

## Measurement Method

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

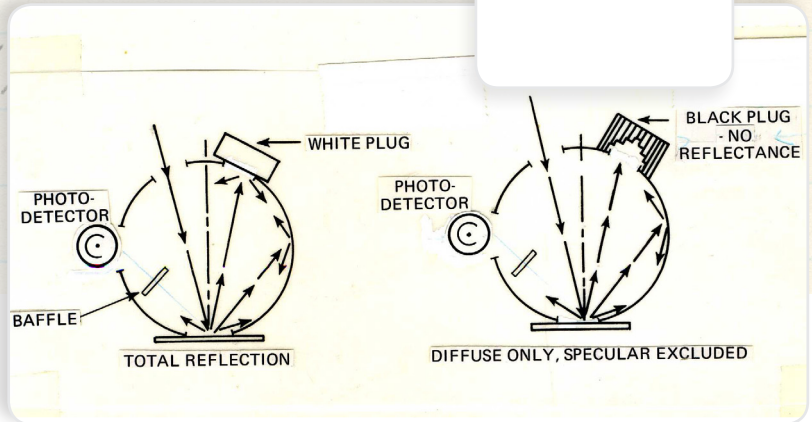
$$n\lambda = 2t + \frac{\lambda}{2}$$

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

substituting

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

MM 5013.00



## Measuring Plastic Pellets

with ColorQuest® XE

In the plastics industry, the color of plastic pellets is often measured before the pellets are extruded, or molded, into a final product. Plastic pellets are typically translucent and non-uniform in size. Therefore, special accessories and presentation techniques are required to provide repeatable results. In general, a sampling of a number of plastic pellets should be measured together in order to obtain an overall average of the color for the batch. Several readings of the group should be averaged for the final result, preferably with replacement of the sample between measurements.

By convention, the instrument geometry most commonly used to measure the color of plastic pellets is a directional ( $45^{\circ}/0^{\circ}$  or  $0^{\circ}/45^{\circ}$ ) geometry instrument such as the LabScan<sup>®</sup> XE (preferred) or ColorFlex<sup>®</sup> 45/0. However, it is also possible to measure pellet color using a diffuse geometry instrument such as the HunterLab ColorQuest<sup>®</sup> XE, UltraScan<sup>®</sup> PRO, or UltraScan<sup>®</sup> VIS spectrophotometer with appropriate sample devices.

### THE APPLICATION

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

They come on the form of pellets, granules, or chips — not a solid sample — and must be measured through the clear window of a glass cell in order to be effectively made into a solid.

Pellets are irregular in size and shape, requiring the averaging of several readings with replacement.

Pellets are translucent — not opaque — and will be sensitive to ambient light and to small differences in the optical configuration of the instrument. Using a sufficient sample thickness (50 mm recommended) and an opaque cover will minimize these effects.

Pellets 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.

*Note: If inter-instrument agreement is a concern when measuring translucent pellets, 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

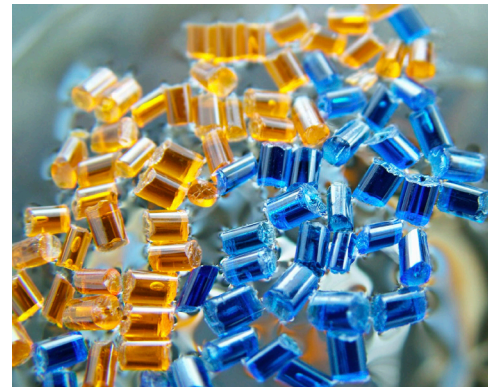
**YI E313 for indication of yellowness**

Recommended Illuminant/Observer

**D65/10°. C/2° may also be used.**

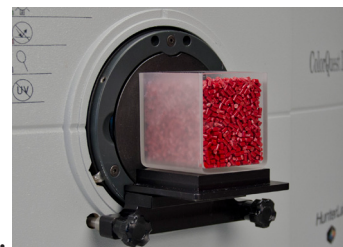
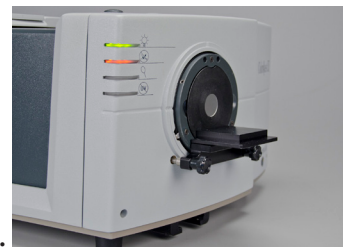


ColorQuest<sup>®</sup> XE



## MEASUREMENT METHOD

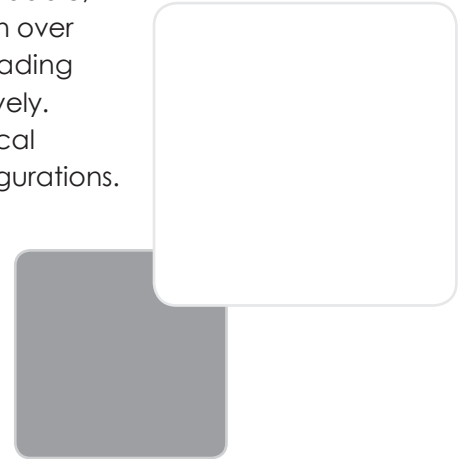
1. Configure your software to read using the desired color scale, illuminant, and observer.
2. Standardize the instrument for RSIN and the large area of view, first using the light trap...
3. ...then the white standard file that came with the instrument.
4. Lower or remove the sample clamp. Install the shelf of the reflectance sample shelf with light cover (HunterLab Part Number B02-1005-172) at the reflectance port.
5. Scoop up pellets from the sample batch and fill the 50-mm glass cell (HunterLab Part Number 13-8573-20) to the top. The 2-inch (50-mm) sample thickness makes the translucent, irregular pellets effectively opaque for reflectance measurement.
6. Place the filled cell flush against the reflectance port so that the pellets will be read through the clear glass window of the cell.
7. Cover the sample cell with the opaque cover. The cover minimizes the possibility of ambient light reaching the detector through the pellet sample when the measurement is taken.
8. Take a single color reading of the pellets. Dump, refill, and read the pellets at least five times from the same batch. Average the five color readings for a single color measurement representing the color of the batch. Averaging multiple readings minimizes measurement variation associated with non-uniform samples.
9. 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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