Customize a System to Fit Your Applications

Models U-4100 and UH4150 allow custom configurations to meet a variety of measuring needs by combining accessories appropriate to the objectives of the application. Models U-4100 and UH4150 offer highly-accurate testing, which make them the most appropriate tool for a variety of fields, including optical materials and components, semiconductors, new material development, and biotechnology.

Collimated light beam enabling more accurate measurements

Large sample compartment allows using a wide variety of accessories

Detectors (integrating spheres) can be selected according to measurement needs

View of Sample Compartment of UH4150*

Dozens of accessories are available to meet the objectives of the measurement

Lineup of Accessories

Model UH4150 Spectrophotometer

Model U-4100 Spectrophotometer

* Image above does not represent actual beams.
Detector Selection Guide

A variety of integrating sphere detectors are offered for Model UH4150, allowing the selection of a detector suitable for the measurement. Below is information on how to select an appropriate integrating sphere.

1. Direct Light Detection and Integrating Sphere Detection

Direct light detection is suitable for absorbance measurement of liquid samples and for transmittance measurement of non-diffusive flat plates. However, for long rod-shaped samples, lenses, and diffusive samples, the shape of transmitted light beam is affected by refraction and scattering. If the size of the light beam for sample measurement is different from that for baseline measurement, accurate results cannot be obtained due to the effect of locality of the detector. In such cases, the effect of locality of the detector can be removed by allowing the incident light to undergo diffuse reflection in the interior of the integrating sphere, and then by guiding it to the detector.

2. Coating Materials for Integrating Spheres

For general integrating spheres, barium sulfate (BaSO₄) is used as the internal coating material, and aluminum oxide (Al₂O₃) is used for the standard reflection plates. Spectralon® is a fluoropolymer that has the highest diffuse reflectance of any known material over the ultraviolet, visible, and near-infrared regions of the spectrum, as illustrated in the figure in which Spectralon® is compared with BaSO₄. Because of low loss in light intensity, Spectralon®-coated integrating spheres allow higher sensitivity measurements.

<table>
<thead>
<tr>
<th>Material</th>
<th>Wavelength Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mm Standard Integrating Sphere</td>
<td>BaSO₄</td>
</tr>
<tr>
<td>60 mm High-sensitivity Integrating Sphere</td>
<td>Spectralon®</td>
</tr>
</tbody>
</table>
3. 60 mm and 150 mm Integrating Spheres

Hitachi spectrophotometer accessories include 60 mm integrating spheres (opening ratio: about 7.8%) and 150 mm integrating spheres (opening ratio: about 2%). Generally, 60 mm integrating spheres are used due to its versatility as well as its superior baseline flatness and noise level. However, for total or diffuse reflectance measurement of samples having high diffusivity, 150 mm integrating spheres, which have a smaller opening ratio, provide higher photometric accuracy. The reason is because the port fraction is smaller, reducing the probability of leakage of sample reflected light, through the port.

4. Number of Ports and Port inclination for 60 mm Integrating Sphere

An integrating sphere has light receiving ports. The number of ports and their angle of inclination are selected depending on the measurement objective. For usual transmittance measurement, almost any type of integrating sphere can be used. However, in the case of lenses and thick sample measurements, where the transmitted light diverges, if a four-port integrating sphere is used, incident light beam would overflow from the sub white plate; measurement errors might arise due to the difference in the reflectance characteristics between the inner surface material of integrating sphere and the material of the sub white plate. In the case of a two-port full integrating sphere, such measurement errors will not occur.

For a total reflectance measurement, the sample is placed behind the integrating sphere. By using the port inclination angle of 8° or 10° in the rear port, the integrating sphere measures total reflectance of the sample, including specular reflectance. On the other hand, for diffuse reflectance measurements, an inclination angle of 0° for the rear port is used. Then, the sample’s specular reflectance is emitted through the light incident port, and only the sample diffuse reflectance is measured by the integrating sphere.

5. Reflectance Measurements using a 150 mm Integrating Sphere (Total and Diffuse Reflectance)

The 150 mm Integrating Sphere Accessory allows both total and diffuse reflectance measurements. For total reflectance, a white plate is placed at the position opposite from the integrating sphere, where the sample’s specular light can be measured, to detect the sample’s total reflected light including both specular light and diffuse light. On the other hand, for diffuse reflectance measurement, an optical trap is placed at the position opposite from the integrating sphere, where sample specular light can be measured, allowing sample specular light to leave so that only sample diffuse light is measured. Since a 150 mm integrating sphere is larger than a 60 mm integrating sphere and allows for removing specular light using optical trap, the 150 mm integrating spheres allow highly accurate diffuse reflectance measurements.
Reflectance Measurement Guide

Optical characteristics measurement of solid samples includes reflectance measurement. An example of reflectance measurement is shown below.

1. Relative and Absolute Reflectance Measurements

There are two types of specular reflectance measurements: Relative and Absolute. In Relative Reflectance Measurements, a reflectance reference sample is placed in the light beam path for baseline correction. Then, the reflectance reference sample is replaced by the sample for measuring the sample reflectance. In this way, the sample’s reflectance relative to the reflectance of the reference sample, which is assumed 100%, is obtained. The relative reflectance measurement is useful for quality control against a reference sample.

The absolute specular reflectance measurement is performed by using the V-N method. For baseline correction, the light is guided through a V-shaped path consisting of mirrors M1, M2, and M3, to the detector. For the sample measurement, the light is guided through an N-shaped path consisting of M1, a sample, M2, and M3 (where the sample is placed between M1 and M2, the position of M2 is changed, and the angle of M3 is changed to keep the length of the light beam to the detector unchanged). The only difference between baseline measurement and sample measurement is that the sample’s reflective surface is included in the light beam path, but other reflective surfaces and the length of the light beam path are unchanged. In this method, the absolute reflectance measurement is accomplished by comparing the detector outputs between baseline measurement and sample measurement.

