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# National Human Exposure Assessment Survey (NHEXAS)

## *Region 5 Study*

# Quality Systems and Implementation Plan for Human Exposure Assessment

Research Triangle Institute
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**Standard Operating Procedure** **NHX/SOP-300-008**

**Title:** The Mettler at 261 Analytical Balance

**Source:** Research Triangle Institute

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**TITLE:** STANDARD OPERATING PROCEDURE FOR THE METTLER AT 261 ANALYTICAL BALANCE

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# METTLER AT 261 ANALYTICAL BALANCE

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## 1.0 INTRODUCTION

Weighing is one of the most important steps in an analytical procedure. Often the quality of the final data depend on the accuracy and the precision of the weighing procedure. The purpose of this SOP is to provide the user with important information necessary to obtain high quality results in weighing with the METTLER AT 261 analytical balance.

## 2.0 INSTRUMENTATION

The METTLER AT 261 is an electronic analytical balance with a weighing capacity of 205 g. It has a resolution of 0.1 mg over the entire weighing range and a moving fine range (DeltaRange) with a resolution of 0.01 mg. It has a fully automatic draft shield and it is capable of fully automatic internal calibration.

## 3.0 INSTRUCTION MANUAL

A copy of the instruction manual, "Operating Instructions - Mettler AT Balances" is kept next to the balance along with a copy of the routine operation instructions and a log book.

## 4.0 CALIBRATION

The balance is calibrated initially and annually by the manufacturer and a certificate of traceability to NIST will be issued at that time. The calibration will be verified (Section 5.1) in any of the following situations:

a) If the balance is physically moved to a different location.

b) After any repairs.

c) If required by the project protocol.

## 5.0 VERIFICATION OF CALIBRATION

### 5.1 Calibration with Internal Weights

The balance is designed to calibrate itself fully automatically with internal calibration weights (2x100 g) as soon as a change in the operating conditions (temperature, humidity etc.) makes it necessary. This internal calibration can also be performed at a key stroke.

5.1.1 Close the draft shield by pressing either <SELECT 1> or <SELECT 2> if it is open.

5.1.2 Repeatedly press the <MENU> key briefly until the display reads "CAL Int".

5.1.3 Trigger the calibration procedure by pressing the <SET> key.

5.1.4 Weights are loaded internally and the calibration is carried out automatically. Calibration and the linearization can be followed in the numerical display and on the Delta Trac.

5.1.5 Once the internal calibration and the linearization is completed the display reads "CAL End"

5.1.6 A beep sounds and the balance returns to the weighing mode with the following display "0.0000"

### 5.2 Calibration Check with Internal Weights

Calibration of the balance will be verified once per month or when necessary with internal weights as follows:

5.2.1 Press the <Menu> key repeatedly until the display reads CAL Int.

5.2.2 Press the <Select 1> key repeatedly until the display reads "CAL tESt". The calibration test is selected.

5.2.3 To execute the 'calibration test' press <Set> key. The balance will check the calibration with the internal weights. The measured weight is displayed in the display. Abort the test by pressing either <Set> or <Cancel> key.

5.2.4 Calculate the %Dev. by using the following formula:

$$\%Dev. = \frac{(W_m - W_s)}{W_s} * 100$$

$W_m$ = Measured weight

$W_s$ = Standard weight

If the %Dev. is more than ±0.00015% (1.5 ppm) the balance will be recalibrated using the internal weights (Section 5.1).

5.3 Calibration Check with External Weights

Calibration check with external weights must be carried out at each weighing session as follows:

5.3.1 Press the <On/Off> key to activate the weighing mode.

5.3.2 Close the draft shield by pressing either <SELECT 1> or <SELECT 2> key.

5.3.3 Set the balance to zero by pressing the <Re-Zero> key.

5.3.4 Open the draft shield (same as Section 5.3.2) and place a calibration weight (an appropriate calibration weight must be used to calibrate the balance in the range of the weighing session) on the weighing pan. Close the draft shield and press the <Print> key.

