

## Standard Operating Procedure

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### Conductivity Measurements

#### 1. Introduction

##### 1.1. Purpose

To outline the procedure for operation of typical conductance/TDS meter in the TRACES Centre and the undergraduate laboratories. This procedure describes how to accurately measure the conductance and correlate this to the TDS of a solution.

##### 1.2. Scope

Applicable to conductance meters located in TRACES Centre and UG Laboratory. These include (but not limited to) Sartorius, Oakton and Mettler-Toldeo brand devices.

##### 1.3. Responsibility

User

##### 1.4. Accountability

TRACES Manager/Course Instructor

#### 2. Referenced Documents

2.1. Oakton Instruction Manual PC 700 :68X541704 Rev. 1 Feb. 2010.pdf

2.2. Mettler-Toledo Operating Instructions SevenEasy pH Meter S20: ME-51710234C.pdf

#### 3. Equipment

##### 3.1. pH/conductance meter, digital

3.1.1. Conductance electrode

3.1.2. ATC (automatic temperature control) probe (if available)

3.2. Various clean containers, beakers (wide-mouth) for samples, calibration standards and waste

3.3. Transfer utensils, pipettes or capillaries

3.4. Stir Plate, with clean stir bars (mini and micro)

3.5. TDS Calibration Solution, 12880 uSiemens/cm @25°C (12880uS/cm)

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### 4. Procedures

**4.1. Conductance Electrode:** The protective probe guard can be removed temporarily for cleaning; it must be re-attached during measurement and calibration. Erroneous results will occur while the probe guard is removed. Always immerse the probe beyond upper steel band for best results. Use the fill line on the outside of the probe guard for reference.

**4.2. Conductance Calibration:** For best results, periodic calibration with known TDS Calibration standards recommended. Various units are capable of automatic or manual calibration for conductivity (check with the owner's manual/TRACES Staff). This SOP will discuss manual calibration. Many conductivity meter are also equipped to handle single point and/or multi-point calibration. The TDS and conductivity range, discussed below, can be set automatically or manually.

#### **4.2.1. Manual Conductivity & TDS Calibration**

**4.2.1.1. Rinse or immerse the probe before calibration and between samples with deionized water.**

**4.2.1.2. Low conductivity standard solutions (less than 20  $\mu$ S) are unstable and are very temperature dependent. As a result, reproducible calibration results are challenging in lowest measurement range #1 (0.00 to 20.0  $\mu$ S).**

4.2.1.2.1. Place 35-40mL of Conductivity Calibration solution into separate 50mL beaker with a magnetic stir bar. Provide stirring for best results.

4.2.1.2.2. Press '**MODE**' as needed to select conductivity ( $\mu$ S or mS) or TDS (ppm or ppt) calibration.

4.2.1.2.3. Dip the electrode into the calibration standard and press '**CAL/MEAS**'.

4.2.1.2.4. The primary display will show the current reading, while the secondary display will be the factory default value. Adjust the conductivity or TDS reading using 'arrow up' or 'arrow down' to match the  $\mu$ S/cm value written on the calibration bottle. Press '**ENTER/RANGE**' to accept. The primary reading will flash briefly before returning to measurement mode upon successful calibration.

**4.2.1.2.5. STIR BAR MUST NOT MAKE CONTACT WITH THE ELECTRODE**

### **4.3. Conductance and TDS Measurements:**

#### **4.3.1. Sample Measurement Procedure**

4.3.1.1. Rinse the electrode with de-ionized water before use to remove any impurities. Gently shake excess water droplets.

4.3.1.2. Dip the probe into the sample beyond the upper steel band (utilize the fill line on the outside of the probe guard for reference).

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- 4.3.1.3. Allow time for the reading to stabilize. Note the reading on the display. The clear yellow protective probe guard must be attached during measurement. Erroneous results will occur while the probe guard is removed.
- 4.3.1.4. The conductivity meter will select the optimal range automatically by default. Refer to TABLE 1 for the list of available ranges.
- 4.3.1.5. For manual ranging, press '**ENTER/RANGE**'. MEAS will flash, indicating that manual ranging is active. To select the next range press '**ENTER/RANGE**' again. Select the range that best meets your needs. The reading should show the greatest number of digits in any given run.
- 4.3.1.6. Press '**ENTER/RANGE**' 5x, automatic ranging is resumed.

Please consult your lab manual or TRACES Staff/TA for clarification.

### 5. Cleaning up

- 5.1. Once you have completed the use of the pH meter, ensure you have properly cleaned the electrodes by rinsing with deionized water. Place the electrode in pH4 solution.
- 5.2. If instructed, place the pH electrode in the pH storage solution provided by the technical staff.

**TABLE 1**

Range #	Conductivity Range	Automatic Calibration Values	
		Normalization Temperature	
		25°C	20°C
r 1	0.00 – 20.00 µS	None	None
r 2	20.1 – 200.0 µS	84 µS	76 µS
r 3	201 – 2000 µS	1413 µS	1278 µS
r 4	2.01 – 20.00 mS	12.88 mS	11.67 mS
r 5	20.1 – 200.0 mS	111.8 mS	102.1 mS

Range #	TDS Range (using 0.5 TDS factor)	Automatic Calibration Values
r 1	0 – 10.00 ppm	none
r 2	10.1 – 100.0 ppm	none
r 3	101 – 1000 ppm	none
r 4	1.01 – 10.00 ppt	none
r 5	10.1 – 100 ppt	none

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