2. Dependence of Incident Angle and Reflectance on Polarization of Light

For incident angles larger than 12°, the difference in reflectance between S and P-polarization is considerable. Moreover, the light intensity of irradiation light of the spectrophotometer varies between S and P-polarization depending on the wavelength. Therefore, to obtain the absolute reflectance of a sample, a polarizer is used for measuring the reflectance of S and P-polarization, respectively, and the two values of reflectance are averaged.

Shown above is a 45° specular reflectance spectrum of S and P-polarization of a dielectric multilayer film. The reflectance spectrum profile is different for S and P-polarization. The reflectance of the sample is given as the average of values of reflectance of S and P-polarization.
Models UH4150 and U-4100, the experts in solid state spectrophotometry, allow configuring a system to meet a variety of measurement needs by combining accessories appropriate to the application objectives.

## Lineup of Detectors (Integrating Spheres)

### 60 mm Standard Integrating Sphere (for both total reflectance and diffuse reflectance)

**UH4150** : P/N 1J1-0120, **U-4100** : P/N 1J0-0216*

- **Internal coating material:** BaSO₄, Sub white plate: Al₂O₃, Number of ports : 4, Port inclination angle : Sample side; 8°, reference side; 0°
- **Specifications**
  - **Wavelength range:** 240 - 2,600 nm
  - **Baseline flatness:** ±0.002 Abs (240 - 2,200 nm) ±0.004 Abs (2,200 - 2,600 nm)

A standard integrating sphere of all-round type applicable to diverse measurement applications

### 60 mm Standard Integrating Sphere (for total reflectance)

**UH4150** : P/N 1J1-0121, **U-4100** : P/N 134-0218

- **Internal coating material:** BaSO₄, Sub white plate: Al₂O₃, Number of ports : 4, Port inclination angle : Sample side; 10°, reference side; 10°
- **Specifications**
  - **Wavelength range:** 240 - 2,600 nm
  - **Baseline flatness:** ±0.002 Abs (240 - 2,200 nm) ±0.004 Abs (2,200 - 2,600 nm)

An orthodox integrating sphere equipped standard on the model U-4100 (solid sample and large sample compartment types)

### 60 mm Standard Full Integrating Sphere

**UH4150** : P/N 1J1-0122, **U-4100** : P/N 134-0205

- **Internal coating material:** BaSO₄, Sub white plate: none, Number of ports : 2
- **Specifications**
  - **Wavelength range:** 240 - 2,600 nm
  - **Baseline flatness:** ±0.002 Abs (240 - 2,200 nm) ±0.004 Abs (2,200 - 2,600 nm)

A full-sphere integrating sphere applicable to lenses and samples having a high diffusivity

### 60 mm High-sensitivity Integrating Sphere (for reflectance measurement)

**UH4150** : P/N 1J1-0123, **U-4100** : P/N 1J0-0210

- **Internal coating material:** Spectralon®, Sub white plate : Spectralon®, Number of ports: 4, Port-inclination angle : Sample side; 8°, reference side; 0°
- **Specifications**
  - **Wavelength range:** 190 - 2,600 nm
  - **Baseline flatness:** ±0.5%/T (195 - 2,600 nm) ±2.0%/T (190 - 195 nm)

A low-noise integrating sphere applicable to diverse measurement applications including those in far UV region

### 60 mm High-sensitivity Full Integrating Sphere

**UH4150** : P/N 1J1-0124, **U-4100** : P/N 134-0206

- **Internal coating material:** Spectralon®, Sub white plate: none, Number of ports : 2
- **Specifications**
  - **Wavelength range:** 190 - 2,600 nm
  - **Baseline flatness:** ±0.5%/T (195 - 2,600 nm) ±2.0%/T (190 - 195 nm)

A low-noise integrating sphere applicable to lenses and samples having high diffusivity, including applications measurement in the far UV region
### 150 mm Standard Integrating Sphere with Optical Trap

**UH4150, U-4100 : P/N 1J0-0212**

Internal coating material : BaSO₄, Sub white plate : Al₂O₃, Number of ports : 5, Port-inclination angle : Sample side; 6°, reference side; 6°

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Wavelength Region</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmittance</td>
<td>Far UV</td>
<td>Wavelength range: 350 - 750 nm</td>
</tr>
<tr>
<td></td>
<td>Near UV</td>
<td>Baseline flatness: ±0.5% T</td>
</tr>
<tr>
<td></td>
<td>Visible</td>
<td></td>
</tr>
<tr>
<td>Scattered Light</td>
<td>Near Infrared</td>
<td></td>
</tr>
</tbody>
</table>

A large-size integrating sphere with a small opening ratio, suitable for accurate measurement of samples having high diffusivity.

### 150 mm High-sensitivity Integrating Sphere with Optical Trap

**UH4150 : P/N 1J1-0126※, U-4100 : P/N 1J0-0376※**

Internal coating material : Spectralon®, Sub white plate : Spectralon®, Number of ports : 5, Port-inclination angle : Sample side; 8°, reference side; 8°

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Wavelength Region</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmittance</td>
<td>Far UV</td>
<td>Wavelength range: 240 - 2,500 nm</td>
</tr>
<tr>
<td></td>
<td>Near IR</td>
<td>Baseline flatness: ±0.002 Abs (240 - 2,200 nm)</td>
</tr>
<tr>
<td></td>
<td>Visible</td>
<td>±0.004 Abs (2,200 - 2,500 nm)</td>
</tr>
<tr>
<td>Scattered Light</td>
<td>Near Infrared</td>
<td></td>
</tr>
</tbody>
</table>

A large-size integrating sphere with a small opening ratio, suitable for accurate measurement of samples having high diffusivity, including measurement applications in near infrared region.

