V. **Laboratory Balances**

1. definition

Laboratory balances from a general standpoint measure the mass of an object, in the laboratory they are used to measure solids, liquids, tissue, they have a wide range of uses in virtually any laboratory including clinical, research and environmental settings.

Most of these scales work on the principle of comparing the gravitation force acting on the object with the force on a standard mass which leads to incredibly precise final results.

A lab balance in its most basic function is there to determine the mass of an object such as a solid, liquid, powder, etc. From that key function however radiates out varying degrees of precision, accuracy, accommodations for what and how much of material needs weighing, and functions to help break down the data.

Lab balances can also have specialized functions like moisture analysis, to help speed up the process of determining the composition of a sample. Measurements are taken before and after a sample is dried, all within the same instrument, cutting down on time spent and sample needed using an incubator and a traditional balance.

Analytical balances are used when a high level of precision and accuracy is needed. These feature a draft shield, meant to reduce the chance of dust landing on the pan while measuring but also prevent air currents from disrupting a read. Weighing powders benefit from an analytical balance's draft shield as they vary greatly in density, and are sometimes electrostatically charged. Air currents can catch particles as they jump into the environment rather than remaining in place. In this case, the use of a dispensing apparatus in a closed system can greatly increase the accuracy as well as safety and reduce the minimum amount of sample needed.

Precision balances can also be enclosed but aren't as sensitive, and therefore are more responsive. For situations where you need exact measurements down to microgram readability, a precision balance can cover a lot of ground. Precision balances usually have a higher capacity as well. Top loading balances in exchange for less precision bring high speeds and higher capacities.

2. Operating éléments

A. Overview of display

Icon	Designation
*	Stability display
O	Indicator “zero display”
%	Application <Calculation of percentage>
PC	Application <Parts counting>
	Loading status rechargeable battery, see chap. **Fehler! Verweisquelle konnte nicht gefunden werden.**
▼	Balance is in input mode
H	Upper tolerance limit
L	Lower tolerance limit
DS	Application <Density>
⌈ ⌉	Brackets to display non verified ciphers (only verified balances)
ct kg mg dwt GN lb ozt	Weighing Units

B. the main components of lab balances

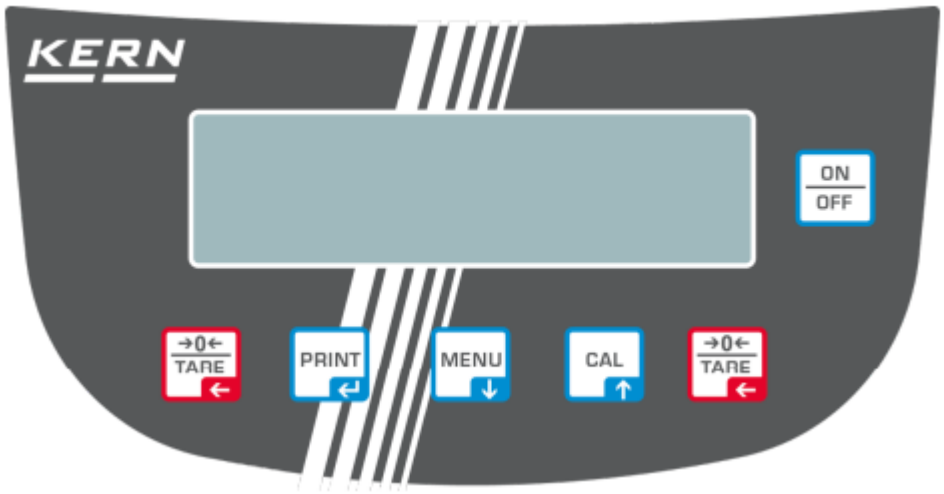


Fig 1: are the main components of lab balances. https://www.vetek.se/

Key	Designation	Short key pressing	Longtime pressed button until the acoustic signal gets mute
MENU	**MENU** button/	• Call-up application menu • Select menu items – scroll forward	• Call-up user menu • Exit user menu
	Arrow button ↓	• numerical input – scroll backward	
ON OFF	**ON/OFF** switch	• Turn on/off • Exit user menu	
CAL	**CAL** button/	• Adjustment • Select menu items – scroll backward	
	Arrow button ↑	• Numerical input – scroll forward	
PRINT	**PRINT** button	• Calculate weighing data via interface • Confirm / store settings	
	Arrow button ←	• Numerical input – cipher selection	
→0← TARE	**TARE** button	• Taring • Zeroing	

