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TITLE: OPERATION AND CALIBRATION ANALYTICAL BALANCE				

1.0 PURPOSE:

To describe the operation and calibration of Analytical Balance

2.0 SCOPE:

This Procedure is applicable to the Analytical Balance of Laboratory.

Make : Mettler

Model : ME204

ID No. : DIPL/QC/INS/AB/002

3.0 RESPONSIBILITY:

3.1 Analyst-QC shall be responsible to follow this SOP.

3.2 Head-QC/Designee shall be responsible for ensuring implementation of this SOP.

3.3 Head-QA/Designee shall be responsible for monitoring overall compliance of this SOP.

4.0 DEFINITIONS:

Nil.

5.0 PROCEDURE:

5.1 Preliminary check:


5.1.1 Check and ensure that the balance is clean and suitable for use. If it is not, using a soft cloth on the outside and use a tissue paper for cleaning the pan and its surroundings.

5.1.2 Check for the spirit level. If the bubble is out of the ring, then adjust the rear knobs on which the balance stands to get the spirit level balanced correctly. Ensure that the balance is placed in an area, which is free from vibrations

5.1.3 Ensure that the container total weight will not exceed the max. Loading weight of the balance.

5.1.4 Before weighing, bring the temperature of the material to be weighed, to the room temperature.

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5.1.5 Perform all the weighing while doors of the balance are in closed position and final reading shall be noted only after closing the sliding door.

5.1.6 Perform all weighing by placing the weights in the centre of the weighing pan.

5.1.7 Display the maximum and minimum weights can be weighed at the balance.

5.2 Basic Operation:

5.2.1 Before using the balance check whether the balance is calibrated or not.

5.2.2 If not calibrated it and if it passes in the calibration and used it.

5.2.3 Check the cleanliness of the balance pan

5.2.4 Remove the load present if any from the balance pan and then press the ON button if the balance reading shows. 0.0000 The balance is ready for use.

5.2.5 Sample weighing:

5.2.5.1 Place the sample to be weighed on the balance pan.

5.2.5.2 Wait until the stability detector “0” disappears’.

5.2.5.3 Note down the reading shown.

5.2.6 Tare facility utilization:

5.2.6.1 Place the container or butter paper on the balance pan the wait will be displayed


5.2.6.2 Press the (O/T) bar.

5.2.6.3 Place the sample to be weighed on the container. The net weight will be displayed after weighing removes the container form the balance.

5.2.6.4 The tare wait will be shown as negative value. The tare weight remains stored until the (O/T) bar is pressed or the balance is switched off.

5.2.6.5 Connect the instrument to the main power supply and switch on the instrument. Wait till the digital display comes to 0.0000 g and also ensure that the spirit level is balanced. Keep the windows of the balance always closed during weighing.

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5.2.7 Weighing Procedure (for Solids):

- 5.2.7.1 Place the clean butter paper on the balance pan and close the balance door.
Tare the weights to zero.
- 5.2.7.2 Choose the units in which sample is to be weighed. Press 'F' button in the balance to switch over from mg to g and vice versa.
- 5.2.7.3 Carefully add the sample being weighed approximately to the nearest mg. Wait for few seconds till the 'o' on the left hand side of the display will disappear and the press 'F' on the printer the weight will be printed.
- 5.2.7.4 Carefully transfer the contents to specified glassware, taking care not wet the paper or spill any of the weighed powder.
Note: Before transferring the contents, ensure the inner check of the glass ware is dry.
- 5.2.7.5 Clean the balance for any powder spillage after use.


5.2.8 Weighing Procedure (for Liquids):

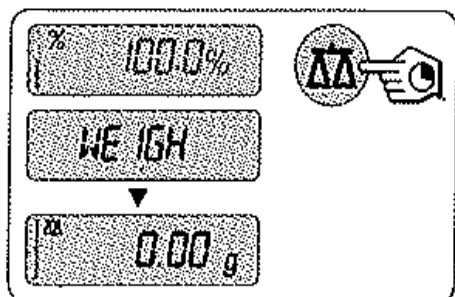
- 5.2.8.1 Place cleaned and dried specified glassware on the balance pan (the weight should not exceeds 220g) and close the balance door. Tare the weight to zero.
- 5.2.8.2 Choose the units in which the sample is to be weighed. Press 'Cal' button in the balance to switch over from 'mg' to 'g' vice versa
- 5.2.8.3 Clean the balance for any spillage after use.

