Do You Know the Difference

between a balance and a scale?

by Ann Crowley, Rice Lake product manager

According to Wikipedia "A weighing scale (usually just 'scales' in UK and Australian English, 'weighing machine' in South-Asian English, and 'scale' in U.S. English) is a measuring instrument for determining the weight or mass of an object.

A balance compares the torque on the arm due to the sample weight to the torque on the arm due to a standard reference weight using a horizontal lever. Balances are also different from scales in that a balance measures mass (or more specifically gravitational mass), whereas a scale measures weight (or more specifically either the tension or compression force of constraint provided by the scale)."

Originally balances were equal-arm balances where a weight was put on one side and a product was put on the other side. There was a comparison of mass between the two. Today, many balances are used as scales to measure the weight of a product.

Today's terminology would define a balance as a scale with a higher resolution. Balances have features including mass unit conversion, counting, percentage, limit functions for checkweighing, or specific-gravity weighing, whereas scales have gross, tare, and net indications, printing, and units-of-measure conversion.

A scale normally consists of a load cell base (or multiple load cell base) and a display, A/D and CPU processor. The displayed resolution is normally 5000 graduations (50 lb × 0.01 lb, for example) for Legal-for-Trade applications (NTEP) or 10,000 graduations for non-legal-for-trade applications (50 lb × 0.005 lb). Scales normally do not specify repeatability. However, NTEP Certified scales are tested for repeatability and have a tolerance of 1/10 of 1% of scale capacity.

A balance may have a load cell, force restoration, or tuning-fork weighing mechanism, a display, processor, and display graduations in excess of 100,000. The primary unit of measure for most balances is grams. An example of 100,000 displayed graduations would be 100 g × 0.001 g. Balances normally have repeatability specifications of one displayed graduation.

Both the scale and the balance could be used to weigh a product. Balances have limited capacity and size in order to maintain high display graduations. ■

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Guidelines to check a balance or scale.

Calibration, checking, testing, or verifying a scale is different from calibration with adjustment. Calibration verifies correct performance of the balance or scale.

First, power up and exercise the platform. Do this by applying light pressure with your hand on the platform or on a larger scale by walking around the corners.

Then complete the following tests:

1. Check for repeatability by placing a weight (near or at capacity) 10 times in the center of the platform.
2. Check for sensitivity or discrimination test (value of a division) by applying a check weight (the value of a scale division) at no load, half capacity, and full capacity.
3. Complete a build-up test by applying weights (or product) to the platform to cover 10 different weigh points. Also complete a decreasing-load test.
4. Check for off-center loading (shift test) by placing a weight equal to 1/4 to 1/3 capacity in the center of each platform quadrant.
5. Check to make sure the platform is within tolerance error. This is set by the company or laboratory for non-legal-for-trade uses, or refer to Handbook 44 or other government regulations for guidelines.
6. Complete uncertainty of measurement calculation if required.

Important notes:

Weight tolerances (when used without correction) should not exceed 1/3 of the smallest tolerance applied.

Verify that all documentation uses the correct symbols for unit values. For example "kg" is written in lower case (not KG).

Calibrating with adjustment is different from checking or testing a scale. Use manufacturers' guidelines to calibrate and adjust a balance or scale.

For example:

1. Look at the scale and remove any debris that would interfere with the weighing process and clear the platform.
2. Exercise the platform.
3. Turn off auto-zero tracking.
4. Follow the calibration procedure of the device. The appropriate size and class of weight should be used for calibration. The calibration procedure will include zero check/adjustment and calibration with weights.
5. During calibration, weights should be applied to the center of the platform.

For calibrations completed in-house, a procedure should be written specifying the correct weights to be used in calibration.

Some customers require "as found" and "as left" values. For this calibration an additional step is needed to check the current weight value before calibration. ■

Reference
-Guidelines on the Calibration of Non-Automatic Weighing Instruments, EURAMET/cg-18-v.02
-NIST Handbook 44