### Continuously Variable Angle Absolute Reflectance Accessory

**UH4150 : Standard-sample version (P/N 1J1-0131), Micro-sample version (P/N 1J1-0132)**

U-4100 : Standard-sample version (P/N 134-0115), Micro-sample version (P/N 1J0-0206)

Internal coating material : BaSO₄, Sub white plate : none, Number of ports : 2

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Wavelength Region</th>
<th>Specifications (Standard-sample version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmittance</td>
<td>Far UV</td>
<td>Incident angle: 20° - 60°</td>
</tr>
<tr>
<td></td>
<td>Near IR</td>
<td>Sample size: Flat substrate : 30 × 30 - 90 × 90 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prism : cube of 85 mm or less</td>
</tr>
<tr>
<td></td>
<td>Visible</td>
<td>Wavelength range: 240 - 2,000 nm</td>
</tr>
<tr>
<td>Scattered Light</td>
<td>Near Infrared</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications (Micro-sample version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident angle: 20° - 60°</td>
</tr>
<tr>
<td>Sample size: 3.5 × 3.5 - 90 × 90 mm</td>
</tr>
<tr>
<td>Sample thickness: 5 mm or less (Sample size: 25 - 90 mm)</td>
</tr>
<tr>
<td>Wavelength range: 340 - 2,000 nm</td>
</tr>
</tbody>
</table>

An accessory equipped with an integrating sphere, applicable to measurements of transmittance and specular reflectance using any desired angle from 20° to 60°.

### Selecting a detector for the UH4150 main unit

- **UH4150 Integrating Sphere Detection System**
  A 60 mm integrating sphere needs to be purchased with the spectrophotometer to use for calibration and performance check.

- **UH4150 Direct Light Detection System**
  The direct light detector built in the spectrophotometer, is used for calibration and performance check.
  The direct light detector can be replaced with an optional integrating sphere detector.

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*Produced on order item.*

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**Rough division of spectral regions (nm)**

- **UV**: 190 - 240 nm
- **Near UV**: 240 - 380 nm
- **Visible**: 380 - 780 nm
- **Near Infrared**: 780 - 2,600 nm
60 mm Standard Integrating Sphere

**UH4150 : Total reflectance P/N 1J1-0121, both Total and Diffuse reflectance P/N 1J1-0120**

**U-4100 : Total reflectance P/N 134-0218, both Total and Diffuse reflectance P/N 134-0216**

There are two types of these highly versatile integrating spheres: one for total reflectance measurement, in which the rear port inclination angles are 10° for sample side and 10° for reference side and the other for both total reflectance and diffuse reflectance, in which the rear port inclination angles are 8° for sample side and 0° for reference side. With the 60 mm Standard Integrating Sphere, the following accessories are available for the respective measurement applications.

**Accessories for Transmittance and Absorbance Measurements**

◆ Sample size : Standard

- **Samples of glass, film, thin film, etc.**

  - **Incident angle**: 0°
  - **Diffusivity**: No

- **Glass Filter Holder (P/N 134-0207)**
  - Used for transmittance and absorbance measurement of plate solid samples, such as glass filter
  - **Specifications**
    - **Sample thickness**: 0.5 - 5 mm
    - **Sample size**: 12 × 12 - 55 × 100 mm

- **Film Holder (P/N 134-0208)**
  - Used for transmittance and absorbance measurement of thin film samples
  - **Specifications**
    - **Film frame**: 25 mm wide, 30 - 55 mm high
    - **Light beam opening**: 10 mm wide, 20 mm high

- **Transmittance Holder (close contact) (P/N 1J0-0202)**
  - Used for transmittance and absorbance measurement of diffusive solid samples
  - **Specifications**
    - **Sample thickness**: 25 mm or less
    - **Sample size**: 30 × 30 - 100 × 100 mm

- **Variable Angle Transmittance Accessory (P/N 134-0200)**
  - **Polarizer Holder (P/N 132-0325)**
    - A rotation stage is used for transmittance measurement under a desired incident angle from 0° to 60°. A polarizer and a polarizer holder are also used to remove the effect of polarization characteristics.
    - **Specifications**
      - **Incident angle**: 0 - 60°
      - **Light beam size**: About 12.3 (H) × 8.5 (W) mm
      - **Wavelength range**: 240 - 2,600 nm
      - **Sample size**: 40 × 40 - 140 × 140 mm, thickness of 3 mm or less
  - **(Option) Sample holder for P/N 134-0200 (P/N 134-6000)**
    - **Specifications**
      - **Sample size**: 25 × 25 - 50 × 50 mm, thickness of 3 mm or less

- **Film Holder (P/N 134-0208)**
  - Used for transmittance and absorbance measurement of thin film samples
  - **Specifications**
    - **Film frame**: 25 mm wide, 30 - 55 mm high
    - **Light beam opening**: 10 mm wide, 20 mm high

- **Transmittance Holder (close contact)**
  - **Specifications**
    - **Sample thickness**: 25 mm or less
    - **Sample size**: 30 × 30 - 100 × 100 mm

- **Polarizer plate, etc.**

  - **Incident angle**: 0°
  - **Diffusivity**: No

- **Polarizing plate Measurement Accessory (P/N 1J0-0208)**
  - Used for the measurement of polarization characteristics by rotating two polarizing plates in the cross arrangement and the parallel arrangement. A polarizer and a polarizer holder (P/N 132-0325), or a depolarizer (P/N 134-6156) is needed separately.
  - **Specifications**
    - **Sample thickness**: 25 mm or less
    - **Sample size**: 30 × 30 - 100 × 100 mm

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* A Glan-Taylor polarizer is required.
**Accessories for Transmittance and Absorbance Measurements**

**Sample size : Small**

- **Incident angle : 0°**
- **Diffusivity : No**
- **Transmittance Measurement Accessory for Micro Samples (P/N 1J0-0204)**
  
  Used for measurement of micro samples of ø20 mm or less. It includes a mask*2 that narrows down the light beam and a holder for the Micro sample.