5.3 Basic principles for operation:

5.3.1 Selecting simple weighing or terminate application:

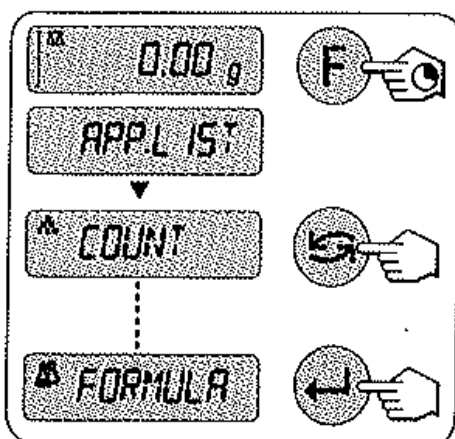
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- Press and hold $\ll \Delta \Delta \gg$ until “WEIGH” appears on the display.
 \Rightarrow The balance returns to the simple weighing mode.


5.3.2 Selecting an application:



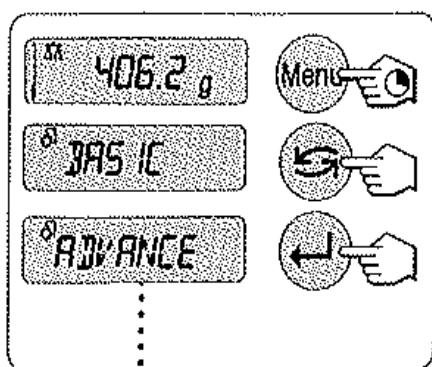
- Press and <F> until “APP.List” (application list)
 \Rightarrow Last active application e.g. “COUNT” appears on the display.
- Select an application by multiple pressing $\ll \hookrightarrow \gg$
- To execute selected application press $\ll \leftarrow \gg$



5.3.3 Available applications:

Display	Remarks	Description	
COUNT	Piece counting	See Application “Piece counting”	
PERCENT	Percent weighing	See Application “Percent weighing”	
CHECK	Check weighing	See Application “Check weighing”	
STAT	Statistics	See Application “Statistics	
FORMULA	Formulation / Net-Total	See Application “Formulation” (Net Total Formulation)	
TOTAL	Totaling	See Application “Totaling”	
DYNAMIC	Dynamic weighing	See Application “Dynamic weighing”	
FACTOR.M	Multiplication factor	See Application “Multiplication factor”	
FACTOR.D	Division factor	See Application “Division factor”	
DENSITY	Density	See Application “Density”	
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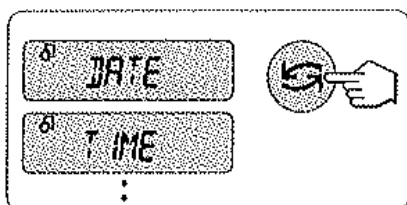
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5.3.4 Entering the menu:



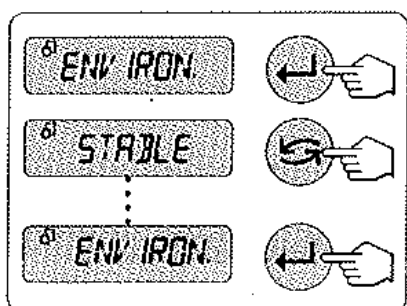
1. Press and hold <Menu> to enter main menu. The first menu “BASIC” is displayed (except menu protection is active).
2. Press  repeatedly to change menu.
3. Press  to confirm the selection.




5.3.5 Select menu topic



- Press . The next menu topic appears in the display. Each time  is pressed, the balance switches to the next menu topic.


5.3.6 Changing the setting in selected menu topic:



1. Press . The display shows the current setting in the selected menu topic. Each time  is pressed, the balance switches to the next selection. After the last selection the first is shown again.
2. Press  to confirm the setting. For store the setting see section **save setting and closing the menu**.