3. Types of Laboratory Balances

Though you can find lab balances in many sizes and variations, there are 3 main types of these scales that you normally see in the market.

1) **Analytical balances**

a. Definition

Analytical balances are an extremely accurate laboratory balance created to precisely measure the mass of an object. Offering a readability up to 0.00001 grams (0.01 mg), analytical balances are frequently used in laboratories. Providing such accurate measurement means that the balance is highly sensitive. Analytical balances are therefore designed with draft shields to provide protection from external environments such as air flows and dust which might affect the precision.

b. How to use an Analytical Balance

When using an analytical balance, great care must be taken. Analytical scales are designed to identify extremely light increments and should be used in a room where there is little or no disturbance in terms of atmosphere and foot traffic. Things such as movement, temperature changes and breezes can distort the results. Anti-vibration tables and mats will ensure complete accuracy.This brief guide below outlines how to use an Analytical Balance from Precisa:

- Check your analytical balance meets all industry standards, including FDA, CFR, etc. This information is available in the manual.
- Make sure calibration has been performed and educate yourself on the calibration procedure for going forward
- Find a safe place to put your analytical balance and plug it in. Give the balance time for it to reach operating temperature (min. 4 hours), and to go through internal checks until the display indicates zero weight.
- Once ready to use, open the draft shield door and place your substance on a pre-weighed and tared weighing paper or any other container into the centre of the weighing pan using gloves, tweezers, or tongs (Fingerprints will add mass).
- Add substance until your desired weight is reached, close the door and allow the reading to stabilise.
- After use, which may have polluted the balance, gently clean the instrument from any sample residues using a soft brush.

c. How to maintain an analytical balance

It is recommended to regularly adjust (calibrate) an analytical balance, particularly when it is being operated for the first time, or it has been moved, and after any levelling, or significant changes in temperature or atmosphere.

The analytical balance's measurement accuracy and lifespan are improved by routine cleaning.Use just a piece of lint-free, soap-wet, mild detergent-coated cloth to clean the analytical balance. Avoid using any abrasive or harsh cleaning chemicals as well as organic solvents. Cut off the electricity and unplug the power cord while cleaning. Ensure no liquid or dust gets inside the housing of the analytical balance.

