

Understanding Weighing

A Grocer's Guide to Metrology



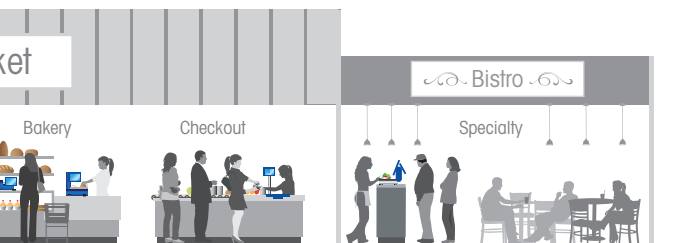
METTLER TOLEDO



Introduction

Metrology is a term you might not be familiar with, but it's something that impacts retail grocers all day long. Metrology is the science of measurement, and the scientific tool at the heart of every service counter transaction is the weighing scale. Without an efficient, easy-to-use, and above all accurate scale, profitability and customer satisfaction would be critically compromised. Dependable product measuring is essential to managing and tracking sales volume and to maintaining compliance with industry regulations.

As the world's leading manufacturer of weighing devices, METTLER TOLEDO produces scales that can measure to the nearest one-billionth of a gram, to scales that can measure several hundred metric tons. We specialize in producing high quality, cost effective measuring devices that meet or exceed the exacting specifications for manufacturing, measuring, safety and the environment.





















The purpose of this guide is to identify some of the terminology associated with retail weighing technology, and to explain the importance of each term as it applies to your day-to-day business. The terms covered in this guide include:

- Accuracy
- Accuracy Class
- Linearity
- Load Cell
- Corner Load
- Repeatability
- Temperature Stability
- Scale Intervals
- Dual Interval Scales
- Tare
- Verification
- Hysteresis
- Sensitivity
- Geolocation
- Precision vs. Accuracy
- Calibration

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Accuracy



Accuracy is the fundamental goal of every weighing instrument ever built. In fact, all of the other terms that we'll discuss in this guide are factors which contribute to the accuracy of a measuring device. But what actually is "accuracy" when used in regard to weighing? Quite simply, it's how closely the measured value on the scale display equates to the actual weight of the item being measured. If those two figures were exactly the same, that would be perfect accuracy. And while perfection is always the goal, infinite accuracy is something that is physically impossible to achieve.

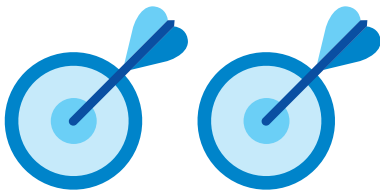
So when we talk about accuracy, we're really looking at the degree of accuracy, which is described as a percentage. Most often, the percentage used is not the amount of accuracy, but rather the amount of inaccuracy. So a scale with 0.001% accuracy is more accurate than one with 0.075% accuracy.

Because today's retail measuring instruments rely on complex internal mechanisms, it's important to calibrate the scale for accuracy at its ultimate location of use – rather than at its manufacturing facility. Factors such as transport, elevation, temperature and other geophysical and environmental variables can impact the device's extremely sensitive technology.

Did you know?

Most commercial scales in use today employ one of two technologies: strain gauge, or electromagnetic force compensation (MonoBloc). Generally speaking, scales using MonoBloc technology – which was introduced to the market by METTLER TOLEDO – are ten times more accurate than strain gauge scales.

Accuracy Class



In the course of your experience with scales, you may have come across certain designations stating whether a device was a Class I, Class II, Class III or even Class IIII scale. And you may have wondered what these designations mean. Simply put, a scale's class designation is another way of expressing its Accuracy Class – which lets you know what range of accuracy the device is designed to deliver (and also how many distinct divisions you can expect the device to display).

A Class I scale is the most sensitive and accurate type of scale. Primarily intended for laboratory use, it is used to weigh amounts greater than or equal to 1 milligram. A Class II scale is also likely to be used in a laboratory, or perhaps a jewelry store. One type of Class II scale is designed to weigh amounts ranging from 1 to 50 milligrams, while a second type is designed to weigh amounts greater than or equal to 100 milligrams. There are also two types of Class III scales – and these might be found in various retail settings, including the post office. The range of these scales is measured either in grams, pounds or ounces. The largest scales are referred to either as Class IIII or Class IIII scales – and these are used to weigh things like trucks, railroad cars and other very heavy objects.

Did you know?

The unit of measurement used in the world's most sensitive scales is something called a yoctogram (or one septillionth of a gram). Here is how one yoctogram would be written numerically – 0.000000000000000000000001 g. What kind of objects would be measured in yoctograms? Well, a single proton from an atom of the elemental gas xenon has been weighed at 1.7 yg.

Linearity



Linearity, as you will notice, comes from the word “line.” With regard to weighing technology, it means that a scale’s sensitivity will be the same across the entire spectrum of its weighing capacity. In other words, on a 1,000 gram-capacity scale, the reading for a 50 gram test weight will be 50 grams, the reading for a 500 gram test weight will be 500 grams, and the reading for a 1,000 gram weight will be 1,000 grams. When a scale is in perfect linearity, there is no noticeable deviation when weighing different amounts – so whether you’re weighing one slice of cheese or an entire block, you can be sure the reading is accurate.

All high-sensitivity scales are linearized by the manufacturer, but can gradually develop unacceptable deviations over time. You can perform a routine test for the linearity of your scale by using calibrated and verified test weights that, when all weighed together, register the same (or a little less than) the instrument’s maximum capacity. Start with a light weight, and note the readout’s accuracy. Do the same with increasingly heavy loads, each time checking for accuracy. Finally, do the same with all of the weights on the scale. In each case, the readings should be identical to the verified test weights. If you observe that there is a meaningful disparity (more than one division) at one or more points along the weighing range, the instrument may need to be adjusted. Contact your METTLER TOLEDO representative to have your measuring device evaluated by an authorized professional.

Did you know?

The presence of static electricity can impact the weighing performance of a measuring device. Minimizing the potential for static electricity in the weighing environment (e.g. rubber floor mats, adequate humidity) can help ensure more accurate readings.