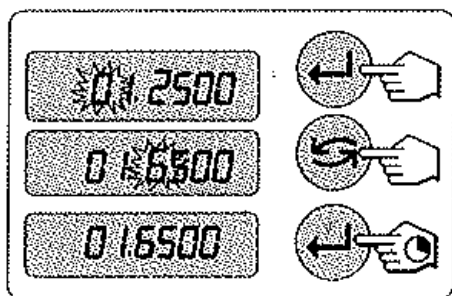
5.3.7 Changing setting in a submenu selection:

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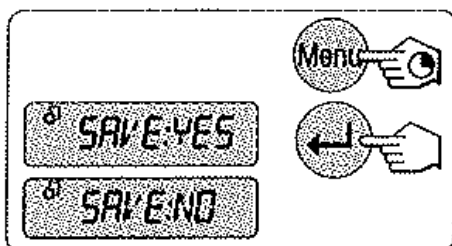
The same procedure as for menu topics.

5.3.8 Input principle of numerical values:




1. Press «←→» to select a digit (cyclically from left to right) or a value (depending on the application). The selected digit or the selected value is blinking.
2. For changing blinking digit or values, press «↶» to increase or «↷» to decrease.
3. Press and hold «←→» to accept the value.

5.3.9 Saving setting and closing the menu:

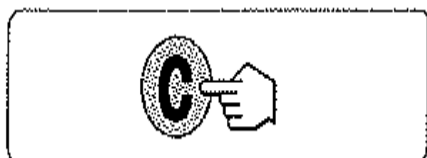


1. Press and hold «Menu» to leave menu topic.
⇒ “SAVE: YES” appears on the display.
2. Press «↶» to toggle between “SAVE: YES” and “SAVE: NO”.
3. Press «←→» to execute “SAVE: YES”. Changes are saved.
4. Press «←→» to execute “SAVE: NO”. Changes are not saved.

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5.3.10 Cancel:



- During menu operation
- To leave menu topic or menu selection without saving press <<C>> (one step back in the menu).
- During application operation
- To cancel setting press <<C>>.
 - ⇒ The balance returns to the previous active application.

Note: If no entry is made within 30 seconds, the balance reverts to last active application mode. Changes are not saved. If changes are made, the balance asks “SAVE: NO”.


5.4 Setting Date and Time:

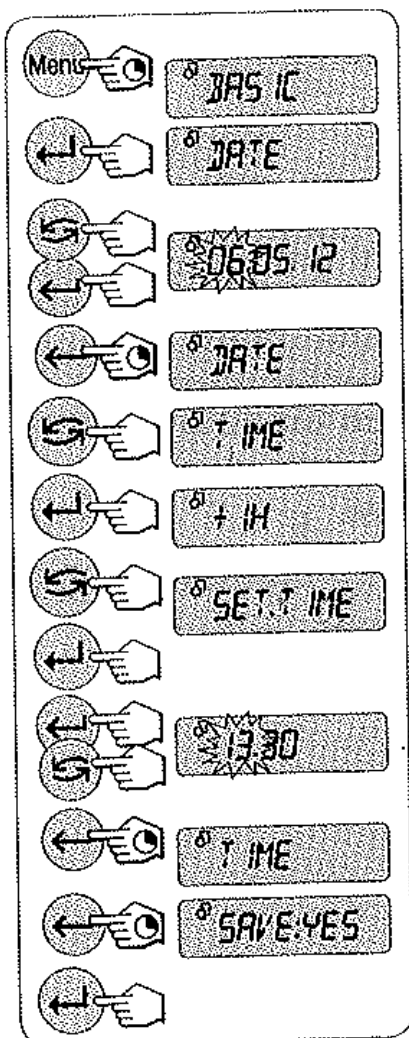
When put new instrument into operation for the first time, you should enter the current date and time.

