

It's what's inside that counts



Understanding internal resolution in counting scales

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COUNTING SCALES ARE VERY SIMILAR TO OTHER SCALES IN TERMS OF WEIGHING, but the counting scale does two additional functions, by performing operations in division and multiplication based on the internal resolution.

1. What is internal resolution?

The internal resolution of a counting scale is the number of divisions into which it divides the total capacity of the scale.

Example: A 50lb counting scale with 1 million count resolution divides up the 50lb into 1,000,000 parts. This means each internal resolution is translated to 50/1,000,000 or 0.00005lb.

All of the weights are calculated on this basis. For example, if some parts were placed on the counting scale, and the internal calculation was 210 internal counts, the weight to be displayed would be 210 times 0.00005lb = 0.01050lb. Since the weight display might only be five digits, then the weight display would be 0.01 lb. This is the external resolution. (rounded off).

The operator can key in the sample quantity—for example, ten pieces. The scale still “knows” how many internal counts are being used (210) and now divides that

number by 10 to get the number of internal counts per piece ($210/10 = 21$).

Next the scale needs to convert the piece weight into pounds, by simply multiplying the weight per count times the number of counts (0.00005 times 21) = 0.00105. This is displayed in the Unit or Piece Weight window.

At this point the scale need only watch for a change in the weight and redo the calculation in reverse, using the number of internal resolutions per piece as the divisor. For example, more pieces are placed on the scale and the number of internal resolutions is now 187091. So $187091 / 21 = 8909.09$ which is rounded to 8909 pieces.

2. What is external resolution?

This is what is displayed in the weight window of a scale. It is also called display resolution and is calculated by taking the capacity of the scale and dividing by the resolution. In most load cell based counting scales, the external resolution will be one part in 10,000 also expressed as 1/10,000.

The displayed resolution is not as important in a counting scale since the calculations are all made using internal resolution. The only time the external resolution

comes into play is when a tare weight is being manually or digitally introduced. If the value of the tare container is rounded, this can result in a less accurate count.

3. How do you size a counting scale?

The internal resolution of the scale must be, at minimum, less than or equal to the weight of one part. Best practices would require that the weight of 10 parts be equal to 0.1 percent of total capacity.

The capacity of the scale should handle the largest container of the heaviest parts. Use two or three platforms to get this range if needed.

For fast and easy sampling, the sample scale capacity should be no larger than 10,000 times the piece weight. This will allow the sample size to be at least .1 percent of the capacity of the sample scale.

4. What is the accuracy of the remote scale?

The unit weight determined on the counting scale is used to determine the count on the larger scale.

Example: A 5000lb counting scale with 1 million count resolution divides up the 5000lb into 1,000,000 parts. This means

50lb capacity counting scale
1,000,000 count internal resolution

No Pieces



0.00 lb

0

0000000

(by 0.00005 lb)
Internal Weight

0.00000 lb

10 Pieces



0.01 lb

10
Hand Counted
Sample

?

0.01050 lb

10 Pieces



0.01 lb

10
Hand Counted
Sample

210
Each piece
= 21 counts

0.01050 lb

Many Pieces



9.35 lb

?

?

9.35455 lb

Many Pieces



9.35 lb

?

187091

9.35455 lb

Many Pieces



9.35 lb

$187091 \div 21$
= 8909.09
or 8909
Pieces

187091

9.35455 lb

each internal resolution is translated to 5000/1,000,000 or 0.005 lb. However, if you are weighing a large container of light parts, an error is introduced in a larger floor scale by internal count reading by 0.005 and displayed resolution by 1 lb or .5 lb. If the parts weigh less than 0.005 each, an error will be introduced. If a large number of light parts need to be counted, they can be broken down into 100 or 1000 piece lots. Each lot will have a suitable unit weight to be counted on a larger capacity scale.

5. How many platforms do you need?

The number of platforms needed for a counting system is determined by the product being weighed and the accuracy desired. When discussing the accuracy of the remote scale, the weight of the parts to be weighed on extra platforms is an important consideration. To obtain the best accuracy, follow the steps for sizing your counting scale making sure that the sample scales are not larger than 10,000 times the piece weight. Also remember that the second scale can be used for sampling in

The penny pincher



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a three platform system. With three platforms, you effectively have two platform systems allowing you to sample and count smaller parts on the first and second platform respectively; next sample and count larger pieces using the second platform as the sample and the third as the bulk.

6. What is the difference between average piece weight and unit weight per thousand?

Let's look at a penny. A penny weighs 0.005 lb, which would be the average piece weight. If we were to display this as unit weight/1000 we would discover the penny actually weighed 5.94 uw/1000 (or 0.00594 if displayed as an average piece weight). If the average piece weight window is limited to five digits, the unit weight per 1000 allows the significant digits to be entered without being "crowded out" with the leading zeros. The lighter the part, the more it affects the accuracy.

What does this mean to you? Compare the math.

5.10 lb of pennies on the scale
 $5.10/0.005 = 1020$ pennies

5.10 lb of pennies on the scale
 $5.10/0.00594 = 858$ pennies

See the difference in count? Unit weight per thousand allows a more accurate count.

7. What size sample should be used?

The minimum sample recommended is 10 pieces. However, here are some considerations:

Is a 10 piece sample sufficient weight on the platform? The sample should be at minimum 0.1 percent of the total capacity.

How uniform are the parts being weighed? A larger sample size provides sufficient data to determine the most accurate unit weight. The pieceweight enhancement feature of the DIGI scales assist in sampling larger sizes accurately.

Sampling 100 pieces is recommended to achieve the best accuracy. A larger sample quantity introduces the human element

of error, so 10 groups of 10 can be counted out by hand, and placed on the scale as a 100 piece sample.

8. How can counting scale accessories save time?

Using a scanner and printer along with a counting scale pay for themselves quickly by eliminating the need for repetitive sampling and handwritten information. Scanning in a unit weight, or tare weight, eliminates the possibility of the operator entering wrong information. Plus, it is faster than keying in numbers.

An external software program that interfaces with the scales allows the operator to scan the part number and begin counting immediately. All other information can be uploaded and downloaded to the software. Multiple scales can be used without introducing different information in different places, and all of the counting activity for one part number can be recorded in one place.

A label with the count eliminates the possibility of transposed numbers or illegible handwriting. ■

Cash in your chips

Be sure your parts inventory is accurately accounted for with the DIGI® DC-782 Portable Counting Scale. With an internal counting resolution of 1/500,000 even the smallest part is counted. The economical DC-782 Series is built to be moved to nearly any environment in your plant or on your route. The large platter size has plenty of room for large bins or parts. Optional rechargeable battery provides 300 hours of continuous use in mobile stations, outdoor applications and rental fleets.

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