**Specifications**

<table>
<thead>
<tr>
<th>Mask Type</th>
<th>Applicable Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø3 mm Mask (supplied standard)</td>
<td>ø5 - ø20 mm, thickness 3 mm or less</td>
</tr>
<tr>
<td>ø3 mm Mask (supplied separately)</td>
<td>ø3 - ø20 mm, thickness 3 mm or less</td>
</tr>
</tbody>
</table>

*2 It is necessary to replace the standard light source mask with the supplied ø4 mm light source mask.

**Sample size : Large**

- **Incident angle : 0°**
- **Diffusivity : No**
- **Transmittance Holder for Large Sample (P/N 1J0-0214)**
  
  A transmittance holder for samples of large size of 300 × 300 mm

**Specifications**

<table>
<thead>
<tr>
<th>Sample thickness</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm or less</td>
<td>50 × 50 - 300 × 300 mm</td>
</tr>
</tbody>
</table>
**60 mm Standard Integrating Sphere**

UH4150 : Total reflectance P/N 1J1-0121, both Total and Diffuse reflectance P/N 1J1-0120
U-4100 : Total reflectance P/N 134-0218, both Total and Diffuse reflectance P/N 1J0-0216*

* Produced on order item.

## Accessories for Reflectance Measurements

- **Sample size : Standard**

  - **Samples of glass, film, thin film, powder, resin plate, etc.**
  - **Total reflectance, diffuse reflectance**
  - **Opaque**
  - **Possible to measure without any accessory**
  - **Transparent**
  - **White Plate Holder with Transmission Hole**
    - P/N 130-2179
    - Used for total reflectance measurement of transparent samples (glasses etc.). It is constructed to prevent transmitted light from entering into the integrating sphere.

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample thickness</td>
</tr>
<tr>
<td>Sample size</td>
</tr>
</tbody>
</table>

- **Variable Angle Absolute Reflectance Accessory (10° - 60°)** (P/N 134-0116)
- **Variable Angle Absolute Reflectance Accessory (15° - 65°)** (P/N 134-0117)

  | Absolute reflectance measurement of a sample is measured by the V-N method with the mirror relocated to the specified position. The Polarizer Holder*1 (P/N 132-0325) is supplied standard. |
  | Common specifications |
  | Sample thickness | P/N 134-0116 : 10° - 60° (in increments of 10°) |
  | Sample size      | P/N 134-0117 : 15° - 65° (in increments of 10°) |
  | Wavelength range | 240 - 2,600 nm |

  | Use the Continuously Variable Angle Absolute Reflectance Accessory. Please see page 23 for details. |
  | **Incident angle : Continuously variable** |

- **5° Specular Reflectance Accessory (Absolute)** (P/N 134-0102)
- **12° Specular Reflectance Accessory (Absolute)** (P/N 134-0104)
- **30° Specular Reflectance Accessory (Absolute)** (P/N 134-0105)
- **Polarizer Holder*1** (P/N 132-0325)
- **45° Specular Reflectance Accessory (Absolute)** (P/N 134-0106)
- **Polarizer Holder*1** (P/N 132-0325)

  | Used for measurement of reflective characteristics of metal films or glass surfaces depending on incident angle by measuring absolute reflectance using the V-N method. Transmittance measurement under the conditions of the same point and the same incident angle is also possible. In the case of the 30° and 45° Specular Reflectance Accessory, using a polarizer is required. (Some samples may require a polarizer even for 5° and 12° accessories.) Please see Reflectance Measurement Guide on page 4 for details. Samples are placed on the side of the accessory. |
  | **Common specifications** |
  | Sample size | Absolute reflectance measurement; 25 x 25 - 100 x 150 mm |
  | Wavelength range | 240 - 2,600 nm |

  | **Incident angle : Fixed** |

* A Glan-Taylor polarizer is required.
Variable Angle Reflectance Accessory (Relative) (P/N 134-0118)

Specifications
- Incident angle: 20° - 60°
- Sample size: 25 × 25 - 50 × 100 mm
- Wavelength range: 240 - 2,600 nm

5° Specular Reflectance Accessory (Relative) (P/N 134-0100)

Specifications
- Sample size: 25 × 25 - 100 × 150 mm
- Wavelength range: 240 - 2,600 nm

Vertical 5° Specular Reflectance Accessory (Relative) (P/N 134-0101)

Specifications
- Sample size: ø25 - ø100 mm
- Wavelength range: 240 - 2,600 nm

The specular reflection of a reference sample is used to measure the sample reflectance relative to the reference.

Sample size: Small

Total reflectance

Specially supplied to order

Samples of glass, film, thin film, powder, resin plate, etc.

Specular reflectance (absolute)

Small 5° Specular Reflectance Accessory (Absolute) (P/N 134-0103)

Specifications
- Measurement area: ø2 mm
- Sample size: ø3 - ø18 mm
- Wavelength range: 240 - 2,600 nm

Accessories for specific types of samples

Prism

Specular reflectance and transmittance (incident angle of 45°)

Sample size: Standard

Prism Measurement Unit (P/N 134-0110)

Specifications
- Incident angle: 45°
- Sample size: 16 - 60 mm cube
- Measuring point: Center
- Wavelength range: 240 - 2,600 nm

Sample size: Small

Small Prism Measurement Unit (P/N 134-0111)

Used for the measurement of transmittance and reflectance of various prisms at the incident angle of 45°. The Polarizer Holder*1 (P/N 132-0325) is supplied standard.