Note:

- These settings are retained even if you disconnect your instrument from the power supply.
- A reset of the instrument will not change these settings.
- Set the current date according to the date format “**DATE: FRM**” in the menu “**ADVANCE.**”
- Set the current time according to the time format “**TIME.FRM**” in the menu “**ADVANCE.**”


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1. Press and hold **«Menu»** until menu **«BASIC»** appears on the display.
2. Press **«←»** to open menu **«BASIC»**.
⇒ **«DATE»** appears.
3. Press **«←»** to confirm.
4. **Set current date.** Press **«←»** to select day, month or year; press **«→»** to set current day, month or year.
5. Press and hold **«←»** to confirm the settings.
⇒ **«DATE»** appears.
6. **Set current time.** Press **«→»** to select **“TIME”**.
7. Press **«←»** to confirm.
⇒ **“+1H”** appears.
8. Select **“SET.TIME”** by pressing **«→»**.
9. Press **«←»** to confirm.
10. Press **«←»** to select hours or minutes; press **«→»** to set current hours or minutes.
11. Press and hold **«←»** to confirm the settings.
⇒ **«TIME»** appears.
12. Press and hold **«←»** to store the settings.
⇒ **«SAVE:YES»** appears.
13. Press **«←»** to confirm.

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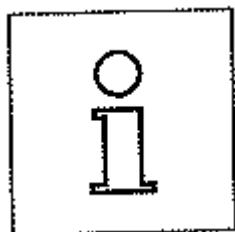
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5.5 Adjustment (Calibration):



To obtain accurate weighing results, the balance must be adjusted to match the gravitational acceleration at its location. Adjusting is necessary:

- Before the balance is used for the first time.
- At regular intervals during weighing service.
- After a change of location.



To obtain accurate results, the balance must be connected to the powder supply for approximately,

- 30 minutes for balances with readability of 1 mg to 0.1g.
- 60 minutes for balances with readability of 0.1 mg.


In order reach operating temperature before adjusting.

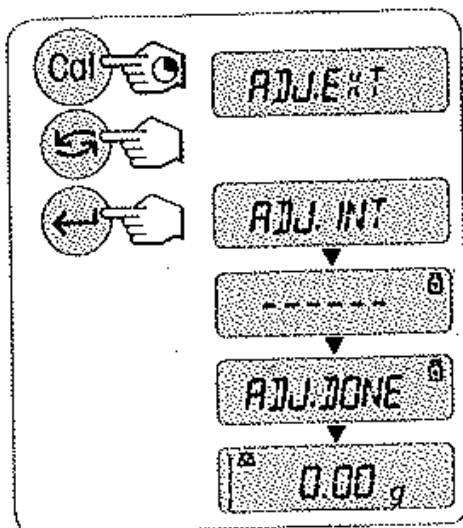
5.6 Adjustment with internal weight:

Note:

- On models with internal weight only
- After the second step verification, this feature is no longer available.

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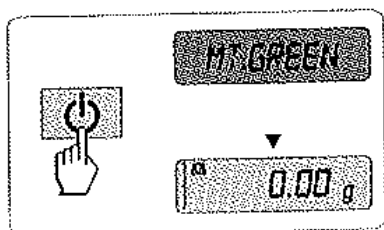
1. To carry out this operation press and hold **«CAL»** until **«ADJUST»** appears.
2. Select **«ADJ.INT»** by pressing **«←»**.
⇒ **«ADJ.INT»** appears on the display.
3. Press **«→»** to execute “Internal Adjustment.”
The balance adjustment itself automatically. The adjusting is finished when the message “**ADJ.DONE**” appears briefly on the display. The balance returns to the last active application and is ready for operation.

5.7 Weighing made simple:



This section shows you how to perform simple weightings and how you can accelerate the weighing process.

5.7.1 Switching the balance On or Off



Switching on


- The balance is in “**STANDBY**” mode. “**MT.GREEN**” appears on the display.
- Press **«⏻»** or remove any load from weighing pan or tap on the weighing pan.

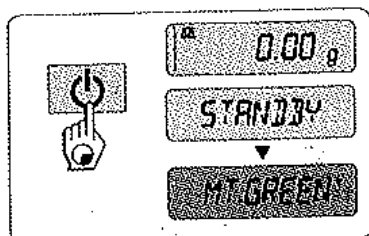
The balance is ready for weighing or for operation with the last active application.