d. Analytical balances parte

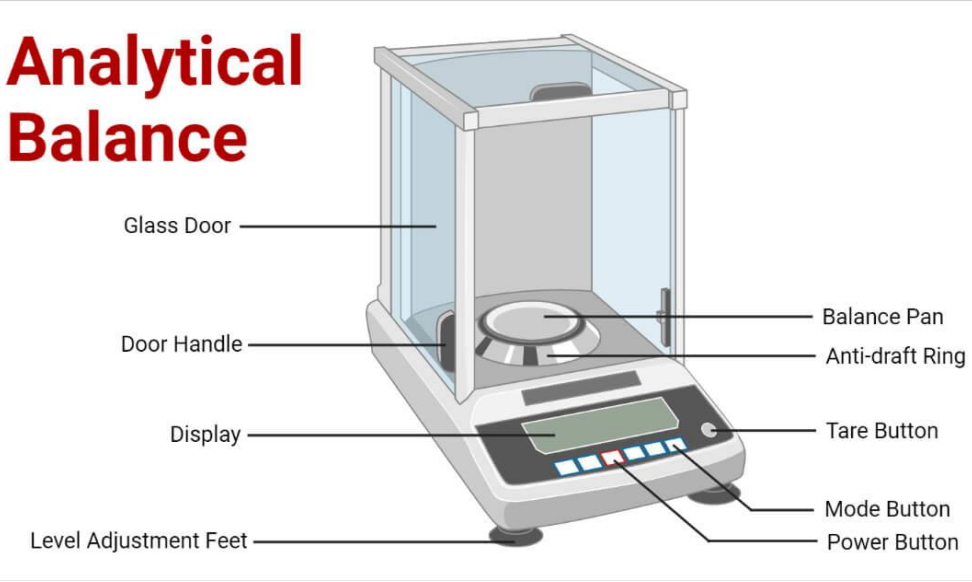


Fig 2: Analytical Balance Parts. https://microbenotes.com/

- **Balance plate (Pan)-** A container to bold the sample material for mass measurement.
- **Weights-** It enables the calibration of analytical scales.
- **Power button (on/off button)-** It is used to activate or deactivate the balance.
- **'Re-zero' or 'Tare' button-** It is used to rebalance the system and bring it back to neutral (zero)
- **'Mode' button-** It is used to configure the measurement conversion system such that the conversion system can be changed as necessary.
- **Draft shields-** These are incorporated into the design of analytical balances to offer protection from outside factors such as air flows and dust that could compromise precision.

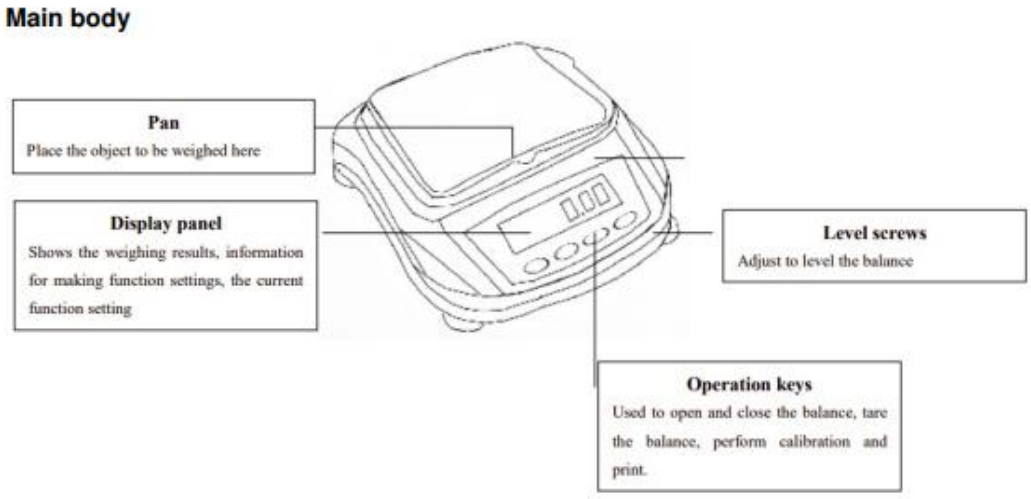
- **Level adjustment feet-** These enable the balance to be brought to the reference position. These are movable legs. The leveling bubble, spirit level, or plumb bob determines the reference position.
- **Level indicator-** It checks the balance in level.
- **Display panel-** It displays various information such as results, errors, information for function settings, and function in progress.

