

## Measurement Method

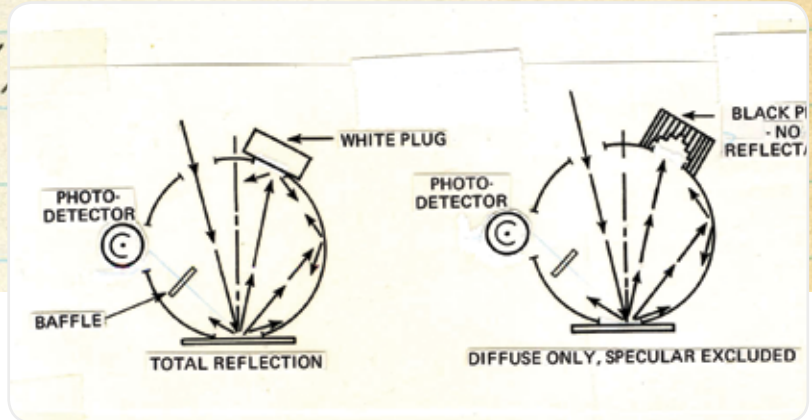
Change of phase of  
 $\Delta = 2t + \frac{\lambda}{2}$  (must equal a whole number of wave length  
for a bright fringe or  $n\lambda$ )

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

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

substituting

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



## Measuring Powder in Very Small Quantities

with UltraScan® PRO

Batch-to-batch color consistency (whiteness, for some)

is an important indicator of quality for many powders.

In the pharmaceutical industry, for instance, the whiteness

of powder may be an indication of its freshness or purity.

Frequently only a small amount of powder may be available

for measurement.

By convention, the instrument geometry most commonly used to measure the color of powder is a directional ( $45^\circ/0^\circ$  or  $0^\circ/45^\circ$ ) geometry instrument such as the LabScan® XE. However, it is also possible to measure powder color using a diffuse geometry instrument such as the HunterLab UltraScan® PRO spectrophotometer with appropriate sample devices.

### THE APPLICATION

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

Powders come in the form of fine particulates—not a solid sample—and must be measured through a clear glass window in order to be effectively made into a solid.

Powders exhibit light trapping between the particles and will be sensitive to ambient light and to small differences in the optical configuration of the instrument. Using a sufficient sample thickness will minimize these effects.

Powders may be slightly fluorescent, which means that they will be sensitive to the UV content of the light source. If fluorescence is an issue, use of the UV control option is recommended.

Powders in the pharmaceutical industry have the additional characteristic of being very expensive, and so normal powder sampling techniques are not economically suitable. Sampling techniques that use a very small sample size (approximately 0.4 cc) are more cost-effective in this situation.

**Note:** If inter-instrument agreement is a concern when measuring powders, all the instruments used for those measurements **MUST** be the same model to minimize measurement differences.

Recommended Color Scale

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

Recommended Single-Number Index

**YI D1925 (2/C), YI E313, WI E313 for indication of yellowness and/or whiteness, Y Brightness**

Recommended Illuminant/Observer

**D65/10°. C/2° may also be used.**



UltraScan® PRO



**MEASUREMENT METHOD**

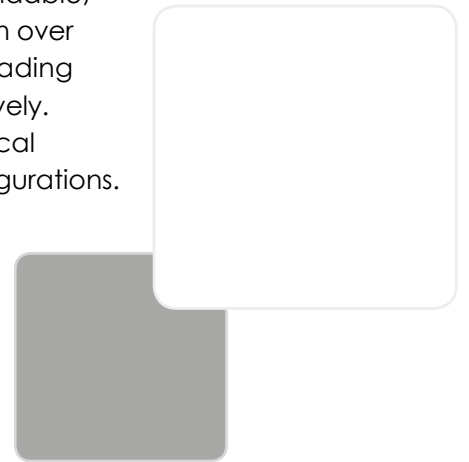
1. Configure your software to read using the desired color scale, illuminant, observer and averaging.
2. Install the special SAV port plate (HunterLab Part Number A02-1011-145) that comes with the semi-micro powder sample accessory (HunterLab Part Number D02-1012-931.) Standardize the instrument in a reflectance mode with the 0.390 inch (9.906 mm) area view.
3. Replace the standardization port plate with the modified port plate.
4. Place the powder to be measured into the powder holder
5. Pack the powder down using the plunger. Do not overtighten the powder holder. The powder should be at least 1/2-cm deep in the holder.
6. Place the powder holder into the port plate.
7. Take a single color reading of the powder. Dump, refill, and read the powder 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.
8. Record the average color values for the sample batch.



## 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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