Note:


Approved balances can only be switched on by pressing **«⏻»** in selected countries.

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Switching off into standby mode:

- Press and hold the  key until “standby” appears on the display. Release the key.
⇒ “MT.GREEN” appears on the display.

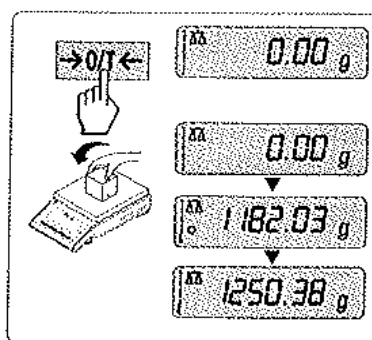
Note:



- Once your balance has been switched off, it is in energy saver mode “STANDBY”. In this case your balance needs no warm-up time in the standby mode and is immediately ready for weighing.

If you wish to perform a weighing, you only need to place the sample in the weighing pan and the balance immediately displays the results. There is no need to switch it on with the  key (with approved balances only possible in selected countries)


- To completely switch off the balance, disconnect it from the power supply.

5.7.2 Performing a simple weighing:

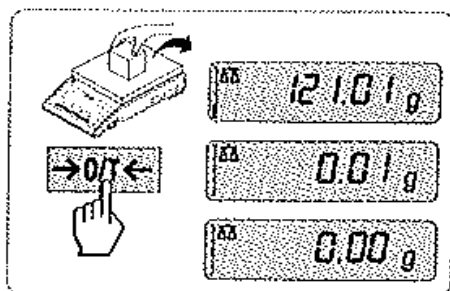


- Press  to zero the balance.
Note: If your balance is not in the weighing mode, first press and hold the  key until “WEIGHT” appears in the display. Release the key. Your balance is in the weighing mode.
- Place weighing sample on the weighing pan.
- Wait until the instability detector “O” disappears and the stability beep sounds.
- Read the result.

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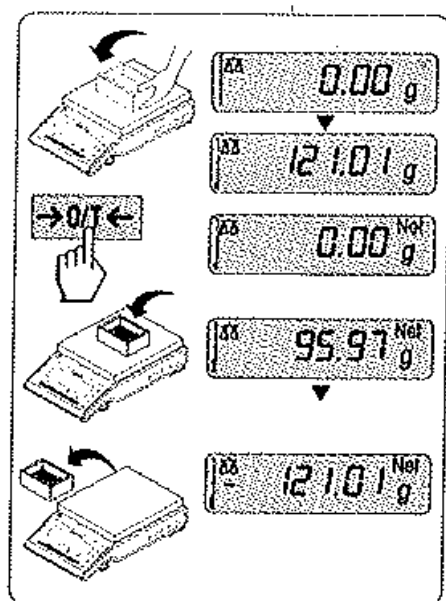
5.7.3 Zero setting /Tearing:



Zero setting:

1. Unload the balance.
2. Press $\llcorner \rightarrow \text{O/T} \leftarrow \gg$ to set the balance to zero. All weight values are measured in relation to this zero point.

Note: Use the $\llcorner \rightarrow \text{O/T} \leftarrow \gg$ zeroing key before you start with a weighing.



tearing:

If you are working with a weighing container, first set the balance to zero.

1. Place empty container on the balance. The weight is displayed.
2. Press $\llcorner \rightarrow \text{O/T} \leftarrow \gg$ to tare the balance.


“0.00 g” and “Net” appears in the display. “Net” indicates that all weight values displayed are net values.

Note:

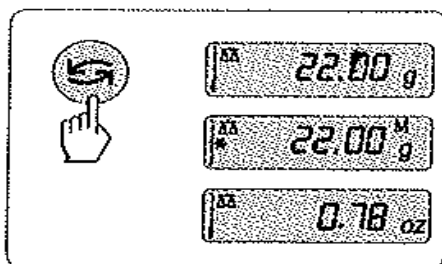
- If the container is removed from the balance, the tare weight will be shown as a negative value.
- The tare weight remains stored until the $\llcorner \rightarrow \text{O/T} \leftarrow \gg$ key is pressed again or the balance is switched off.