2) Precision Balances

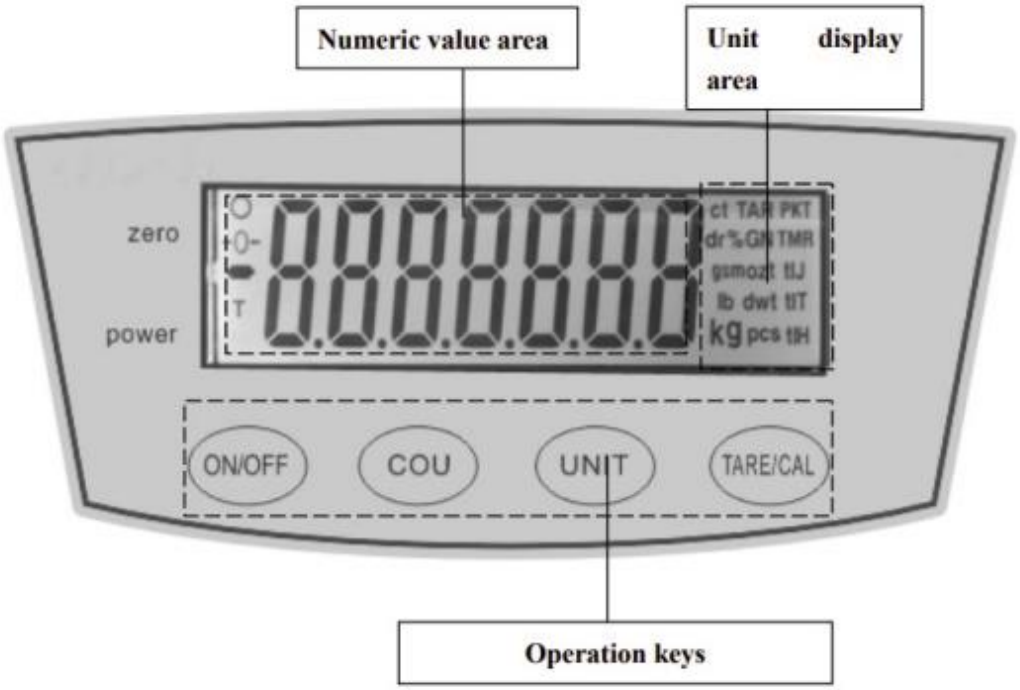
a. Definition

A precision balance is an accurate, robust weighing instrument with capacities from 120 g to 64 kg, and readabilities from 1 g to 0.1 mg. Lower readability models have a draft shield to ensure the best performance, while high-capacity models have a large weighing pan to accommodate heavy loads. Precision balances are used in a variety of applications in the lab and in manufacturing environments, including sample and standard preparation, formulation, statistical quality control, and counting.

b. Main body



c. Name and Function of the Components



Operation Keys

Key	During Weighing	
	Press once and Release	Press and hold for awhile
ON/OFF	Turn on or turn off the balance	—
COU	Select the counting function	—
TAR/CAL	Tare the balance(setting it tozero)	Performs calibration
UNIT	Select the unit	—

d. How to maintain an Precision Balances

- Do not use the balance anywhere exposed to explosive, combustible or corrosive gases. This could cause fire or trouble.
- Avoid locations where the balance will be exposed to any of the following: Air flow from an air conditioner, ventilator, door or window; Extreme temperature changes; Vibration from surroundings or nearby equipment; Direct sunlight ; Dust, electromagnetic waves or a magnetic field ; Install the balance on a strong and stable flat table or floor.
- Performing Span Calibration; Always perform span calibration for a balance after moving it. Weights are required for external calibration balances.
- Before performing, span calibration, warm up the balance in advance.

- It is essential to thoroughly wipe down the balance after weighing chemicals or other potentially hazardous materials.
- lab balances should only be moved when absolutely necessary.

e. Using the balance

1. Enter the weighing mode

2. Place a container on the pan.

3. Once the display has stabilized, press “zero/tar”. The indication changes to zero.

4. Insert the sample into the container.0+

5. When the display has stabilized, (the stability mark) lights up, read the display.

6. **Switching Units:** You can display different units from among those set to be available. 1 press “UNIT” in the weighing mode. Repeatedly pressing this key will cycle you through the registered units. 19 units to choose from: g, kg, ct, T, TAR, dr, PKT, GN, TMR, gsm, tlJ, mo, dwt, oz, lb, tlT, ozt, tlH, %.