Document Number: **SASoM/EQUIP/097.v2**

Title: **Use and Maintenance of the Mettler Toledo MS105DU Analytical Balance**

Version: **v2**

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Effective from:	17/04/2020
Valid to:	16/04/2025

SOP History		
Number	Date	Reason for Change
v1	17/04/2015	Original
v2	17/04/2020	Quinquennial Update

1.0 Purpose –

The purpose of this SOP is to outline the principles of the routine use of the Mettler Toledo MS105DU Analytical Balance in Laboratory 248 at the St Andrews School of Medicine (SASoM).

2.0 Scope –

This SOP applies to routine use and maintenance of the Mettler Toledo MS105DU Analytical Balance within the SASoM.

3.0 Responsibilities –

It is the responsibility of all users of the Mettler Toledo MS105DU Analytical Balance within the SASoM to comply with this SOP.

ALL USERS MUST SIGN THE 'USERS LOG' BEFORE USE!!!

4.0 Procedure –

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The accuracy of any balance is determined by the formula k x sd / tolerance where is 'k' is equal to the highest weight the balance can measure (ie 110g), 's' is the standard deviation of ten measurements, and tolerance is the degree of error we are allowing ourselves (in this case 0.5%).

A Certified 10g Calibration weight was measured ten times as follows: 9.99993g, 9.99993g, 9.99994g, 9.99992g, 9.99991g, 9.99991g, 9.99993g, 9.99990g, 9.99995g and 9.99990g. This represents a mean of 9.999922g with a standard deviation (sd) of 0.000016.

If k = 120g (max range of balance), sd = 0.000016, and the required weighing tolerance is 0.2%, then k x sd / tolerance = 120 x 0.000016 / 0.2 = 0.0096g = 9.6mg.

It is suggested that this balance should therefore only be used to weigh chemicals between 9.6mg and 120g at 99.8% accuracy.

It is suggested that this balance should therefore only be used to weigh chemicals between 3.8mg and 120g at 99.5% accuracy.

Before the start:

1. Check that the bubble level indicator at the front left of the balance is centred.
2. Adjust the adjustable rear feet at the right and left of the balance so that the bubble is centred in the circle.
3. Press the ON/OFF button to the left of the display in order to switch on the balance. The balance will then perform a display test. After a brief warm up time, the balance is ready for weighing. Wait for the auto-check to be completed.
4. The display should read 0.00mg or 0.00000g depending on which units were last used.
5. The balance can display either milligrams (mg) or grams (g) depending on which units are selected. The units are selected by pressing the 'F2 / double arrow' button to toggle between g and mg.
6. The balance has been set up so that both doors open when the handle is manually pushed back on either left or right hand side.
7. If a fault is detected during auto-check, a code will be displayed. Note this code, so this can be checked against the manual or given to the service engineer, if necessary.
8. Switch off the balance by holding down the ON/OFF button until the display reads SHUTTOFF. The display will switch off.

Calibration using the internal calibration weight (not usually necessary):

1. This instrument is programmed to perform an internal calibration every day at 21:00hrs providing the instrument is plugged into the mains supply. An additional calibration check can be performed before each use as follows:
2. Empty the weighing pan and ensure it is clean.
3. Press TARE and wait for the display to return to 0.00mg or 0.00000g.
4. Press the Internal Calibration Icon (button number 3 on drawings). The display will then show "ADJ.INT" followed by '- - - - - - ' and finally 'ADJ.DONE' The display will then return to return to 0.00mg or 0.00000g ready for use. This process may take a minute or so to complete.

Validation / confirmation using external weights (to be performed daily):

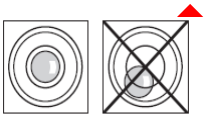
Balance accuracy should be checked / verified using Certified Calibration Weights. For the purpose of this SOP we will accept a tolerance of 99.8% accuracy (0.2% error).

1. Users should verify that the balance is performing accurately by weighing two separate 'certified' calibration weights prior to weighing a test sample. These weights should ideally be selected to sit on either side of the test weight; suggested weights are shown in Appendix 1.
2. Press TARE and wait for the display to return to 0.00mg or 0.00000g. An acoustic signal will sound.
3. Carefully remove the first calibration weight from its storage box, place on the centre of the balance pan and close the door.
4. Wait until the display shows a constant reading and the gram sign (g) is displayed (approximately 3s) indicating that the balance has come to rest.
5. Record the actual weight on the Balance Calibration Log Sheet (Weight 1).
6. Carefully replace the calibration weight into the storage box from which it came.
7. Repeat the process with a second calibration weight and again record the weight on the Balance Calibration Log Sheet (Weight 2).
8. If both 'Actual Weights' lie within the accepted range (as detailed in the SOP) then the Balance Calibration Log sheet should be recorded as **PASS**. If one or both 'Actual Weights' lie out with the accepted range the Balance Calibration Log sheet should be recorded as **FAIL** and the balance should be re-calibrated before revalidating.
9. If recalibration does not rectify the problem the balance should not be used until a service has been carried out.

Weighing:

1. Open either of the doors at the side of the balance and place a weighing boat or paper onto the weighing pan.
2. Press TARE and wait for the display to return to 0.00mg or 0.00000g. An acoustic signal will sound.
3. Place the item to be weighed into the centre of the weighing boat and close the door.