5.7.4

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5.7.5 Switching Weight Units:

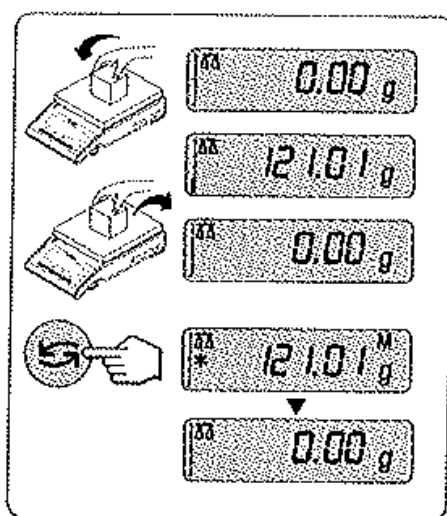



The  key can be used at any time to toggle between weight unit “UNIT 1”, “RECALL” value (if selected), weight unit “UNIT 2” (if different from weight unit 2) and the application unit (if any).

5.7.6 Recall / recall weight value:


Recall store stable weights with an absolute display value bigger than 10d.

Requirement: The function “RECALL” must be activated in the menu.



1. Load weighing sample. The display shows weight value and stores stable value.
2. Remove weighing sample. When the weight is removed the display shows zero.
3. Press . The display shows last stored stable weight value for 5 seconds together with asterisk (*) and memory (M) symbols. After 5 seconds the display goes back to zero. This can be repeated unlimited times.


Delete last weight value

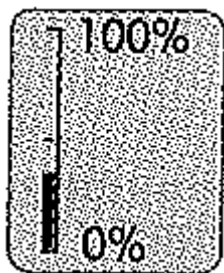
As soon a new stable weight value is displayed, the old recall value becomes replaced by the new weight value. When pressing , the recall value is set to “0”.

Note: If the power is switched off, the recall value is lost. The recall value cannot be printed.

5.7.7 Weighing with the weighing – in Aid:

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The weighing-in aid is a dynamic graphic indicator which shows the used amount of the total weighing range. You can thus recognize at a glance whether the load on the balance approaches the maximum load.

5.8 Weighing Range of Balance:

Lower Limit: least count x 50 (i.e. 0.1 mg x 50 = 5 mg)

Upper Limit: Upto 200.00 gr

5.9 CALIBRATION:

5.9.1 Routine Calibration.

5.9.1.1 **Frequency:** Daily. (Between 6:00 to 11:00)

5.9.1.2 Do not Use Hands for holding the standard Weights. Use FORCEPS

5.9.1.3 Procedure Carry out the following checks before taking up calibration.

5.9.1.4 Balance cleanliness.

5.9.1.5 Carry out the daily verification test by placing the standard weights certificate from the Govt. authorized test house and record the weighing and results of the test in the format.

5.9.1.6 Perform the calibration test with following loads.

5.9.1.7 50 gr, 10 gr, 1 gr, 100 mg, 50 mg and 10 mg.


5.9.1.8 Enter all weighing in the Current version format.

5.9.1.9 **Acceptance Tolerance:** The displayed load shall be within the range specified in table-1.

Table -1

S.No	Weights	Acceptance Tolerance
01	50 gr	± 0.1%

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02	10 gr	
03	1 gr	
04	100 mg	
05	50 mg	± 0.2%
06	10 mg	± 1.0%

5.9.2 MONTHLY CALIBRATION:

5.9.2.1 **Frequency:** Monthly.

5.9.2.2 Do not Use Hands for holding the standard Weights. Use FORCEPS

5.9.2.3 Procedure Carry out the following checks before taking up calibration.

5.9.2.4 Balance cleanliness.

5.9.2.5 Carry out the monthly verification test by placing the standard weights certificate from the Govt. authorized test house and record the weighing and results of the test in the format.

5.9.2.6 Perform the calibration test with following loads.

5.9.2.7 200gr, 100gr, 50gr, 20gr, 10gr, 5gr, 2gr, 1gr, 500mg, 200mg, 100mg, 50mg, 20mg, 10mg and 5mg.


