QAM-I-101

Operation and Calibration of the Analytical Balance

Revision 12

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Texas Institute for Applied Environmental Research

1. **Applicability and Purpose**

This procedure applies to the operation and calibration of the analytical and top loading balances used for weighing. The purpose of this procedure is to provide a method for the operation and calibration of the analytical balances used in the laboratory. The guidelines assure quality of data and uniformity of techniques between analysts.

2. **Definitions**
   a. Class 1: A standardized weight that is traceable to the National Institute of Standards and Technology (NIST).

3. **Equipment, Reagents, and Standards**
   a. Equipment
      i. Sartorius MC1 AC 210P analytical balances
      ii. Mettler Toledo PL-602 top loading balance
      iii. U.S. Solid USS-DBS8 analytical balance
      iv. Mettler Toledo MS6002TS top loading balance
      v. Other equivalent balances
      vi. Plastic forceps
      vii. Desiccator
   b. Reagents: Not applicable
   c. Standards: Store weights in their containers in a desiccator
      i. Troemner Inc. Class 1, 100 mg S/S Wt. or equivalent
      ii. Troemner Inc. Class 1, 10 g S/S Wt. or equivalent

4. **Procedure**
   a. Sartorius MC1 AC 210P
      i. Leveling (daily when in use)
         1. If necessary, level the balance by adjusting the feet while observing the level indicator on the back of the balance. When the balance is level the bubble is in the center of the level indicator.
         2. Press the power key to turn on the display (if off).
      ii. Internal Calibration (each time the instrument is turned on)
         1. After the display reads 0.0000g, press the **F1** key to initiate an internal calibration.
         2. When the display reads 0.0000g, the internal calibration is complete.
      iii. Calibration Check (daily when in use and prior to making measurements on samples or chemicals)

1. Check to ensure the weights are within calibration by the label dates. Using the forceps, place the 100-mg Class 1 Wt. on the pan center (see Operation below).
2. Record the weight indicated in the display in the Analytical Balance Logbook or E-log (Attachment 1).
3. If weight recorded is not within ± 0.1% (0.0999-0.1001 g) of the 100 mg Class 1 Wt., initiate corrective action in accordance with QAM-Q-105, “Corrective Actions”. Note the CAR number in the comments column when appropriate. The balance is removed from service until the problem is investigated if not immediately corrected.

iv. Operation

1. When the display indicates 0.0000 g, place the sample on the weighing pan and close the sliding doors.
2. Read the weight indicated in the display only after the weight unit appears as the stability symbol.
3. Use the tare control key, **T**, to zero the display or to zero the weight of a container, as needed, for next weighing.

b. Mettler Toledo PL-602 and MS6002TS

i. Leveling (daily when in use)

1. If necessary, level the balance by adjusting the feet while observing the level indicator bubble. When the balance is level the bubble is in the center of the level indicator. MS6002TS has a built in guide to help you level the balance.
2. Calibration Check (daily when in use)
   a. Check to ensure the weights are within calibration by the listed dates. Use the Class 1, 10 g weight to perform steps in Operation below.

b. Record the weight indicated in the display in the Analytical Balance Logbook (Attachment 1).If weight recorded is not within ± 0.2% (9.98-10.02 g) of the 10 g, Class 1 Wt., complete corrective actions in accordance with QAM-Q-105, “Corrective Actions”. Note the CAR in the comments section when appropriate. The balance is removed from service until the problem is investigated and corrected, if not immediately corrected.

3. Operation
   a. When the display indicates 0.00g, place the sample or item on the weighing pan.
   b. Read the weight indicated in the display only after the motion indicator next to the weight unit has disappeared.
   c. Press the **Tare** control key to zero the display or to zero the weight of a container, if desired, for next weighing.

c. U.S. Solid USS-DBS8
   i. Leveling (daily when in use)
      1. If necessary, level the balance by adjusting the feet while observing the level indicator on the front of the balance. When the balance is level the bubble is in the center of the level indicator.
      2. Press the “ON” key to turn on the display (if off).
   ii. Calibration
      1. After the display reads 0.0000g, press the **“CAL”** key to initiate calibration.
      2. Open the glass door in the windshield, place the 200g weight on the pan and shut the glass door again. Wait until the flashing weight value on the display changes to “200.0000g.”
      3. Open the glass door, remove the weight and shut the glass door again. “0.0000g” will show up and the balance will return to the weighing mode.
   iii. Calibration Check (daily when in use and prior to making measurements on samples or chemicals)

1. Check to ensure the weights are within calibration by the label dates. Using the forceps, place the 100-mg Class 1 Wt. on the pan center (see Operation below).
2. Record the weight indicated in the display in the Analytical Balance Logbook or E-log (Attachment 1).
3. If weight recorded is not within ± 0.1% (0.0999-0.1001 g) of the 100 mg Class 1 Wt., initiate corrective action in accordance with QAM-Q-105, "Corrective Actions". Note the CAR number in the comments column when appropriate. The balance is removed from service until the problem is investigated if not immediately corrected.

iv. Operation

1. When the display indicates 0.0000 g, place the sample on the weighing pan and close the sliding doors.
2. Read the weight indicated in the display only after the stability symbol appears to the left of the reading.
3. Use the tare control key, **TAR**, to zero the display or to zero the weight of a container, as needed, for next weighing.

5. **Quality Control and Safety Aspects**

a. All aspects of this procedure comply with QAM-Q-101, "Laboratory Quality Control" and QAM-S-101, "Lab Safety".
b. Calibration procedures and calibration checks are done daily before initial use of the balances. Calibration checks are recorded in the Analytical Balance Logbook (E-log).
c. Instrument maintenance and internal calibrations of the balances are done annually by a contractor, or as needed, and recorded in the laboratory maintenance logbook or E-log. Contractor calibration records show the standards used bracket the range of normal use of the balance. These records are kept on file.
d. Unique balance identification shall be noted in the front of the logbook as to which balance it refers to (example: S1 being the Sartorius).
e. Do not handle the weights with fingers. Oily residue will change the weight. Weights should never need cleaning when properly stored in a desiccator. If the weight is dropped or gets dirty, rinse with DI water or alcohol and dry overnight in a desiccator prior to re-use. Scratched, dented or uncleanable weights are replaced.

f. The Laboratory Manager or his/her designee is responsible for ordering new weights, or having current weights certified, by an outside vendor on an annual basis (at a minimum).

6. References

a. "Sartorius MC1 Manual WAC 6009-e90011," Sartorius AG, Sartorius AG, Goettingen, 1991.
b. Mettler Toledo PL-602 balance operating manual.
c. U.S. Solid Instruction Manual, Rev. USS-DBS.
d. Mettler Toledo Precision and Analytical Balances User Manual, Mettler Toledo GmbH, 07/2019.
e. National Environmental Laboratory Accreditation Conference (NELAC), The NELAP Institute, TNI standard, 2016.

7. Attachments

a. Analytical Balance Log (or E-log)

Attachment 1: Example Analytical Balance Log

Limits: for 0.100 g wt- 0.0999 to 0.1001g, for 10 g wt- 9.98 to 10.02g, for other wts- ±0.1%

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Balance ID	Date	Time	Initials	True weight	Observed Weight	Pass/Fail	Comments	Weight ID	QA check