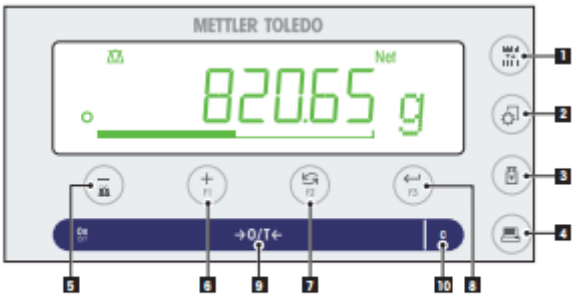
4. Wait until the display shows a constant reading and the gram sign (g) is displayed (app 3s) indicating that the balance has come to rest.
5. ALWAYS clean the inside of the balance as well as the area around the balance of any spillages and dust (visible and invisible) with a damp white tissue and 70% ethanol. When weighing dyes such as crystal violet, bromphenol, SRB, thioflavin etc., use 100% ethanol to remove any stains.
6. Clean stirrers and spatula with excess water and 70% ethanol and return them to the weighing area.
7. Place used weighing boats and weighing paper into the red low chemical hazards bin.
8. **The balance MUST BE turned off after use. Press and hold →0/T button (9) until SHUT OFF is displayed indicating balance is off. Wipe away any spillage from weigh pan using brush then gently wipe balance pan and surrounding area with tissue soaked with 70% ethanol to remove residual chemical. Dispose of tissue in Red Chemical waste bin.**



Balances with S platform and readability of 0.1 mg and 1 mg

– Adjust the two leveling feet appropriately until the air bubble comes to rest exactly in the middle of the glass:

Air bubble at	"12 o'clock"	turn both feet clockwise
Air bubble at	"3 o'clock"	turn left foot clockwise, right foot counterclockwise
Air bubble at	"6 o'clock"	turn both feet counterclockwise
Air bubble at	"9 o'clock"	turn left foot counterclockwise, right foot clockwise



Key Functions

No.	Key	Press briefly (less than 1.5 s)	Press and hold (longer than 1.5 s)
1		• To change display resolution (1/10d function) while application is running Note: not available with approved models in selected countries.	no function
2		• Enter or leave menu (Parameter settings) • Save parameters	no function
3		• Execute predefined adjusting (calibration) procedure	no function
4		• Printout display value • Printout active user menu settings • Transfer data	no function
5		• To navigate back (scroll up) within menu topics or menu selections • Decrease (numerical) parameters within menu and in applications	• To select the weighing application • Decrease (numerical) parameters quickly within menu and in applications
6	F1	• To navigate forward (scroll down) within menu topics or menu selections • Increase (numerical) parameters within menu and in applications	• To select assigned F1 application and entering the parameter settings of application. • Default F1 application assignment: Piece counting • Increase (numerical) parameters quickly within menu and in applications

No.	Key	Press briefly (less than 1.5 s)	Press and hold (longer than 1.5 s)
7	F2	• With entries: scroll down • To navigate through menu topics or menu selections • To toggle between unit 1, recall value (if selected), unit 2 (if different from unit 1) and the application unit (if any)	• To select assigned F2 application and entering the parameter settings of application. • Default F2 application assignment: Percent weighing
8	F3	• To enter or leave menu selection (from / to menu topic) • To enter application parameter or switch to next parameter • To confirm parameter	• To select assigned F3 application and entering the parameter settings of application. • Default F3 application assignment: Formulation
9	ON/OFF →0/T←	• Switch on • Zero/Tare	• Switch off
10	C	• Cancel and to leave menu without saving (one step back in the menu).	no function

5.0 Personal protection –
Howie coat must be worn at all times.

6.0 Training –
All users have to be trained before using the Instrument by a designated person.

7.0 **Related documents**

7.1 Equipment Manual – Mettler Toledo MS105DU Balance

7.2 Risk assessments – RA/GEN/017 & RA/COSHH/003

7.3 Acceptable ranges for Check Weights (appendix 1); Balance Calibration Log (Appendix 2).

Appendix 1:
Acceptable Ranges for Check-Weights.

Balance Type	Check-weight (nominal)	Acceptable Range	Error Range
Sartorius BL610 Pan Balance (0.1-610g in 0.01g)	10g	9.9 – 10.1g	+/- 1%
	20g	19.8 – 20.2g	+/- 1%
	50g	49.5 – 50.5g	+/- 1%
	100g	99.5-100.5g	+/- 0.5%
Mettler Toledo MS105DU Analytical Balance (0.1mg-110g in 0.1mg)	50mg	49.9 – 50.1mg	+/- 0.2%
	100mg	99.8 – 100.2mg	+/- 0.2%
	200mg	199.6 – 200.4mg	+/- 0.2%
	500mg	499 – 501mg	+/- 0.2%
	1g	0.998 – 1.002g	+/- 0.2%
	10g	9.8 – 10.2g	+/- 0.2%

Appendix 2:
BALANCE CALIBRATION LOG

Balance ID: Mettler Toledo MS105DU Analytical Balance			**Serial No: B513753256**			
Date	**Weight 1**		**Weight 2**		**Pass/Fail**	**Initials**
	Nominal	**Actual**	**Nominal**	**Actual**		

BalCalLogV2(01Apr2015).

8.0 Approval and sign off –

Author:

Name: Peter Mullen

Position: Research Fellow

Signature: Date:

Management Approval:

Name: Peter Mullen

Position: Research Fellow

Signature: Date:

QA release by:

Name: Alex MacLellan

Position: QA Manager

Signature: Date:

STANDARD OPERATING PROCEDURE

Please sign below to indicate you have read this S.O.P and understand the procedures involved.

NAME	POSITION HELD	SIGNATURE	DATE