Counting

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 result in overfilling expenses, unstable production processes, waste, and a damaged reputation. Piece counting with scales is a simple and fast way to determine the number of parts in receiving, warehousing, production, or shipping processes. However, counting accurately requires a thorough counting solution.

This includes:
- An efficient process
- Adequate scales
- Operator training
- A plan to maintain operational reliability and accuracy

What influences counting accuracy?
Counting parts can be influenced by numerous factors, including:
- Part's weight and deviations
- Accuracy of the scales (counting resolution)
- Environmental factors

Let's take a closer look at each of these.



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1 Part's Weight and Deviations

When selecting a counting system, it's important to consider the characteristics of the parts. Counting very light parts and parts with significant variations in piece weight requires a special approach. Each part has a measurable variation, expressed as the standard deviation of its average piece weight (APW). For high-precision parts, the standard deviation is typically around 0.5%. This means that a part with an APW of 1.5 grams may vary by approximately 0.0075 grams. In practice, standard deviations range between 0.5% and 1.5%. However, some parts, like certain plastic-molded components, can have even higher deviations.

How do the average piece weight and its deviation affect counting accuracy? Higher standard deviation leads to greater counting errors. Additionally, the smaller the average piece weight, the higher the counting resolution needed to maintain accuracy within a desired range.
When selecting a new counting system, ensure your supplier takes both the average piece weight and its variation into account to achieve reliable and precise results.

2 The Right Counting Solution

To start counting with a scale, you first need to determine the APW. Industrial counting scales allow you to store this APW in their memory. To do so, weigh ten sample parts and press the 'sample 10' (or 'reference 10') button. The scale will save the total weight divided by ten as the APW. Getting the initial sample count correct is crucial for accurate counting. Any mistake made at this stage can cause significant errors throughout the counting process.

Consider the following points when determining APW:

1. Use sample parts that truly represent the batch you want to count. Since raw materials or machine settings may change, a new APW should be determined for each batch. Advanced scales may feature APW optimization, allowing for storing the weights in a database to improve accuracy over time.

2. The number of sample parts affects counting accuracy. For parts with high weight variation, increasing the sample size from 10 to 30 can reduce counting error by half. Features like reference count optimization can help to enhance APW accuracy by recalculating it as more pieces are added, especially when adding smaller quantities than the original sample.

3. The scale used to determine APW must have a resolution sufficient to measure sample weights accurately. Often, a two-scale system is used where a high-resolution sample scale determines APW, and a bulk weighing scale is used for the actual counting. Alternatively, a dedicated sample station can be set up to perform all reference counts. The collected measurement data is then stored in a database used by a bulk counting scale.

3 Counting Resolution vs. Maximum Resolution

The scale's accuracy in sample weight determination is primarily defined by its counting resolution. Achieving a high counting resolution requires high-quality weighing electronics that minimize noise, ensure adequate signal integration, and apply proper filtering techniques. Sampling rate and advanced signal processing methods are crucial for distinguishing small weight differences by effectively filtering noise and achieving measurement stability.
It is important not to confuse counting resolution with the maximum process resolution, as the latter has little impact on the scale's counting accuracy. Counting resolution refers to the smallest weight increment a scale can reliably detect and display, which directly influences measurement accuracy. For instance, a scale with a maximum process resolution of 600,000d may reach a counting resolution over 1,000,000d thanks to superior electronics and signal processing. This demonstrates how counting resolution can exceed internal resolution for precise measurements.

4 Benefits of Scale Calibration and Routine Testing

Selecting the right equipment is crucial. What's equally important is proper installation, operator training, and a maintenance and calibration plan to ensure optimal scale performance. Industrial scales are designed to withstand tough manufacturing environments. Regular testing and servicing help keep them in peak condition. Calibration is particularly critical when using a two-scale system, as counting errors will occur if either scale is inaccurate. Professional calibration and maintenance ensure that your measuring devices operate reliably and provide accurate results throughout their lifespan.

5 The Environment

Operating conditions significantly impact counting accuracy. To achieve an optimal weighing environment, remove:

- Vibrations caused by other instruments or operators
- Drafts from fans, air conditioning, or other ventilation systems
- Direct sunlight
- Temperature fluctuations

Scales should be placed on a stable, level surface and aligned horizontally, especially the high-resolution models. Utilizing the scale's noise-filtering features can help safeguard consistent and accurate weighing results for all your counting applications.

6 What Does "Accuracy" Mean for You?

When discussing accuracy, it's important to frame it in terms of your specific process requirements. As the demands may vary depending on the application, understanding the acceptable deviation is critical.
For example, is a deviation of ±1% acceptable, or do you need tighter control? Defining these limits can help you select the right counting scale that meets your operational needs and delivers reliable, precise results tailored to your process.

7 Good Weighing Practice for Counting

METTLER TOLEDO helps customers determine the right counting solution to meet any process requirements based on the principles of the global weighing standard, Good Weighing Practice (GWP®).

GWP Recommendation includes:



Evaluation
Your counting process is evaluated by determining the average piece weights and deviations of the critical parts, as well as your process tolerances.



Selection
The right scales and balances are selected based on your requirements, and the optimal number of sample (reference) pieces is specified.



Installation
Professional installation and user training are performed.



Calibration
Scales and balances are regularly calibrated to preserve accuracy and provide you with the necessary audit documentation.



Routine Operation
Training is conducted to ensure smooth operation and regular maintenance.



Get more information on GWP Recommendation
www.mt.com/gwp-rec-counting

www.mt.com/GWP

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

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