Specifications
- Incident angle: 45°
- Sample size: 5 - 6 mm square-cube
- Measuring point: 7 - 20 mm square-cube
- Wavelength range: 240 - 2,600 nm

Wafer

Specular reflectance and transmittance (incident angle of 5°, relative reflectance)

Specular reflectance and transmittance (incident angle of 12°, absolute reflectance)

Top-mount Transmittance and Reflectance Measurement Unit (P/N 134-0107)

Specifications
- Incident angle: 0°
- Sample size: 50 × 50 - 230 × 230 mm, ø6 inch, ø8 inch
- Wavelength range: 240 - 2,600 nm

Top-mount Transmittance and Reflectance Measurement Unit (P/N 134-0108)

Specifications
- Incident angle: 12° (absolute)
- Sample size: 50 × 50 - 230 × 230 mm, ø6 inch, ø8 inch
- Wavelength range: 240 - 2,600 nm

Measurement of transmittance and reflectance of large-size samples is possible by switching the light beam path.

*1 A Glan-Taylor polarizer is required.
60 mm Standard Full Integrating Sphere
UH4150 : P/N 1J1-0122, U-4100 : P/N 134-0205

This type of integrating sphere has no rear ports, and is suitable for measurement of lenses and other samples, where transmitted light beam changes in shape. However, total and diffuse reflectance measurement is not available. With the 60 mm Standard Full Integrating Sphere, the following accessories can be used for respective measurement applications.

**Accessories for Transmittance and Absorbance Measurements**

- **Sample size : Standard**
  - **Samples of glass, film, thin film, etc.**
  - **Incident angle : 0°**
    - **Diffusivity : No**
    - **Glass Filter Holder (P/N 134-0207)**
      - Used for transmittance and absorbance measurement of plate solid samples, such as glass filter
      - **Specifications**
        - Sample thickness: 0.5 - 5 mm
        - Sample size: 12 × 12 - 55 × 100 mm
    - **Film Holder (P/N 134-0208)**
      - Used for transmittance and absorbance measurement of thin film samples
      - **Specifications**
        - Film frame: 25 mm wide, 30 - 55 mm high
        - Light beam opening: 10 mm wide, 20 mm high
    - **Transmittance Holder (close contact) (P/N 1J0-0202)**
      - Used for transmittance and absorbance measurement of diffusive solid samples
      - **Specifications**
        - Sample thickness: 25 mm or less
        - Sample size: 30 × 30 - 100 × 100 mm
  - **Incident angle : 0° - 60°**
    - **Diffusivity : Yes**
    - **Variable Angle Transmittance Accessory (P/N 134-0200)**
      - Polarizer Holder (P/N 132-0325) **1**
        - A rotation stage is used for transmittance measurement under a desired incident angle from 0° to 60°. A polarizer and a polarizer holder are also used to remove the effect of polarization characteristics.
        - **Specifications**
          - Incident angle: 0 - 60°
          - Light beam size: About 12.3 (H) × 8.5 (W) mm
          - Wavelength range: 240 - 2,800 nm
          - Sample size: 40 × 40 - 140 × 140 mm, thickness of 3 mm or less
    - **(Option) Sample holder for P/N 134-0200 (P/N 134-6000)**
      - **Specifications**
        - Sample size: 25 × 25 - 50 × 50 mm, thickness of 3 mm or less

- **Polarizing plate, etc.**
  - **Incident angle : 0°**
    - **Diffusivity : No**
    - **Polarizing plate Measurement Accessory (P/N 1J0-0208)**
      - Used for the measurement of polarization characteristics by rotating two polarizing plates in the cross arrangement and the parallel arrangement. A polarizer and a polarizer holder (P/N 132-0325), or a depolarizer (P/N 134-6156) is needed separately.
      - **Specifications**
        - Sample thickness: 25 mm or less
        - Sample size: 30 × 30 - 100 × 100 mm

*1 A Glan-Taylor polarizer is required.
### Accessories for Transmittance and Absorbance Measurements

**Liquid samples**

- **Sample size**: Small
  - Samples of glass, film, thin film, etc.
  - Incident angle: 0°
  - Transmittance Measurement Accessory for Micro Samples (P/N 1J0-0204)
    - Used for measurement of micro samples of ø20 mm or less.
    - Includes a mask*2 that narrows down the light beam and a holder for the micro sample.
    - Specifications:
      - Mask Type
        - ø3 mm Mask (supplied standard)
        - ø5 - ø20 mm, thickness 3 mm or less
        - ø3 - ø20 mm, thickness 3 mm or less
      - Applicable Sample Size
        - ø5 - ø20 mm, thickness 3 mm or less
        - ø3 - ø20 mm, thickness 3 mm or less

**Liquid samples**

- **Sample size**: Large
  - Samples of glass, film, thin film, etc.
  - Incident angle: 0°
  - Transmittance Measurement Accessory for Large Sample (P/N 1J0-0214)
    - A transmittance holder for samples of large size of 300 × 300 mm
    - Specifications:
      - Sample thickness
        - 25 mm or less
      - Sample size
        - 50 × 50 - 300 × 300 mm

**Others**

- **Sample size**: Small
  - 10 mm Rectangular Cell Holder (P/N 134-0209)
    - 10 mm Rectangular Cell Holder is used for measuring transmittance and absorbance of liquid samples. This holder is also required when using a filter calibration standard.