5.3.5 Note the weight and record the weight in the balance log book (see Section 9.0).

5.3.6 Calculate the % deviation as described in Section 5.2.4. If the % deviation is more than 1%, the balance must be recalibrated using the internal weights (Section 5.1) and the calibration check must be repeated. If the % deviation is still greater than 1%, notify the balance custodian. Do not use the balance.

## 6.0 ROUTINE OPERATING INSTRUCTIONS

6.1 The balance is always left on STAND BY mode. It can be switched to weighing mode by pressing the <On/Off> key.

6.2 If the draft shield is open, close it by pressing either <Select 1> or <Select 2> key.

6.3 Select the coarse or the fine range by pressing the <0.1/0.01 mg> key. The coarse range measures down to 0.1 mg whereas the fine range measures down to 0.01 mg.

6.4 Set the balance to zero by pressing the <Re-Zero> key. Close the draft shield by pressing either <Select 1> or <Select 2> key. While zeroing is in progress the display reads "----".

6.5 As soon as the zeroing is complete, a beep is heard and the balance is ready for weighing. Taring can also be performed similarly by pressing the <Re-Zero> key.

6.6 Perform the calibration check with external weights as described in Section 5.3.

6.7 Load the weighing sample, close the draft shield and press the <Print> key.

6.8 The triangle symbol (Print symbol) and the circle symbol of the stability detection appears in the display. When the symbol of the stability detection fades, a beep sounds and the triangle symbol also fades. Weighing result remains 'frozen' on the display for 5 seconds. This can be recognized by the flashing circle above the weighing unit.

6.9 Once the weighing is over, tilt up the <On/Off> key briefly from below. Close the draft shield. The balance goes to STAND BY mode.

6.10 Clean the weighing pan with the brush provided.

NOTE: (a) Opening of the draft shield can be triggered when necessary by pressing either <Select 1> or <Select 2> key.

(b) If a mistake is made during the weighing procedure, simply press the <On/Off> key twice and restart the weighing procedure.

Contact the balance custodian in the event of balance malfunction or failure.

Reference: Operating Instructions - METTLER AT Balances

## 7.0 ROUTINE MAINTENANCE

Balance should be inspected for general cleanliness and proper operation on a regular basis (at least once a month) by laboratory personnel and results recorded in the logbook.

7.1 Clean the weighing pan, the draft shield and the housing with the brush provided.

7.2 For thorough cleaning lift off the weighing pan and the draft cover vertically upward. After cleaning, replace the weighing pan and the draft cover.

NOTE: When replacing the weighing pan, ensure that it has free movement in its slot and does not touch the draft cover. (refer operating instructions manual, pp. 56).

7.3 Any problems with the balance should be communicated to the custodian and the custodian is responsible for taking appropriate action to correct the problem. The custodian should also inform the laboratory supervisor of such problems.

## 8.0 NON-ROUTINE MAINTENANCE

In the event of balance failure or malfunction the user must notify the balance custodian. The custodian is responsible for informing the laboratory supervisor about the problem. The custodian should make arrangements for necessary repairs to the balance to bring it to proper working condition. After any repairs, accurate performance of the balance must be demonstrated and documented by performing any of the following:

(a) Calibration of the balance by a manufacturer recommended service representative.

(b) Calibration of the balance using internal weights as described in Section 5.1.

## 9.0 DOCUMENTATION

A log book must be maintained for records regarding the balance and kept near the balance. All users must make the following entries in the log book:

(a) Date of use

(b) Name of the user and the project number

(c) Results of the calibration check procedure

All periodic calibration information must be recorded in the log book as well.

All maintenance (routine and non-routine) operations must be recorded in the maintenance section of the log book.

## 10.0 REFERENCES

1. Operating Instructions - Mettler AT Balances.