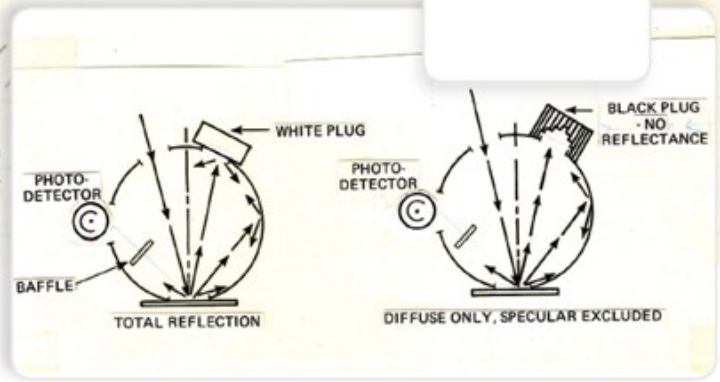
Applications Note

AN 1097



Inter-Instrument Agreement

The best inter-instrument agreement in terms of absolute color values will always be found using the same model of instrument from the same manufacturer.

Abstract

Customers often ask HunterLab Applications Specialists how they can make readings of their samples taken with several different HunterLab instruments—often at different locations—correlate more closely. They would love to wave a magic wand and bring the instruments into perfect alignment, but unfortunately inter-instrument agreement is actually quite a complex topic. The answer to the question is that they need to standardize how those measurements are made on all instruments at all sites.

The world's true measure of color
HunterLab

There are six parameters that affect the color values obtained from an instrument. They are:

- The **color scale** being reported
- The CIE **illuminant** being used to calculate the color values
- The CIE standard **observer** being used to calculate the color values
- The **instrument type, geometry, and standardization mode**
- The method of **preparing** the samples
- The method of **presenting** the samples to the instrument.

When any one or more of these parameters is changed, the resulting color values also change. Said another way, if two different sites or users vary any of these parameters, the color values cannot be expected to agree. **The best inter-instrument agreement in terms of absolute color values will always be found using the same model of instrument from the same manufacturer with all of the six parameters matching at all sites.**

As an example, consider a company with a ColorFlex EZ 45/0 at one plant and an Agera at another plant. Each plant is reading powder samples and comparing the color values to an absolute color specification. The table below shows each of the six parameters for the two plants.

Plant	A	B
1. Color Scale	CIE L*a*b*	CIE L*a*b*
2. Illuminant	D65	D65
3. Observer	10°	10°
4. Instrument Configuration	ColorFlex EZ, circumferential 45°/0°, xenon flash lamp, reflectance	Agera, 0°/45° circumferential, LED, reflectance
5. Sample Preparation	Dry sample for 8 hours and grind to fine powder with no lumps	Dry sample for 8 hours and grind to fine powder with no lumps
6. Sample Presentation	Scoop into glass sample cup and read once through glass bottom of cup.	Press into a smooth plaque and measure once at open sample port with port down.

Once these parameters are standardized as much as possible, the next step is to establish how different the readings are at the two plants. A single standard tile could be sent around as a round robin and read on both instruments. However, it would be better if a stable powder sample could be used. Compare the readings. If the difference you are seeing between sites is not acceptable, you have two options for reconciling the problem:

Read a physical product standard on each instrument and establish a new tolerance specification based on differences from that product standard. Instruments of the same geometry should agree on difference values from a physical standard, even if they don't agree exactly on absolute color values.

Establish a separate absolute color specification for each instrument/site by reading acceptable, borderline, and out-of-spec samples of your product (as established visually) on each instrument.

If you absolutely must see measurements in absolute values and must use the same specification at all sites, you can use the hitching feature available on all HunterLab systems *as a last resort* after aligning all of the six parameters as closely as possible. Note that hitching is not recommended for instruments with different geometries.

About HunterLab

HunterLab is the technology leader in color measurement solutions, providing instruments, software, knowledge and service to a wide variety of industries.
With over 5 decades of experience in more than 65 countries, HunterLab applies our leading edge technology to your products helping you measure and communicate color simply and effectively.

 11/2023

The world's true measure of color
HunterLab