5.9.2.8 Enter all weighing in the Current version format.

5.9.2.9 **Acceptance Tolerance:** The displayed load shall be within the range specified in table-2.

Table -2

S.No	Weights	Acceptance Tolerance
01	200 gr	± 0.1%
02	100 gr	± 0.1%
03	50 gr	± 0.1%
04	20 gr	± 0.1%
05	10 gr	± 0.1%
06	5 gr	± 0.1%

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S.No	Weights	Acceptance Tolerance
07	2 gr	± 0.1%
08	1 gr	± 0.1%
09	500 mg	± 0.1%
10	200 mg	± 0.1%
11	100 mg	± 0.1%
12	50 mg	± 0.2%
13	20 mg	± 0.5%
14	10 mg	± 1.0%
15	5 mg	± 2.0%

5.9.3 UNCERTAINTY:

5.9.3.1 **Frequency:** Monthly.

5.9.3.2 Uncertainty is defined as three times the standard deviation of not less than ten replicate Weighing Divided by the amount weighed should not exceed 0.0001 or 0.1% of the reading.

5.9.3.3 Carry out the Uncertainty test by placing the standard weight certified from the Govt. authorized test house and record the weighing and results of the Test in the format.

5.9.3.4 Before start the calibration ensure that the display indicate “0.0000”

5.9.3.5 Perform the calibration test with 50.0 mg standard weight.

5.9.3.6 Press TARE key display shows 0.0000

5.9.3.7 Place weight on the pan.


5.9.3.8 Weigh 10 times of weights (50 mg)

5.9.3.9 Enter all value in format as per current version format.

5.9.3.10 Calculate uncertainty test for each weights by using following formula:

$$Uncertainty = \frac{3 \times STDEVA}{Weight}$$

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5.9.3.11 **Acceptance Criteria:** The displayed load shall be within the range specified in table-3

Table-3

S. NO	WEIGHTS	ACCEPTANCE CRITERIA
01	50.0 mg	$\pm 0.02\%$

5.9.4 Eccentricity:

5.9.4.1 **Frequency:** Monthly

5.9.4.2 Before start the calibration ensure that the display indicate “0.0000”

5.9.4.3 Record the weights of the standard analytical weights one by one.


5.9.4.4 Perform the calibration test with following loads.

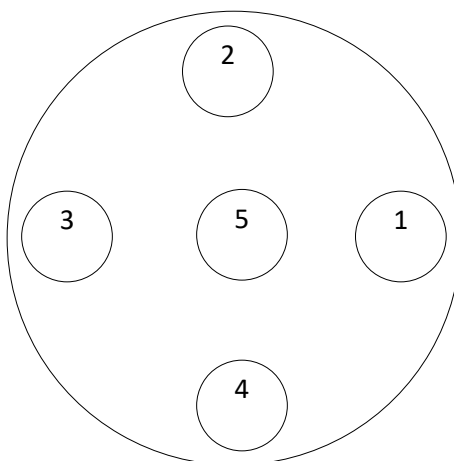
5.9.4.5 Press TARE key display shows 0.0000

5.9.4.6 Place weights (20 mg) on the pan.

5.9.4.7 Weigh 5 times of each weight (20 mg) in specified place as shown in the following Diagram

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5.9.4.8 Enter all values in format No current version format.

5.9.4.9 Acceptance Criteria: The displayed load shall be within the range specified in table-4.

Table -4


S.No	STANDARD WEIGHT	TOLERANCE
1	200 mg	± 0.2 mg

Note: Weighing box Calibration will be done on yearly once sending to external laboratory, at that time calibration performs with spare weight box.

6.0 FORMATS / ANNEXURE(S):

S.No	Details	Format No. (Current version)
1.	Analytical Balance daily Calibration Record	
2.	Analytical Balance Monthly Calibration Record	
3.	Analytical balance uncertainty test record	
4.	Analytical balance eccentricity test record	

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5.	Analytical Balance Usage log book	
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7.0 CHANGE HISTORY:

Revision No.	Effective Date	Details of Revision	Ref CCF No.
00	16.08.2016	New SOP introduced	--
01	01.01.2017	Modified as per current SOP format.	

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