

## Balances & Strain Gauges

### Optimise Your Lab Balance's Performance and Precision

Ruthanne Bell, Adam Equipment. Email: [r.bell@adamequipment.com](mailto:r.bell@adamequipment.com)

The location of a lab balance plays an important role in ensuring accurate results. Many factors can affect the operation of a lab balance, including the immediate locale, room temperature, light fixtures, atmospheric humidity, barometric pressure, vibrations from wind or nearby movement, static electricity, and even the weather. Monitoring these factors and making the proper adjustments can improve the performance of a lab balance and optimise results.

Most scientists will readily agree that precision is the most fundamental requirement of any type of lab equipment. Balances must perform with consistency and reliable accuracy during testing.

A lab that has worked hard to achieve a good reputation wants to maintain it. This is accomplished by using lab equipment that offers excellent performance, that consistently produces accurate measurements, and that delivers repeatable results.

Lab instruments, especially balances, are very sensitive devices. Their general surroundings and specific location can play an important role in how well the balance operates, which has a direct effect on measurement results and accuracy.

#### Take Calibration Seriously

Calibrating a balance regularly is an important step to ensuring consistently accurate results. There are myriad reasons a balance needs to be calibrated, according to Tom Storey, director of marketing with Adam Equipment, a manufacturer of scales and balances. Variations in temperature or barometric pressure make a difference, and even the simple act of moving a balance from one location to another can affect the mechanics of the balance. These changes might seem insignificant, but they can mean big differences in results.

"Let's say the ambient temperature in a room changes more than two degrees Celsius," Mr Storey said. "Before you think about performing high-precision measurements, you need to calibrate your balance. Fluctuations in barometric pressure can skew the results from a precision or analytical balance that hasn't been calibrated. And if your locale has a different gravitational force than that of the factory producing the balance, calibration is necessary for precise measurements."

It's essential to ensure that lab balances are calibrated regularly, especially if the ambient temperature changes or the balance is moved. Certified to OIML and ASTM standards, Adam Equipment's calibration weights are available separately or in sets, and are used to calibrate high-precision analytical balances that need to satisfy certain traceability requirements.



Adam Equipment Calibration Weights

#### The Gravity of the Situation

In a building, moving your balance only one floor up or down can mean you'll be getting variable measurements. Gravity is not the same everywhere on Earth, as our planet is not a perfect orb. Every place in the world is positioned differently to "magnetic north." This variation results in slight gravitational differences, depending on a particular location's altitude compared to sea level.

If you stand at either of the Earth's poles, you are slightly closer to the centre of the Earth than if you stand on the equator. As you move closer to the centre of the Earth, the force due to gravity will be slightly greater. As you move away from the centre, it decreases. Therefore, if you climb a mountain, you move

farther from the Earth's centre and the effect of the gravitational force is less. This is important, because balances measure the force of gravity that is pulling the mass toward the centre of the Earth.

Balances react differently to location changes. A less-sensitive balance may not notice a shift in gravity after moving from one place to another, while certain laboratory balances will more readily display differences in gravitational forces. On a highly sensitive semi-micro balance such as Adam Equipment's Equinox, it's possible that a very small difference in altitude can alter the balance's calibration.



Adam Equipment Equinox Analytical Balance

#### Change is in the Air

Environmental fluctuations can significantly distort the measurements provided by a precision or analytical balance. It might seem insignificant, but these variables can mean big differences in results. In particular, vibrations can wreak havoc with balances.

When you're deciding where to set up your balance, temperature stability is an important consideration. A good location is one that's not in direct sunlight, as that can skew results. Even lighting fixtures can give off enough heat to cause inconsistent results, so fluorescent bulbs are recommended.

Never place the balance near air conditioning or heating vents, as the blowing can cause vibrations. Avoid locations that get a lot of activity as people walk nearby or as doors open and close. To minimise the effects of heat and vibrations from the building, place the balance table is a slight distance away from the wall. Low-pressure weather systems in the area can produce winds that might cause buildings to shake. The amount of shaking increases exponentially on higher floors. This issue is difficult to control, but it's a good point to remember.

Before weighing samples that come from a dishwasher, dryer or cooler, make sure to allow sufficient time for them to warm or cool to the temperature of the balance's weighing chamber. If possible, try not to put your hands inside the weighing chamber, as that can have an adverse effect on measurements by altering the humidity and temperature in the chamber. For the same reason, hold any sample containers with tweezers to avoid warming them with hands. Always place samples in the centre of the pan to eliminate errors.

If your balance is outfitted with a draft shield, open it only as far as necessary to place the sample container. This helps maintain constant temperature and humidity levels in the weighing chamber, ensuring consistent measurement.

A balance's accuracy can be negatively affected by static electricity and humidity. Monitoring and controlling these factors in the environment can improve results. If you're experiencing weighing errors due to interference from electrostatic charge, check the atmospheric moisture level in the room. If the humidity is too low, that could cause an increase in electrostatic charge, so you'll need to make adjustments accordingly. As far as air moisture is concerned, the ideal conditions for a balance comprise a relative humidity of 45-60%, with a fluctuation of 10% or less. Humidity levels that are lower than 20% or higher than 80% are unsuitable for balance operation.

Keep in mind that certain materials are more apt to be affected by electrostatic charge. Granulated substances and powders are notorious for these issues in particular, and when they're placed in plastic or glass containers, the problems multiply substantially. To address this, increase the humidity in your location and try using a metal container, which helps reduce the electrostatic charge.

#### What's Shaking?

To improve repeatability and accuracy, an anti-vibration table can provide a viable solution. With its remarkably durable design, the Adam Equipment AVT anti-vibration table helps to minimise the effects of vibration during lab balance operation. AVT's sturdy aluminium construction allows balances to perform with marked precision, despite any movements or air currents that might cause inconsistent or inaccurate results. The solid-granite base rests on shock-absorbing rubber mounts, offering outstanding stability and creating the ideal setting in which to perform balance calibration or lab tests. AVT also features a convenient working surface that is suitable for placing samples, weights, pipettes, or other supplies and lab items.

There are other steps you can take to optimise the efficiency of your balance. Check to make certain your balance displays exactly zero each time before weighing, and if it's necessary, tare the balance to avoid errors. Align the balance properly by verifying that the air bubble is in the centre of the level indicator. You can adjust the levelling feet to ensure the balance is situated correctly.



Adam Equipment AVT Anti-Vibration Table