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# WS-1 Reflectance Standard

## Operating Instructions

The WS-1 Diffuse Reflectance Standard is for use in performing diffuse reflectance measurements, especially color analysis. The WS-1 is available in the following four models:



### WS1 Diffuse Reflectance Standard

Made of PTFE, a diffuse white plastic that provides a Lambertian reference surface for reflectance experiments. The WS-1 comes in an anodized aluminum housing, and is hydrophobic, chemically inert and very stable, even in deep-ultraviolet applications. It is >98% reflective from 250-1500 nm and >95% reflective from 250-2200 nm.

The reflective area of the WS-1 has a 32 mm OD. The diffusing material is encased in a small receptacle with screw-on top. The material is almost uniformly reflective (>95%) by wavelength across the entire range of 250-2000 nm.



### WS-1-SL White Reflectance Standard

The WS-1-SL is a diffuse reflectance standard from Labsphere and is made from their patented diffuse reflectance material, Spectralon. Spectralon is hydrophobic and is thermally stable to 350 °C. The durable material provides highly accurate, reproducible data. Unlike all the other PTFE-based standards on this page, the WS-1-SL often can be smoothed, flattened and cleaned if nicked or soiled.



### WS-1-SS White Standard with Stainless Steel Housing

The WS-1-SS comes in a stainless steel housing and has the same properties as the WS-1. In addition, the surface of the WS-1-SS is slightly recessed to allow the RPH-1 Reflection Probe Holder to sit on the standard without coming in direct contact with the standard's surface.



### WS-3-GEM White Standard

Conceived for use in colorimetric applications involving diamonds and other gems, the WS-3-GEM White Reference Tile consists of a diffuse PTFE-based material, shaped to form a holder within its stainless steel receptacle. Because of its concave shape, the WS-3-GEM becomes an integrating sphere when illuminated.

The WS-3-GEM has >98% reflectivity from 400-1500 nm and >95% reflectivity from 250-2000 nm. Like the WS-1, the WS-3-GEM's reflectance material is hydrophobic, chemically inert and very stable, even in deep-UV applications.

## Operation

Reflection is the return of radiation by a surface, without change in wavelength. Reflection is expressed as a percentage relative to the reflection from a standard substance, such as the WS-1 white reference material. The WS-1 is mostly used in a setup with a reflection probe and reflection probe holder for diffuse reflection measurements.

### Operating Using OOIBase32 Software

#### ► Procedure



1. Make sure you are in Scope mode, by either clicking the Scope Mode icon on the toolbar, or selecting **View | Scope Mode**. Take a reference spectrum by first making sure nothing is blocking the light path going to your reference. Place the reflection probe over the reflection standard. Keep the reflection probe at an angle between 0 and 45°.
2. Click the **Store Reference** spectrum icon on the toolbar or select **Spectrum | Store Reference** from the menu bar to store the reference. This command merely stores a reference spectrum in memory. You must select **File | Save | Reference** from the menu bar to permanently save the spectrum to disk.
3. Block the light path to the spectrometer. Then, take a dark spectrum by clicking the **Store Dark Spectrum** icon on the toolbar or by selecting **Spectrum | Store Dark** from the menu bar. This command merely stores a dark spectrum in memory. You must select **File | Save | Dark** from the menu to permanently save the spectrum to disk.

You must take a dark spectrum before measuring transmission.

4. Put the sample in place and ensure that the light path is clear. Then, take a reflection measurement by clicking on the **Transmission Mode** icon on the toolbar or selecting **Spectrum | Transmission Mode** from the menu bar (since the mathematical calculations used to calculate transmission and reflection are identical). To save the spectrum to disk, click the **Save** icon on the toolbar or select **File | Save | Processed** from the menu bar.

### Operating Using SpectraSuite Software

#### ► Procedure

1. Place SpectraSuite in Scope mode by clicking the Scope () icon in the Experiment mode toolbar or selecting **Processing | Processing Mode | Scope** from the menu.
2. Ensure that the entire signal is on scale. The intensity of the reference signal's peak differs depending on the device being used. If necessary, adjust the integration time until the intensity is appropriate for your device. Ensure that the entire signal is on scale.
3. Select **File | New | Reflection Measurement**. Use the Reflection Measurement wizard to take a reference spectrum (with the reference standard) and a dark spectrum. You must take a reference and a dark spectrum before measuring reflection.
4. Put the sample in place and ensure that the light path is clear. Then, take a reflection measurement.
5. If you received calibration file with your reference standard, click the Non-unity Correction icon () on the toolbar. The **Select Reference File** screen appears.
6. Browse to the location where you stored your reflectivity standard files. Then click the **Apply** button.

The reference information appears on the **Select Reference File** screen.

## Specifications

Specification	WS-1	WS-1-SL	WS-1-SS	WS-3-GEM
Housing dimensions	38 mm diameter			
Tile dimensions	32 mm OD, 10 mm thick			31 mm OD, 10 mm thick
Weight	30 g			70 g
Housing	Aluminum	Delrin holder, protective cover	Stainless steel	Stainless steel
Reflectivity	>98% (250- 1500 nm) >95% (250- 2200 nm)	99% (400- 1500 nm) >96% (250- 2000 nm)	>98% (250-1500 nm) >95% (250-2200 nm)	
Spectral range	250-2000 nm	250-2500 nm	250-2000 nm	250-2000 nm

