1-2 cm into the electrolyte provided in the ISO-NO start-up kit, the current should go offscale during this. Using the MicroFil™ nonmetallic syringe needle (WPI #**MF28G67-5**) and 1 ml plastic syringe, supplied with the replacement sleeve kit, inject approximately 100 microliters of electrolyte directly into the new sleeve. The MicroFil supplied should be less than the length of the sleeve, so that it will not puncture the delicate membrane at the tip of the sleeve during injection. If the MicroFil is longer than the sleeve it can be cut to the correct length.
8. Slowly and smoothly insert the electrode into the sleeve, and screw the locking cap into the handle. The electrode should be observed to press gently against the membrane.
9. The current displayed on the meter at this time will be high or offscale.
10. Suspend the tip of the new assembled probe into distilled water.
11. After 10-15 minutes the current should no longer be offscale and will gradually decrease with time. It may take several hours for the sensor current to reach a low stable value, at which time it will be ready for use.

12. The integrity of the new membrane can be determined by immersing the probe tip into a strong saline solution (1 M). If the current observed, after a few minutes in the saline solution, increases dramatically or is offscale then the membrane integrity is not good and a new membrane will have to be fitted.
13. When the ISO-NOP is not being used it should be stored with the tip suspended in distilled water.

Additional membrane kits (WPI #**5436**) may be purchased separately.

### **Maintenance for the ISO-NOP200, ISO-NOP30, and ISO-NOP007**

The ISO-NOP200/30/007 microsensors are maintenance-free, disposable sensors. Once the microsensor no longer functions it must be replaced with another sensor. The primary concern is to avoid damage to the membrane tip and to keep it as clean as possible. After each use the membrane should be cleaned by immersing the tip in distilled water for 20-30 minutes to dissolve salts and remove particles, which may have accumulated on the membrane. If the probe was used in a protein rich solution the tip should first be soaked in a protease solution for several minutes to remove protein buildup, and then in distilled water. Enzymatic detergent (e.g., Enzol, WPI #**7363**) can also be used. The microsensors can also be sterilized chemically using an appropriate disinfectant (e.g., Cidex, WPI #**7364**). To extend the working life of these microsensors it is important to avoid subjecting them to physical stress, which could damage the delicate membrane tip. **These sensors must be stored dry in a cool place away from direct sunlight.**

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