

Best Practices in Counting

How to Achieve Accurate Counting Results

When counting thousands of parts every day, accuracy is key. Mistakes can be costly and translate in overfilling costs, unstable production processes, waste and a damaged reputation. Piece counting with scales is a simple and fast way to determine numbers of parts in receiving, warehousing, production or shipping. However, counting accurately requires a thorough counting solution.

This includes:

- An efficient counting process for your operators
- Adequate counting scales
- Operator training and
- A plan to maintain the operational reliability and accuracy of the scales.

What influences counting accuracy?

Parts counting can be influenced by a multitude of factors. However, among the main impacts are the:

- Parts weights and its deviation
- The accuracy of the counting scales (counting resolution)
- The environment

Let's take a closer look on each of those factors.



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1 Parts Weights and Deviation

Your counting system should be specified according to the critical parts you have to count. There are critical components to every counting process, which include counting parts that are very light and/or parts that have the greatest deviation in piece weight. Each part has a certain deviation that can be measured and calculated with the standard deviation. For high-precision parts, the standard deviation of the average piece weight (APW) is about 0.5%. That means that a part with APW of 1.5 grams has a deviation of 0.0225 grams. Practical experience shows that standard deviations vary from 0.5 – 1.5%. There also are parts with a higher standard deviation, such as some plastic-molded parts.

What is the impact of the average piece weight and its deviation on the counting accuracy? In summary, the higher the standard deviation, the higher the resulting counting error. In addition, the smaller the average piece weight, the higher the counting resolution of your reference or sample scale needs to be to achieve results in a defined accuracy range. Therefore, when specifying a new counting system, ask your supplier to take those two factors into account.

2 The Right Counting Scale System

To start counting with a scale, the average piece weight first needs to be determined. Industrial counting scales can store the average piece weight in its memory. To do this, first weigh ten sample parts and press the sample 10 (or reference 10) key. Now the scale will store the average piece weight to its internal memory, a crucial key to achieving accurate counting results. Making a mistake here translates to big errors throughout the counting process.

Here are some key considerations when determining average piece weight:

1. The sample parts you use need to be representative of the parts you want to count. For each new batch, a new average piece weight should be determined due to changes in raw materials or machine settings.

2. The number of sample pieces impacts the counting accuracy. If, for example, your parts have a high standard deviation, you can cut the counting error in half by increasing the number of sample parts from 10 to 30.

3. The counting scale used to determine the average piece weight needs to have the appropriate counting resolution to accurately measure the sample weight. This can imply that a two-scale counting system is needed with a high-resolution sample (reference) scale connected to the counting (bulk) scale where the actual counting takes place.

3 Counting Resolution vs. Internal Resolution

How accurate a scale can determine the sample weight is determined by its counting resolution. To achieve a high counting resolution the quality of the weighing electronic in terms of low noise, adequate integration and proper filtering is of major importance.

The counting resolution should not be mistaken with the so called "internal resolution" which has hardly any influence on the counting accuracy of a scale.

4 Benefits of Scale Calibration

Not only is it important to select the right equipment, but installing it correctly and getting operators trained is paramount to putting in place a maintenance and calibration plan. Even though industrial scales are designed to withstand harsh manufacturing environments, they must be periodically tested and maintained. Proper scale calibration is especially important

when operating a two-scale system. If the sample and counting scale are not periodically calibrated, chances are the counting results are wrong. Qualified calibration and maintenance makes sure your measuring device operates reliably and delivers accurate results throughout its lifetime.

5 The Environment

Ambient conditions also influence counting accuracy. To achieve an optimum result, the environment must be as free from vibrations as possible. For example, drafts caused by fans or air conditioning systems must be prevented, as should direct sunlight and fluctuations in temperature. The scale itself should be

aligned horizontally, especially high-resolution scales. In each case, correct installation, user training and the scales capability of filtering noise have a positive effect on the counting result.

6 What Does "Accuracy" Mean for You?

What are your process tolerances? This is an important question that needs to be answered during the evaluation of a counting solution. Accuracy is not the same for everyone. To select the right counting scale,

it's key to know if a deviation of +/-1% (e.g. +/- 1 parts of 100 parts) is acceptable or if it needs to be higher.

7 Good Weighing Practice™ for Counting

Based on the principles of the global Weighing Standard - Good Weighing Practice™ (GWP®) - METTLER TOLEDO helps customers to determine the right counting solution for any process requirement.

With GWP® Recommendation for Counting*, you can be sure that:

Evaluation

- Your counting process is evaluated by determining the average piece weights and deviations of the critical parts and your process tolerances



Selection

- The right scales and balances are selected based on your requirements and the optimal size of sample (reference) pieces is specified



Installation

- Successful installation and user training is performed



Calibration

- Scales and balances are maintained and calibrated regularly to preserve accuracy and to generate the necessary documents for audits



Routine Operation

- Training has been conducted ensuring good operation



Get more information on GWP® Recommendation for Counting*
 ► www.mt.com/gwp-rec-counting

* available in selected countries

www.mt.com/GWP

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GWP® is the only science-based global standard for efficient lifecycle management of weighing systems, applicable to all kinds of weighing systems of any manufacturer. It helps you to

- choose the right balance or scale
- calibrate and operate your weighing equipment with security
- comply with current quality, compliance, laboratory and manufacturing standards