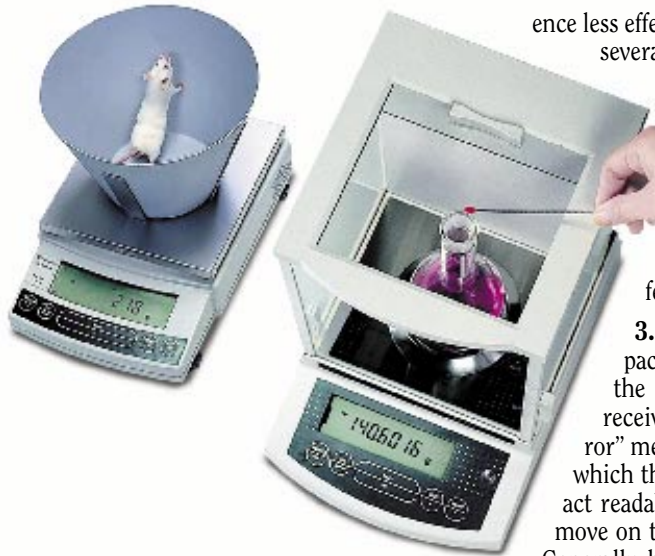




Selecting Industrial & Laboratory Balances



Webster's Dictionary defines balance as: "1 : an instrument for weighing; *a* : a beam that is supported freely in the center and has two pans of equal weight suspended from its ends *b* : a device that uses the elasticity of a spiral spring for measuring weight or force."

While this definition may seem clear cut, the reality is quite opposite. The industry offers a wide range of laboratory and industrial models. They can be used in a variety of environments, such as clean rooms, quality assurance labs, or hazardous areas, to perform functions as simple as straight weighing of small items or as complex as batching a formula.

In choosing a balance, it is essential to evaluate the application, determine tasks the balance will perform, and plan for the future in order to purchase a model that suits your needs. Whether you are a novice to the laboratory or a seasoned veteran, there are 14 important, yet often overlooked, considerations that will help you choose just the right device. While all are important, the first five elements are by far the most crucial and should be addressed first.

1. Keep Realistic Expectations. Resist the temptation to find one balance that will allow you to do all things with one instrument. By trying to achieve everything with one device, you can easily spend more money and experi-

ence less effective results than if you invest in several balances that may have fewer features but are designed for specific applications.

2. Readability. Readability is the smallest amount of weight change that you can visibly detect on the display. This is the first feature you should select.

3. Capacity. Simply stated, capacity is the largest weight value the balance will display before you receive some type of "overload" or "error" message. It is the effective range in which the balance operates. Find the exact readability you are looking for. Then, move on to select an appropriate capacity. Generally, balances that offer finer readability are more expensive.

4. Accuracy vs. Sensitivity. Don't let what seems to be a contradiction of terms cause confusion. Remember the old brain teaser: which is heavier, a pound of feathers or a pound of lead? The same principle applies to the accuracy of a balance. For example, which of the following balances is more accurate:

- a unit with a capacity of 210g and a readability of 0.1mg, or
- a unit with a capacity of 210g and a readability of 0.001g?

The answer is neither. Each device is equivalent in accuracy, if it performs to the manufacturer's design specifications. However, Balance A, because it is rated as 210g x 0.1mg, is more sensitive than Balance B, which has a readability of 0.001g. In other words, the device that has a readability of 0.1mg displays a finer, smaller, or more sensitive increment of measure. The value on the display will change when a smaller sample is placed on the platform.

5. Repeatability and Linearity. The next considerations, repeatability and linearity, are good indicators of how a balance will perform over time, as well as the precision that was given to its design and performance specifications.

6. Unit of Measure. Most balances today offer multiple, user-selectable Units of Measure (UOM). If you frequently use more than one UOM, make sure that pushbutton conversion

is available. If you need to use more than two, be specific with your sales representative. Not all devices allow pushbutton conversion for multiple UOM. Some devices are limited to a pushbutton conversion between only two units of measure (e.g., pounds and kilograms; or grams and ounces). To obtain a different conversion on these devices, you must change the setup parameters of the device. Other devices offer pushbutton conversion that require toggling through a range of as many as 15 UOM or more. In this case, during setup, some balances allow you to simply turn off the ones you will never use. From that point on, with each push of a button, you will scroll through each active UOM. Not only is this feature convenient, you can instantly convert a weight in one UOM to any other, such as decimal ounces, decimal pounds, troy ounces, pennyweights, carats, mommes, grains, tael, and others.

7. Weighing Pan Size. Be sure to reference this specification in the manufacturer's literature. Typically, a lighter weighing capacity yields a smaller weighing platform.

8. Environment. Environmental conditions play a critical role in balance performance. Start by checking the specifications for operating temperature and relative, non-condensing humidity. Also, employ your senses to see, feel, and hear the surroundings. Conditions that will degrade the performance results of your balance include:

- High voltage lines overhead
- Vibration in the floor from passing trucks or forklifts
- The commotion of large motors starting
- The proximity of air conditioning vents
- The sway of a tall building
- Unpredictable or unconditioned power

Depending on the severity of the conditions, in some cases you may need to operate your balance in a different area of the building than initially intended. However, there are solutions to some of these difficulties, ranging from electronic adjustments on the balance that can "hide" undesirable effects, to mechanical accessories that can aid in isolating the balance from its environment. The best solution is to utilize a location that will allow

you to use the balance as it was designed by the manufacturer.