- **Sample size**: Large
  - 10 mm Rectangular Cell Holder (P/N 134-0209)

### Accessories for specific types of samples

- **Sample size**: Standard
  - Lens Transmittance Measurement Accessory (P/N 134-0201)
    - Specifications:
      - Incident angle: 0°
      - Measurement method: Transmittance measurement
      - Lens holder (ø25 - ø80 mm)
        - Peripheral thickness of 6 mm or less
      - Lens holder (ø40 - ø110 mm)
        - Peripheral thickness of 6 mm or less

- **Sample size**: Large
  - Large Lens Measurement Accessory (P/N 134-0203)
    - Specifications:
      - Incident angle: 0°
      - Measurement method: Transmittance measurement
      - ø50 - ø200 mm, length of 300 mm or less
Accessories for Reflectance Measurements

- Sample size: Standard

Samples of glass, film, thin film, powder, resin plate, etc.

Total reflectance and Diffuse reflectance

Use the 60 mm Standard Integrating Sphere instead of the 60 mm Full Integrating Sphere, which is not appropriate for these measurements.

Polarizer Holder

- 5° Specular Reflectance Accessory (Absolute) (P/N 134-0102)
- 12° Specular Reflectance Accessory (Absolute) (P/N 134-0104)
- 30° Specular Reflectance Accessory (Absolute) (P/N 134-0105)
- 45° Specular Reflectance Accessory (Absolute) (P/N 134-0106)

Variable Angle Absolute Reflectance Accessory (10° - 60°) (P/N 134-0116)
Variable Angle Absolute Reflectance Accessory (15° - 65°) (P/N 134-0117)

Absolute reflectance of a sample is measured by the V-N method with the mirror relocated to the specified position. The Polarizer Holder*1 (P/N 132-0325) is supplied standard.

Common specifications

<table>
<thead>
<tr>
<th>Sample thickness</th>
<th>P/N 134-0116: 10° - 60° (in increments of 10°)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P/N 134-0117: 15° - 65° (in increments of 10°)</td>
</tr>
</tbody>
</table>

| Sample size     | 8 × 8 - 90 × 100 mm |
| Wavelength range| 240 - 2,600 nm |

Samples of glass, film, thin film, powder, resin plate, etc.

Sample thickness

Wavelength range

Incident angle: Continuous variable

Use the Continuously Variable Angle Absolute Reflectance Accessory. Please see page 23 for details.

Incident angle: Fixed

Variable Angle Absolute Reflectance Accessory (10° - 60°) (P/N 134-0116)
Variable Angle Absolute Reflectance Accessory (15° - 65°) (P/N 134-0117)

5° Specular Reflectance Accessory (Absolute) (P/N 134-0102)
12° Specular Reflectance Accessory (Absolute) (P/N 134-0104)
30° Specular Reflectance Accessory (Absolute) (P/N 134-0105)
45° Specular Reflectance Accessory (Absolute) (P/N 134-0106)

Polarizer Holder*1 (P/N 132-0325)

Common specifications

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Absolute reflectance measurement: 25 × 25 - 100 × 150 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength range</td>
<td>240 - 2,600 nm</td>
</tr>
</tbody>
</table>
### Top-mount Transmittance and Reflectance Measurement Unit

- **Variable Angle Reflectance Accessory (Relative)**
  - P/N 134-0118
  - **Specifications**:
    - **Incident angle**: 20° - 60°
    - **Sample size**: 50 × 50 - 100 × 100 mm
    - **Wavelength range**: 240 - 2,600 nm

- **5° Specular Reflectance Accessory (Relative)**
  - P/N 134-0100
  - **Specifications**:
    - **Sample size**: 25 × 25 - 100 × 150 mm
    - **Wavelength range**: 240 - 2,600 nm

- **Vertical 5° Specular Reflectance Accessory (Relative)**
  - P/N 134-0101
  - **Specifications**:
    - **Sample size**: ø25 - ø100 mm
    - **Wavelength range**: 240 - 2,600 nm

---

### Vertical 5° Specular Reflectance Accessory (Absolute)

- **Small 5° Specular Reflectance Accessory (Absolute)**
  - P/N 134-0103
  - **Specifications**:
    - **Incident angle**: Fixed
    - **Specular reflectance**: Absolute
    - **Light beam size**: ø2.2 (W) × 2.2 (H) mm
    - **Sample mounting unit**: ø20 mm
    - **Sample size**: ø5 - ø18 mm
    - **Measurement area**: ø2 mm
    - **Sample size**: ø3 - ø18 mm

---

### Accessories for specific types of samples

- **Prism**
  - **Prism Measurement Unit**
    - P/N 134-0110
    - **Specifications**:
      - **Incident angle**: 45°
      - **Sample size**: Standard
      - **Measuring point**: 16 - 60 mm cube
      - **Center**: 240 - 2,600 nm

- **Wafer**
  - **Top-mount Transmittance and Reflectance Measurement Unit**
    - P/N 134-0107
    - **Specifications**:
      - **Incident angle**: 0°, Reflectance: 5° (relative)
      - **Sample size**: 50 × 50 - 230 × 230 mm, ø6 inch, ø8 inch
      - **Wavelength range**: 240 - 2,600 nm

- **Top-mount Transmittance and Reflectance Measurement Unit**
  - P/N 134-0108
  - **Specifications**:
    - **Incident angle**: 12° (absolute)
    - **Sample size**: 50 × 50 - 230 × 230 mm, ø6 inch, ø8 inch
    - **Wavelength range**: 240 - 2,600 nm

---

### Sample size: Small

- **Total reflectance**
  - Specially supplied to order

- **Specular reflectance (absolute)**
  - Fixed

### Measurement of transmittance and reflectance of large-size samples is possible by switching the light beam path.
This integrating sphere uses Spectralon®, which has the highest diffuse reflectance, for the inner surface material of the integrating sphere. It allows low-noise measurements compared to the standard integrating sphere, and is especially useful for measurement in the UV region of the spectrum. The rear port inclination angles are 8˚ for sample side and 0˚ for reference side, and both total and diffuse reflectance measurement are possible. With the 60 mm High-sensitivity Integrating Sphere for Reflectance Measurement, the following accessories are available for the respective measurement applications.

