

Aurora Fluoride Electrode Instruction Manual

The Fluoride Electrode is a hand crafted ion-selective electrode which measures total free fluoride in aqueous solutions simply, quickly, economically, and accurately. If you have the mono-model fluoride electrode, then you also need a reference electrode. Carefully follow the directions on this instruction sheet to obtain the best performance and electrode life.

Required Equipment

- Ion meter or pH/mV meter.
- Wash bottle with distilled or deionized water.
- Several clean beakers.
- 1 mL, 10 mL and 100 mL pipettes.
- 4-cycle semi-logarithmic paper for calibration curves.
- Reference Electrode for mono-model. A Reference Electrode is **not** required with the Combination Model electrodes.

Required Solutions

- 1000 ppm F⁻ Standard (SD0FL2)
- Total Ionic Strength Adjuster Buffer (TISAB) (AJ0FL1)
- Reference Fill Solution - For FastFil (refillable) combination (RF0FL1)

Electrode Preparation

1. Remove the protective cap covering the electrode tip. **Caution: Do not touch the sensing element with your fingers.**
2. **Mono** (Model 01) - the Reference Electrode must be prepared as described in the Reference Electrode Instruction Manual. Fill the Reference Electrode with Reference Fill Solution.
3. **FastFil (refillable) Combination** (Model 44) - the reference (outer) chamber must be filled with Reference Fill Solution and remain open during testing:
 - a. Slide the sleeve of the electrode FastFil cap down to uncover the fill holes (**see fig. 1**).
 - b. Fill the reference chamber with the Reference Fill Solution provided.
 - c. Shake the electrode downwards like a thermometer to remove any air bubbles trapped inside.
 - d. The surface of the Reference Fill Solution in the reference chamber must be above the inner junction. This is approximately 3" from the electrode tip.
4. **PermaFil (non-refillable) Combination** (Model 43) - the reference chamber is gel filled and sealed. No Reference Fill Solution is required.
5. Rinse the electrode with DI water, blot dry. Do not rub dry.
6. Place the electrode in the electrode holder. Immerse the tip of the electrode in DI water and stir the water for 5 minutes. This will properly clean the electrode.

Checking Electrode Operation (Slope)

1. Connect electrode to the meter. (For Mono-model, also connect Reference Electrode to meter.)
2. Place 50 mL DI water into a 150 mL beaker. Add 50 mL TISAB to the DI water and stir thoroughly.
3. Set the function switch to the mV mode.
4. Rinse the electrode with DI water, blot dry and place in the solution prepared in step 2. (For Mono, also rinse and place Reference Electrode in the solution.)
5. Pipette 1 mL of 1000 ppm F⁻ Standard into the beaker. Stir thoroughly, then record the potential (E₁) in mV when a stable reading is displayed.
6. Pipette 10 mL of the same standard into the same beaker. Stir thoroughly. When a stable reading is displayed, record the potential (E₂) in mV.
7. The difference between the first and the second potential readings (E₁-E₂) is defined as the electrode slope. The normal range for the slope is 56±4 mV at 25°C.

Troubleshooting

If the electrode slope is not within the normal range, the following procedure may restore the electrode.

1. Polish the electrode sensing element with the furnished polishing strips. **Caution: Do not touch the sensing element with your fingers.**
 2. Rinse and soak the electrode in standard solution for about 5 minutes before use.
 3. Repeat "Checking Electrode Operation" procedure again. Note: All standard solutions should be prepared fresh. You must use TISAB.
- Periodically check the Reference Fill Solution level in the reference chamber of the FastFil. The solution level must be higher than the inner junction. This step is unnecessary with the Mono and PermaFil models. If the electrode slope is still outside the normal range after this procedure, please contact manufacturer's technical service department.

Reading a Sample with the Electrode

Various procedures may be used to determine the concentration of a sample. The most common is the Direct Calibration method, which is described below. Contact manufacturer's technical service department for details of other methods. In Direct Calibration a series of standard solutions of differing concentrations are used to calibrate the electrode. Then each sample requires only a single meter reading, which is compared with the calibration readings to obtain the sample concentration. TISAB is added to all solutions to ensure the samples and the standards have the same ionic strength.