9. Peripheral Interfacing. With the technology available today, a primary consideration when purchasing a balance, or any other measuring device, is communications. After all, a balance is a device that collects and reports valuable data during the weighing process. Communications allow you to transmit this data to peripheral equipment that can automatically sort, merge, and analyze it.

10. 21 CFR Part 11. This government requirement presents one of the major considerations in data transmission, use, and security. There are balance automation solutions and data management systems that provide secure and documented control over balance applications and balance data management. 21 CFR Part 11 compliance, control of the SOP process, automated data collection and automated data reporting make these programs ideally suited for laboratories concerned with regulatory compliance and maintaining the integrity of their SOPs. They are data based management principles incorporating client/server architecture to provide secure and efficient management of balance data and control over the SOP process and can present solutions that include electronic signatures, password protection, and audit trail. There are facilities that can define the SOPs for weighing applications and then confidently guide the analyst through the process, ensuring that the SOP is followed exactly as written.

11. ISO/GLP/GMP/LIMS Compliance. Be sure to investigate whether a balance can report the information required by your quality system. Not all devices can meet this requirement and some only meet the most basic requirements. Generally, if you need written reporting, you can automate and simplify the process by purchasing a balance and printer from the same manufacturer.

12. Legal-for-Trade. Although not the most prevalent consideration, the question is more common than in the past. Pharmaceutical applications are increasingly requiring Legal-for-Trade certification, and only a select few balances currently meet this need.

13. Sensor Technology. Three popular means of sensing the load on your balance include strain gauge transducer, magnetic force restoration, and double-ended tuning fork. Strain gauge technology is fast and durable but provides low resolution ($\leq 10,000$ Div.). Magnetic force restoration is slower and more susceptible to damage, but provides a higher resolution ($\geq 100,000$ Div.). The double-ended tuning fork is fast, dura-

ble, and provides high resolution ($\geq 100,000$ Div.). All are worthy of consideration as they apply to your application.

14. Intangibles. There are many other considerations that have a significant impact on which balance is best for you. Never make your final decision without all application, operational, and environmental conditions that may affect balance performance, such as:

- Who is operating the device?
- What kind of training do they have?
- Is more training required?
- Will the manufacturer provide that training free of charge?
- Where will they operate the balance?
- Is the environment not only balance friendly but people friendly as well?
- What consideration have you given to ergonomics?
- When will operators be using the device?
- Why is the work required?
- How can a balance facilitate better usage of your basic resources?
- What manual processes can we automate for additional cost savings?

While choosing the proper balance for a specific application is important, there is another area of concern that is often either overlooked or misunderstood—the proper “care and feeding” of a balance.

Simply stated, a weighing device is a precision measuring system that is designed for a very unique application. It requires care, maintenance, and respect. Here are a few rules of the road.

- **Always follow** the manufacturer’s operating instructions and maintenance recommendations.
- **Keep your balance as clean as possible.** Dust and dirt buildup can affect electronics, and chemicals that are allowed to sit on the device for long periods of time can damage its surface. Make it your goal to keep it looking as it did the day it came out of the box, no matter how old it gets. If your application is “dirty” by nature, then invest a few extra dollars for an in-use cover. These clear acrylic devices will protect your investment.
- **Keep the balance level.** A natural result of cleaning the balance will be to move it slightly. When you’ve finished, check to make sure the device is still level. A balance that is not level will not perform at its optimum.
- **Don’t move the balance around frequently.** If you find yourself moving a balance from

work station to work station on a frequent basis, you need to purchase another balance. When you perform a pushbutton calibration, or when your technician performs an external calibration of the device, that calibration is practically intact only until the balance is moved from one location to another.

• **Keep the balance turned on 24 hours a day.** Many of the more recent models have sleep modes that allow the display to automatically turn off after a certain, and sometimes programmable, interval of non operation. This feature is much like a computer’s screen saver. It allows the lifetime of the display to be extended while holding the balance’s operating temperature at a desirable level.

• **Don’t tread on me.** Your balance is a precision engineered, delicate, unique device. Treat it with the respect you would give to any other expensive piece of equipment. Don’t drop things on it. Don’t push it around from location to location on the workbench. Don’t spill things on it. Don’t rest things on it that you do not intend to weigh. Keep it away from sunlight, air conditioning currents, and sources of heat and vibration. Your balance will return the favor with a long and dutiful life cycle.

• **Calibrate your balance frequently.** While an annual check-up by a trained service technician is a good idea, you can do a lot in the interim to head off other complications. This is not the same as using the internal calibration routine. This routine is designed as a reference procedure only to ensure that the balance is operating correctly. Other factors can influence the operation of the balance and are not corrected by internal calibration. Also, your balance may need technical servicing more frequently than on an annual basis. It’s like changing the oil in your car – it depends on how hard the car is driven.

If you follow all of these guidelines, you will not only select the balance or balances that you truly need, but you will realize the most from your investment.

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