### Accessories for Transmittance and Absorbance Measurement

**Sample size : Standard**

- **Polarizing plate, etc.**
  - Incident angle : 0°
  - Diffusivity : No
  - Polarizing plate Measurement Accessory (P/N 1J0-0208)
    - Used for the measurement of polarization characteristics by rotating two polarizing plates in the cross arrangement and the parallel arrangement. A polarizer and a polarizer holder (P/N 132-0325), or a depolarizer (P/N 134-6156) is needed separately.
    - Specifications
      - Sample thickness: 25 mm or less
      - Sample size: 30 × 30 - 100 × 100 mm

- **Samples of glass, film, thin film, etc.**
  - Incident angle : 0°
  - Diffusivity : Yes
  - Film Holder for High-sensitivity Integrating sphere (P/N 134-0211)
    - Used for transmittance and absorbance measurement of thin film samples
    - Specifications
      - Film frame: 25 mm wide, 30 - 55 mm high
      - Light beam opening: 10 mm wide, 20 mm high

- **Incident angle : 0° - 60°**
  - Transmittance Holder (close contact) (P/N 1J0-0202)
    - Used for transmittance and absorbance measurement of diffusive solid samples
    - Specifications
      - Sample thickness: 25 mm or less
      - Sample size: 30 × 30 - 100 × 100 mm

- **Variable Angle Transmittance Accessory (P/N 134-0200)**
  - Polarizer Holder (P/N 132-0325) *1
    - A rotation stage is used for transmittance measurement under a desired incident angle from 0° to 60°. A polarizer and a polarizer holder are also used to remove the effect of polarization characteristics.
    - Specifications
      - Incident angle: 0 - 60°
      - Light beam size: About 12.3 (H) × 8.5 (W) mm
      - Wavelength range: 240 - 2,600 nm
      - Sample size: 40 × 40 - 140 × 140 mm, thickness of 3 mm or less
  - (Option) Sample holder for P/N 134-0200 (P/N 134-6000)
    - Specifications
      - Sample size: 25 × 25 - 50 × 50 mm, thickness of 3 mm or less

---

*1 A Glan-Taylor polarizer is required.
### Accessories for Transmittance and Absorbance Measurements

#### 10 mm Rectangular Cell Holder for High-sensitivity Integrating sphere (P/N 134-0212)

- 10 mm Rectangular Cell Holder is used for measuring transmittance and absorbance of liquid samples. This holder is also required when using a filter calibration standard.

#### Specifications

<table>
<thead>
<tr>
<th>Mask Type</th>
<th>Applicable Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø3 mm Mask (supplied standard)</td>
<td>ø5 - ø20 mm, thickness 3 mm or less</td>
</tr>
<tr>
<td>ø3 mm Mask (supplied separately)</td>
<td>ø3 - ø20 mm, thickness 3 mm or less</td>
</tr>
</tbody>
</table>

---

### Sample size: Small

- **Samples of glass, film, thin film, etc.**
- Incident angle: 0°
- Diffusivity: No

#### Transmittance Measurement Accessory for Micro Samples (P/N 1J0-0204)

- Used for measurement of micro samples of ø20 mm or less. It includes a mask\(^2\) that narrows down the light beam and a holder for the Micro sample.

#### Specifications

<table>
<thead>
<tr>
<th>Mask Type</th>
<th>Applicable Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø3 mm Mask (supplied standard)</td>
<td>ø5 - ø20 mm, thickness 3 mm or less</td>
</tr>
<tr>
<td>ø3 mm Mask (supplied separately)</td>
<td>ø3 - ø20 mm, thickness 3 mm or less</td>
</tr>
</tbody>
</table>

---

### Sample size: Large

- **Samples of glass, film, thin film, etc.**
- Incident angle: 0°
- Diffusivity: No

#### Transmittance Holder for Large Sample (P/N 1J0-0214)

- A transmittance holder for samples of large size of 300 × 300 mm

#### Specifications

<table>
<thead>
<tr>
<th>Sample thickness</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm or less</td>
<td>50 × 50 - 300 × 300 mm</td>
</tr>
</tbody>
</table>

---

### Accessories for specific types of samples

- **Lens**
- **Sample size: Small**
- **Sample size: Standard**
- **Sample size: Large**

#### Lens Transmittance Measurement Accessory (P/N 134-0201)

- A transmittance measurement accessory for small lens is available as special order.

#### Specifications

<table>
<thead>
<tr>
<th>Incident angle</th>
<th>Transmittance measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø25 - ø80 mm</td>
<td>(peripheral thickness of 6 mm or less)</td>
</tr>
<tr>
<td>ø40 - ø110 mm</td>
<td>(peripheral thickness of 6 mm or less)</td>
</tr>
</tbody>
</table>

#### Large Lens Measurement Accessory (P/N 134-0203)

- **Sample size**
- **Sample size**
- **Sample size**

#### Specifications

<table>
<thead>
<tr>
<th>Incident angle</th>
<th>Transmittance measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø50 - ø200 mm, length of 300 mm or less</td>
<td></td>
</tr>
</tbody>
</table>
60 mm High-sensitivity Integrating Sphere for Reflectance Measurement

UH4150 : P/N 1J1-0123, U-4100 : P/N 1J0-0210

Accessories for Reflectance Measurements

Sample size : Standard

- Samples of glass, film, thin film, powder, resin plate, etc.
- Total reflectance, diffuse reflectance
- Possible to measure without any accessory
- White Plate Holder with Transmission Hole (P/N 130-2179)
  - Used for total reflectance measurement of transparent samples (glasses etc.). It is constructed to prevent transmitted light from entering into the integrating sphere.

