

	Standard Operating Procedure	SOP Number D-706	Revision 6
	Use and Calibration of pH Meters	Effective Date 10/24/23	Page Page 1 of 7
Written by/ Date H. Bunnard 10/09/23	Reviewed by/ Date SAS 10/10/23	Approved by/ Date SS 10/22/23	
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## 1.0 Purpose

This procedure gives guidelines on the calibration and use of the Bench 700 Series pH meter with ATC made by Oakton and the Mettler Toledo SevenCompact™ S220 Series pH meter.

## 2.0 Scope

This procedure gives general guidance for the calibration and use of any pH meter. This procedure also gives specific instructions on calibration and use of an Oakton Bench 700 Series pH meter and the Mettler Toledo SevenCompact™ S220 Series pH meter. This procedure complies with USP <791> pH.

## 3.0 Responsibility

- 3.1 It is the responsibility of QC and Analytical Chemists to follow this procedure.
- 3.2 It is the responsibility of QC Laboratory Management to implement this procedure and to ensure that the procedure is being followed.
- 3.3 It is the responsibility of QC Laboratory Management to keep this procedure aligned with current practices.

## 4.0 Definitions

- 4.1 **IPA** – Isopropyl alcohol
- 4.2 **ATC** – Automatic Temperature Correction
- 4.3 **QC** – Quality Control

## 5.0 References

- 5.1 USP <791> pH
- 5.2 D-706-F1, Form, pH Measurement Test Ticket
- 5.3 Mettler Toledo SevenCompact™ pH Ion Meter S220 Operating Instructions, 2011
- 5.4 Quick Guide Bench 700 Series pH/mV/Conductivity/TDS/Dissolved Oxygen/°C/°F, Oakton, 5/11, Rev 0
- 5.5 C-501, SOP, Document Control Procedure
- 5.6 C-502, SOP, Record Storage, Retention, and Destruction

## 6.0 Equipment

- 6.1 Oakton Bench 700 Series pH Meter with All-in-One pH/ATC Probe, Sealed/SJ/Epoxy.
- 6.2 Mettler Toledo SevenCompact™ S220 pH/Ion meter with Mettler Toledo InLab® Expert Pro-ISM pH probe.

## 7.0 Procedure

- 7.1 General instructions on use of a pH meter
  - 7.1.1 When not in use the probe tip should be submerged in electrode storage solution formulated for the probe.
  - 7.1.2 The Probes are sealed and do not require filling with electrolyte solution.
  - 7.1.3 Turn on the pH meter and allow a minimum of 15 minutes to equilibrate and stabilize.
  - 7.1.4 The probe should be rinsed with Millipore water before use. The probe should not be wiped. If water remains on the tip of the probe it can be removed by gently dabbing the bottom of the probe with a Kimwipe.

- 7.1.5 For aseptic applications the probe should be rinsed with 70% IPA before use. The probe should not be wiped. If IPA remains on the tip of the probe it can be removed by gently dabbing the bottom of the probe with a Kimwipe.
- 7.1.6 All buffer solutions and solutions to be buffered should be equilibrated to room temperature before testing.
- 7.1.7 Only NIST traceable reference buffers will be used for calibration. Buffers are available at pH 12.45, 10.01, 7.00, 4.01, and 1.68.
- 7.1.8 The meter should be calibrated daily or a change in calibration range.
- 7.1.9 The pH meter should be calibrated with fresh buffer using a minimum of a 2 point calibration curve the brackets the expected pH of the solution to analyzed.
- 7.1.10 The observed pH can be temperature dependent especially at the higher pH range. To mitigate any pH variation with temperature, the temperature of the sample should be documented and unless otherwise stated, is required to be  $25 \pm 2^{\circ}\text{C}$ .
- 7.1.11 If the temperature of that sample can not be in this range, the temperature of the sample must be measured by an appropriate thermometer and compared to the temperature reading on the ATC sensor on the pH system controller. The temperature of the thermometer and the probe should not differ by more than  $\pm 2^{\circ}\text{C}$ . If this type of reading is performed, it should be documented on the pH test ticket form.
- 7.1.12 The error measurement on the instrument is  $\pm 0.02$ . This should be taken into account when reporting pH values and comparing them to the specification. Depending on the specification, the measured value should be within specification even with the  $\pm 0.02$  value added.

7.2 Calibration and use of the Oakton 700 Bench Series pH Meter

- 7.2.1 To calibrate the Bench 700 press the <Cal/Meas> button to enter into calibration mode noted by **CAL** on the LED screen.
- 7.2.2 Place the rinsed electrode in the first buffer. The Bench 700 will automatically recognize buffer.
- 7.2.3 When the LED screen blinks **READY**, press <Enter> to accept.
- 7.2.4 Rinse probe and repeat until all required reference buffers are complete.
- 7.2.5 After calibration is complete, press <Cal/Meas> button to return to pH mode.
- 7.2.6 Begin measuring pH by placing the electrode tip into the solution to be measured. Adjust pH using good laboratory technique. The final measured pH is indicated by the stabilization of the pH and the appearance of **Ready** on the screen.
- 7.2.7 For further quick instruction on other functions of the Oakton 700 pH Meter see the Quick Guide Bench 700 Series pH/mV/Conductivity/TDS/Dissolved Oxygen/°C/°F, Oakton, 5/11, Rev 0.
- 7.3 Operation of the Mettler Toledo SevenCompact™ pH/Ion S220 Meter
- 7.3.1 pH calibrations can be run with this meter for up to 5 points.
- 7.3.2 For information on the setup of the pH probe see Mettler Toledo SevenCompact™ pH Ion Meter S220 Operating Instructions, 2011.
- 7.3.3 Place the electrode in a calibration buffer and press <CAL> button.
- 7.3.3.1 **Cal 1** appears on the display.
- 7.3.4 The meter endpoints according to the preselected endpoint made after the signal has stabilized or after pressing the <READ> button.
- 7.3.4.1 The relevant buffer value is shown on the display.

