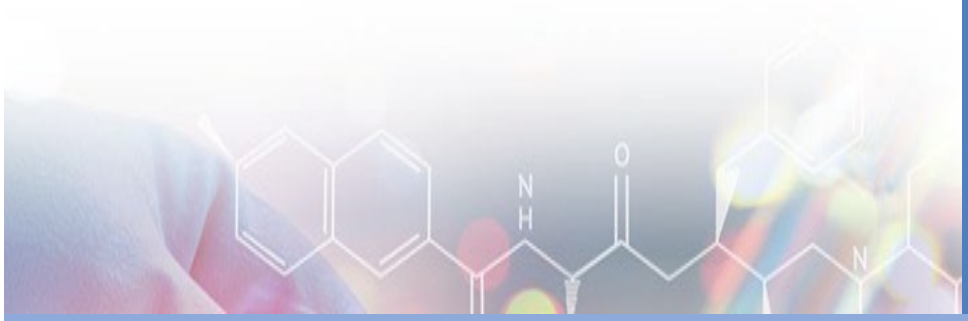

PUBLICATION

How to Choose a Balance

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www.scientech-inc.com

Author: Robert Guidetti

Email: sales@scientech-inc.com

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How to Choose a Balance

There are many considerations when deciding which balance best meets your needs and if you are not careful you might end up compromising on something important or getting something that may not be a necessity.

Either strain gage or electro-magnetic force restoration sensors are the most common technologies used for electronic weighing. Strain gage sensors are what is used in your bathroom or kitchen scales. They are ubiquitous because of their low cost. However, they are not intended for precision measurements and tend to drift. Strain gages are typically good for measurements up to 1 part in 300,000. Where precision and accuracy matter, the preferred technology is electro-magnetic force restoration. Force restoration balances are used for measurements of 1 part into the millions. All Scientech's balances employ electro-magnetic force restoration measuring technology.

Now that you know what balance technology to look for, balance capacity and readability are the two most significant factors to consider. Scientech balance capacities vary from 50g to 12kg. The maximum capacities available vary by the category of balances. Typically, the higher the capacity, the lower the resolution or readability that can be achieved. Within a category of balances, the higher the capacity the more difficult it is to achieve the same resolution. This is why prices increase as capacity increases within a category of balances. Scientech offers a range of high precision balances that fall into five distinct categories based on readability:

- Semi-micro balances with readability of 0.01mg,
- Analytical balances with readability of 0.1mg,
- Precision balances with readability of 1 mg,
- Laboratory balances with readability of 10mg, and
- General balances with readability of 0.1g.

Readability, which is the resolution or division size, is the smallest unit the balance will display. For example, the analytical balance has a 0.1mg increment size which means the display on the analytical balance will increment by 0.1mg. This is compliant with the National Institute of Standards and Technology (NIST) Handbook 44 which specifies the smallest displayed division of a balance as the "d" value.

Resolution is not the same as accuracy. Accuracy of a balance is the maximum difference between the applied test weight and the displayed weight. No measuring device is 100% accurate. However, in a stable environment a typical accuracy for precision balances is approximately +/- 1 .5 divisions throughout the weighing range. For analytical balances the accuracy is +/- 2 divisions. In the USA, Class I analytical balances are the most common balance found in laboratories for high precision weighing applications. Balances used for point-of-sale applications typically are Class II. The following table from NIST Handbook 44 summarizes the three accuracy classes commonly found with force restoration types of balances.

Balance Accuracy Classes

Class	Value of Verification Division (d or e)	Minimum Number of Divisions	Maximum Number of Divisions	Application
I	≥ 1mg	50,000	No limit	Precision laboratory weighing Semi micro, analytical, & precision balances
II	1 to 50mg inclusive ≥ 100mg	100 5,000	100,000 100,000	laboratory weighing, precious metal & gem weighing, grain test
III	0.1 to 2g inclusive ≥ 5g	100 500	10,000 10,000	commercial weighing i.e. animal weighing, food weighing, precious metal & semi-precious gems

Reference: Handbook 44 Specifications, Tolerances, & Other Technical Requirements for Weighing & Measuring Devices, Section S.5, Table 3 Parameters for Accuracy Classes

Balances and scales used for legal for trade or point of sales applications require more rigorous testing to ensure accuracy and fairness to both buyer and seller. An important parameter listed on legal for trade balances is the "e" value. The "e" value is the smallest scale increment that can be used to determine price by weight in point-of-sale transactions. That "e" value varies by balance model and is determined by the manufacturer when the model received type approval, such as NTEP approval in the USA. "e" is the stated accuracy or certified reliability of a balance when the balance display shows extra units that expand the resolution. Most analytical weighing applications do not require the use of an NTEP certified balance.

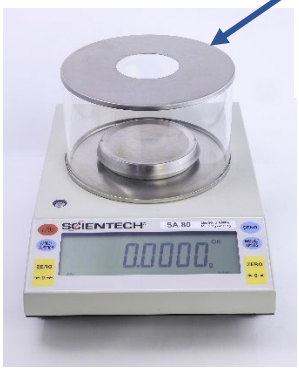
Next, consider what features you desire with your balance. Calibration is the most important consideration. You can either manually calibrate the balance using an external calibration weight or alternatively just press a button to calibrate the balance using the internal weight calibration feature offered with most models. If your quality control procedures require frequent calibration, then the internal calibration weight feature is desirable. However, external calibration weights that have been certified to have a known mass are the best. Even internal calibration weights can get out of tolerance due to particulates collecting on the weight, and the require periodic calibration to an external weight.

Make sure that the balance has the units that you want to weigh in. Most balances offer standard units of measure such as grams, ounces, milligrams, grains, or troy ounces for example. In labs that weigh small animals,

you will need a balance with dynamic weighing mode capabilities. You may need part counting capabilities if, for example, you need to determine the number of parts placed on the weighing pan. Check weighing mode compares the weight of a sample against target limits and allows confirmation that the item or set of items is within specification. Hi/low weighing is a mode of operation that may be used to eliminate under or over filling. Some balances include statistical functions. Make sure the balance supports the weighing mode that you plan to use.

You will certainly need to consider the environment where you will be using the balance. The higher the resolution of the balance, the more susceptible your readings may be to external forces such as vibrations or air currents. Motorized equipment running nearby, ventilation system drafts on the balances weighing pan, as well as sudden temperature deviations from heating or cooling sources can all influence your measurement. In addition to motorized equipment, vibration may also occur from other less obvious sources such as disturbances in upper floor levels, heavy road traffic or trains nearby. Scientech balances are equipped with multiple stability control settings to help abate these inferences. You may also want to consider getting an anti-vibration plate for the balance to be used on. Draft shields, included with analytical balances, mitigate the effects of air currents on measurements. Analytical or circular draft shields may be ordered with other balances as well.

Balance with Analytical Draft Shield



Balance with Circular Draft Shield

Scientech balances have temperature compensation over the operating range of the balance to mitigate the effects of room temperature variations. Although less common, electrostatic issues may affect the measurement results when weighing plastic or other conductive parts. If an output of your measurement results is required, compatible printers may be connected the balance to print results. While the common considerations for selecting a balance have been covered, you may still have questions. It is always best to contact the balance manufacturer to determine the balance that best fits your needs!