Setup:

1. Prepare the electrode as described in "Electrode Preparation" and "Checking Electrode Operation".
2. Connect the electrode to the meter.
3. Prepare two standard solutions that differ in concentration by a factor of ten (or follow meter manufacturers instructions) and bracket the expected sample concentration range. Use the concentration unit that is most appropriate. The standards should be at the same

temperature as the sample.

Measurement:

If using a meter with direct concentration reading capability (see individual meter instruction manuals for more specific information):

1. Place 50 mL of the more dilute standard into a 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
2. Rinse electrode with DI water, blot dry and place in the beaker. Wait for a stable reading, and then adjust the meter to display the value of the standard. Refer to the meter's instruction manual for the meter adjustment procedure.
3. Measure 50 mL of the more concentrated standard into a second 150 mL beaker. Add 50 mL of TISAB and stir.
4. Rinse electrode with DI water, blot dry and place in the second beaker. Wait for a stable reading, then adjust the meter to display the value of the second standard.
5. Pipette 50 mL of sample into a 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
6. Rinse electrode with DI water, blot dry and place in the sample beaker. Wait for a stable reading and the sample concentration will be displayed on the meter.

If using a meter with millivolts (mV) reading only:

1. Turn the function switch to mV range.
2. Place 50 mL of the more dilute standard into a 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
3. Rinse electrode with DI water, blot dry and place in the beaker. Wait for a stable reading, then record the mV value and the corresponding standard concentration.
4. Measure 50 mL of the more concentrated standard into a second 150 mL beaker. Add 50 mL of TISAB and stir.
5. Rinse electrode with DI water, blot dry and place in the second beaker. Wait for a stable reading, then record this mV value with the corresponding concentration.
6. Using the semi-logarithmic graph paper, prepare a calibration curve by plotting the mV values on the linear axis and the standard concentrations on the logarithmic axis.
7. Pipette 50 mL of sample into a 150 mL beaker. Add 50 mL of TISAB. Stir thoroughly.
8. Rinse electrode with DI water, blot dry and place in the sample beaker. Wait for a stable reading and record the mV reading.
9. Determine the sample concentration using the calibration curve prepared in Step 6 above.

Electrode Storage

Short Term (over night or the weekend):

Rinse the electrode thoroughly with DI water and place the tip in a solution of 50 mL of TISAB in 50 mL of DI water. For FastFil model slide the sleeve up to close refill holes.

Long Term:

Mono-electrode and **PermaFil** (gel filled)—rinse thoroughly with DI water and store dry. Replace the cap to protect the sensing element.

FastFil Combination - empty reference chamber of Reference Fill Solution. Flush reference chamber with DI water several times. Empty DI water from reference chamber and store the electrode-dry. Replace the cap to protect the -sensing element.

Follow procedures in "Electrode Preparation" and "Checking Electrode Operation" before using the electrode again.

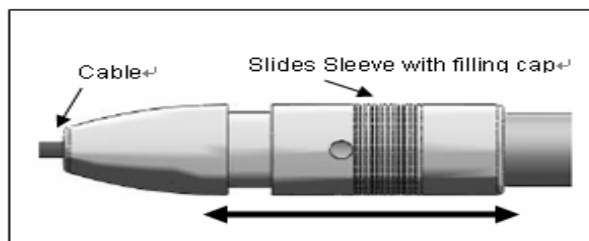
Specification

Concentration Range: Saturated to $1 \times 10^{-6} M$
(saturated-0.02 ppm)
pH Range: 5 to 7 pH at $1 \times 10^{-6} M$
5 to 11 pH at saturated
Temperature Range: 0 to 80°C continuous, 80 to 100°C intermittent
Electrode Resistance: less than 50 MΩ
Reproducibility: $\pm 2\%$
Minimum Sample Size: 5 mL in a 50 mL beaker
Size: Electrode length—155 mm
Body Diameter—12 mm
Cap Diameter—16 mm
Cable Length—100 cm

Contents

Fluoride Electrode	1 ea.
1000 ppm as F ⁻ (SD0FL2)	1 oz.
TISAB with CDTA (AJ0FL1)	2 oz.
Reference Fill Solution (RF0FL1)	1 oz.
Polishing Strip (MD0004)	2 ea.
Fluoride Instruction Manual (ISE4010-C00)	1 ea.

FastFil Cap Fig.1



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