

## Measurement Method

$\Delta = 2t + \frac{\lambda}{2}$  (must equal a whole number of  $\lambda$  for a bright fringe or

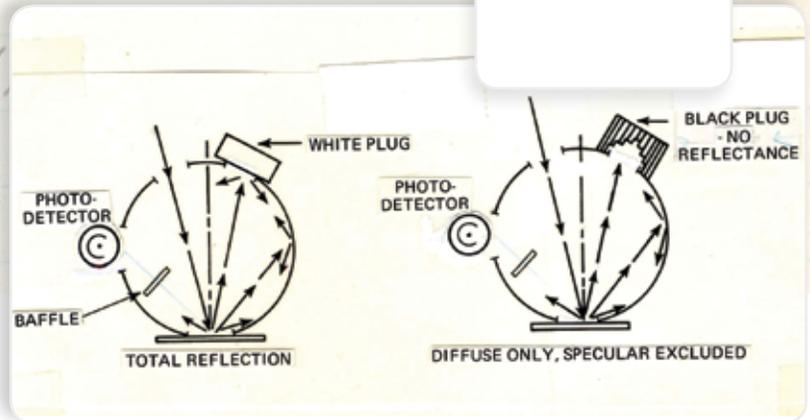
$$n\lambda = 2t + \frac{\lambda}{2}$$

$$t = \frac{n\lambda - \frac{\lambda}{2}}{2} = \frac{\lambda}{2} \left( n - \frac{1}{2} \right)$$

substituting

$$D^2 = 2\rho \left[ \frac{\lambda}{2} \left( n - \frac{1}{2} \right) \right]$$

MM 5127.00



## Measuring Large Granular Food

with D25<sup>®</sup> NC

The color of large, granular food pieces, such as snack food, beans, pasta, cereal, and dried fruit, must be assessed both to ensure lot-to-lot consistency and, in some cases, as an indicator of completeness of baking or frying. These types of samples are typically non-uniform in size and shape. Therefore, special accessories and presentation techniques are required to provide repeatable results. Generally, a sampling of a number of chips or cereal pieces should be measured together in order to obtain an overall average of the color of the batch. The D25 NC averages 5 measurements per second, 25 measurements per each rotational cycle of the turntable.

A HunterLab D25<sup>®</sup> NC spectrophotometer can be used to measure the reflectance of batches of samples with the instrument in the port-up orientation and the samples in a glass or plastic sample cup or dish. This is the most common method advocated by HunterLab for the measurement of chips and cereal. This method also applies to other large, granular pieces, such as pet food, nuts, beans, dried fruit, pasta, gumballs, and candy.

### THE APPLICATION

Chips and cereal have several non-uniform characteristics that require compensating preparation and presentation techniques in order to ensure a repeatable sample measurement.

The available measurement area of individual pieces may be very small and/or curved. The surface of samples can be measured through the use of large sample dishes.

These pieces are irregular in size and shape, and may require 2-3 turntable cycles of turntable rotation.

Recommended Color Scale

**CIE L\*a\*b\* as a full color descriptor**

Recommended Illuminant/Observer

**C/2° D65/10°.**



**D25<sup>®</sup> NC**



## MEASUREMENT METHOD

1. Configure your software to read using the desired color scale, illuminant, and observer.
2. Standardize the instrument using the black and calibrated white standards that come with the instrument. Confirm that the instrument is working properly by using the green check tile at the end of the standardization procedure.
3. Scoop up or pour pieces from the sample batch to fill dish. The selection of the dish size depends on the amount of sample that is available for the measurement, and the color uniformity of the sample. The larger the color variance in the sample, the larger the dish (more sampling area). To reduce the amount of sample needed, the smaller 6 inch dish can be nested inside a larger 12 inch dish and the sample placed between the two.
4. Place the sample on the sensor turntable.
5. Ensure that the sensor is correctly positioned over the sample using the horizontal adjustment arm. Use the vertical adjustment arm to position the sensor 85-95 mm above the sample surface. The built-in Height Sensor is located in the Diagnostic menu.
6. Press the "Measure" button on the sensor to start the rotation of the turntable and sensor measurement cycle. For samples with a large shape or color variation, it may be necessary to dump, refill, and read the pieces at least three times from the same batch. Average the three color readings for a single color measurement representing the color of the batch. Averaging multiple readings minimizes measurement variation associated with non-uniform samples.
6. Record the average color values.



1.



2.



3.



4.



5.

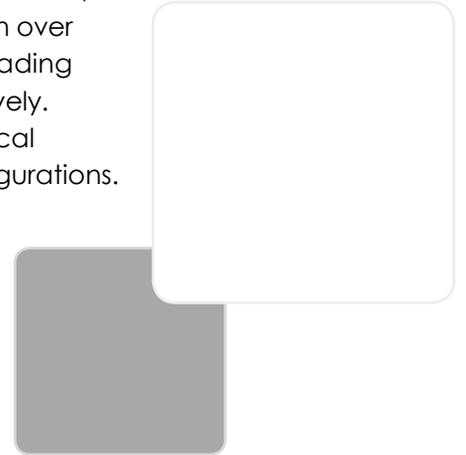


6.

## ABOUT HUNTERLAB

HunterLab, the first name in color measurement, provides ruggedly dependable, consistently accurate, and cost effective color measurement solutions. With over 6 decades of experience in more than 65 countries, HunterLab applies leading edge technology to measure and communicate color simply and effectively. The company offers both diffuse/8° and a complete line of true 45°/0° optical geometry instruments in portable, bench-top and production in-line configurations. HunterLab, the world's true measure of color.

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**More Information about  
Measurement Methods at**

*[hunterlab.com](http://hunterlab.com)*

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