- 7.3.5 Rinse the electrode with Millipore water.
- 7.3.6 Place the electrode in the next calibration buffer.
- 7.3.7 Press <CAL> button.
- 7.3.7.1 **Cal 2** appears on the display. The meter endpoints according to the preselected endpoint mode after the signal has stabilized or after pressing <READ>.
- 7.3.7.2 The relevant buffer value is shown on the display.
- 7.3.8 Repeat steps 7.3.5 to 7.3.7 for all calibration buffers.
- 7.3.9 Press <END> to end the calibration procedure.
- 7.3.9.1 Alternatively, the meter ends the calibration automatically when 5 calibrations are performed. The offset value and slope are shown on the display.
- 7.3.10 Press <<> to scroll down to next data set.
- 7.3.11 Press <Save> to keep the calibration.
- 7.3.12 Press <Exit> to reject the calibration.
- 7.3.13 To measure a sample after the calibration process is complete, place the probe tip in the sample and press <READ> to start a measurement.
- 7.3.14 The endpoint format blinks, indicating a measurement is in progress.
- 7.3.15 The “automatic endpoint” format is used. The measurement stops automatically as soon as the **Stability** icon appears.
- 7.3.16 For further quick instruction on other functions of the Mettler Toledo SevenCompact™ S220 pH/Ion meter see Mettler Toledo SevenCompact™ pH

Ion Meter S220 Operating Instructions, 2011.

#### 7.4 Changing the Probe

7.4.1 The probe can be changed following these steps:

7.4.1.1 Remove currently attached probe by twisting interlock and removing the connection. If temperature attachment is connected, be sure to disconnect as well.

7.4.1.2 Attach new probe by connecting the new probe to the back on the meter and twisting interlock to the locked positions. If probe has a temperature auxiliary, be sure to attach as well.

7.4.1.3 The meter should recognize the name of the pH probe in the left hand corner of the display screen.

7.4.1.4 Probe should be calibrated each time it is changed.

#### 7.5 pH measurements of gummies and other chewable gels

7.5.1 Be sure to attach appropriate probe for the measurement of gels (consult 7.4 for directions on how to change probe)

7.5.2 Carefully, insert probe into gel, ensuring at least 3/4s of the lower half of the probe is covered.

7.5.3 Acquire data as normal.

#### 7.6 Calibration Notebook and Form D-706-F1 pH Measurement Test Ticket

7.6.1 This notebook will record the following information each time the pH meter is calibrated:

7.6.1.1 Analyst calibrating the pH meter

7.6.1.2 Date

7.6.1.3 pH and lot number of each buffer used

7.6.2 Record results on form D-706-F1 pH Measurement Test Ticket.

## 7.7 Documentation Requirements

7.7.1 All completed test tickets will be maintained as outlined in SOP C-501 Document Control and SOP C-502 Record Storage, Retention, and Destruction.

## 8.0 Revision History

Revision	Date	Description of Changes	CCR #	By
0	05/06/10	New	-	-
1	02/18/13	Reformatted SOP. Removed calibration buffer preparation. Gave more specific instruction on setup and calibration of meter. Expanded information needed in calibration notebook.	-	-
2	03/07/13	Updated information to new pH meter. Added form.	13-136	B. Johns
3	02/23/15	Updated SOP. Added specific information on the Mettler Toledo SevenCompact™ pH meter. Biennial Review.	15-0171	B. Johns
4	11/20/19	Updated SOP to reflect current practices and procedures. Added Solid Probe pH meter for gummy use	19-0899	J. Maignan
5	04/15/21	Updated SOP to require temperature of sample to be 25 ± 2°C	CC-21-0147	J. Maignan
6	10/09/23	Added documentation requirements. Added additional SOP references. Revised test ticket to include logbook number. Updated format. Updated responsibilities section.	CC-23-0502	K. Burris



**pH Measurement Test Ticket**

Form:

D-706-F1

CCR No.

CC-23-0502

Revision: 7

Logbook Number: \_\_\_\_\_

Logbook Page: \_\_\_\_\_

<b>Date:</b>	
<b>Sample Name:</b>	
<b>Sample Identification #:</b>	

<b>pH Meter Used:</b>	<input type="checkbox"/> <b>SevenCompact™</b>	<input type="checkbox"/> <b>Oakton 700</b>
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<b>pH Ion ID #:</b>		<b>Temp probe Ion ID #:</b>	
<b>Electrode Serial #:</b>		<b>Cal Due Date:</b>	
<b>Calibrated:</b>	<input type="checkbox"/> <b>Yes</b>	<input type="checkbox"/> <b>No</b>	

<b>Standards Used</b>				
<input type="checkbox"/> <b>1.68</b>	<input type="checkbox"/> <b>4.01</b>	<input type="checkbox"/> <b>7.00</b>	<input type="checkbox"/> <b>10.01</b>	<input type="checkbox"/> <b>12.45</b>

<b>Measured pH of Sample:</b>		<b>Temperature of sample</b>	
<b>pH of sample -0.02:</b>		<b>Sample Specification Min:</b>	
<b>pH of sample +0.02:</b>		<b>Sample Specification Max:</b>	

Determination (circle one):

**Pass**

**Fail**

Comments:

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Performed By/Date: \_\_\_\_\_

Reviewed By/Date: \_\_\_\_\_

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