Specifications
- Sample thickness: 25 mm or less
- Sample size: 50 × 50 - 300 × 300 mm

Variable Angle Absolute Reflectance Accessory (10° - 60°) (P/N 134-0116)
Variable Angle Absolute Reflectance Accessory (15° - 65°) (P/N 134-0117)

- Absolute reflectance of a sample is measured by the V-N method with the mirror relocated to the specified position. The Polarizer Holder (P/N 132-0325) is supplied standard.

Common specifications
- Sample thickness: P/N 134-0116: 10° - 60° (in increments of 10°)
  P/N 134-0117: 15° - 65° (in increments of 10°)
- Sample size: 8 × 8 - 90 × 100 mm
- Wavelength range: 240 - 2,600 nm

Variable Angle Absolute Reflectance Accessory (10° - 60°)
Variable Angle Absolute Reflectance Accessory (15° - 65°)

Used for measurement of reflective characteristics of metal films or glass surfaces depending on incident angle by measuring absolute reflectance using the V-N method. Transmittance measurement under the conditions of the same point and the same incident angle is also possible. In the case of the 30° and 45° Specular Reflectance Accessory, using a polarizer is required. (Some samples may require a polarizer even for 5° and 12° accessories.) Please see Reflectance Measurement Guide on page 4 for details. Samples are placed on the side of the accessory.

*1 A Glan-Taylor polarizer is required.
### Specifications

#### Incident angle
- 20° - 60°

#### Sample size
- 25 × 25 - 50 × 100 mm

#### Wavelength range
- 240 - 2,600 nm

### Vertical 5° Specular Reflectance Accessory (Relative)

#### Specifications

- **Sample size**: ø25 - ø100 mm
- **Wavelength range**: 240 - 2,600 nm

### Small 5° Specular Reflectance Accessory (Absolute)

#### Specifications

- **Sample size**: ø3 - ø18 mm
- **Measurement area**: ø2 mm
- **Sample size**: ø3 - ø18 mm
- **12 mm square or less

### Prism Measurement Unit

#### Specifications

- **Incident angle**: 45°
- **Sample size**: 16 - 60 mm cube
- **Measuring point**: Center
- **Wavelength range**: 240 - 2,600 nm

### Small Prism Measurement Unit

#### Specifications

- **Incident angle**: 45°
- **Sample size**: 5 - 6 mm square-cube
- **Wavelength range**: 240 - 2,600 nm

### Top-mount Transmittance and Reflectance Measurement Unit

#### Specifications

- **Incident angle**: 0°, Reflectance: 5° (relative)
- **Sample size**: 50 × 50 - 230 × 230 mm, ø6 inch, ø8 inch
- **Wavelength range**: 240 - 2,600 nm

### Other sample holders for photomask, etc. are also available.

---

* A Glan-Taylor polarizer is required.

---

The specular reflection of a reference sample is used to measure the sample reflectance relative to the reference.
60 mm High-sensitivity Full Integrating Sphere
UH4150 : P/N 1J1-0124, U-4100 : P/N 134-0206

This integrating sphere uses Spectralon®, which has the highest diffuse reflectance, for the inner surface material of integrating sphere.

It allows lower-noise measurements compared to the standard integrating sphere, and is especially useful for measurement in the UV region of spectrum. This type of integrating sphere has no rear-side ports, and is suitable for measurement of lenses and other samples, of which transmitted light beam changes in shape. However, total reflectance and diffuse reflectance measurement are not available. With the 60 mm High-sensitivity Full Integrating Sphere, the following accessories are available for the respective measurement applications.

## Accessories for Transmittance and Absorbance Measurement

- **Sample size : Standard**

  - **Incident angle : 0°**
    - **Diffusivity : No**
      - **Glass Filter Holder for High-sensitivity Integrating sphere** (P/N 134-0210)
        - Used for transmittance and absorbance measurement of plate solid samples, such as glass filter
        - **Specifications**
          - **Sample thickness**
            - 0.5 - 5 mm
          - **Sample size**
            - 12 x 12 - 55 x 100 mm
      - **Film Holder for High-sensitivity Integrating sphere** (P/N 134-0211)
        - Used for transmittance and absorbance measurement of thin film samples
        - **Specifications**
          - **Film frame**
            - 25 mm wide, 30 - 55 mm high
          - **Light beam opening**
            - 10 mm wide, 20 mm high
  - **Incident angle : 0°- 60°**
    - **Diffusivity : Yes**
      - **Transmittance Holder (close contact)** (P/N 1J0-0202)
        - Used for transmittance and absorbance measurement of diffusive solid samples
        - **Specifications**
          - **Sample thickness**
            - 25 mm or less
          - **Sample size**
            - 30 x 30 - 100 x 100 mm
      - **Variable Angle Transmittance Accessory** (P/N 134-0200)
        - **Polarizer Holder** (P/N 132-0325) **11**
          - A rotation stage is used for transmittance measurement under a desired incident angle from 0° to 60°. A polarizer and a polarizer holder are also used to remove the effect of polarization characteristics.
          - **Specifications**
            - **Incident angle**
              - 0 - 60°
            - **Light beam size**
              - About 12.3 (H) × 8.5 (W) mm
            - **Wavelength range**
              - 240 - 2,600 nm
            - **Sample size**
              - 40 x 40 - 140 x 140 mm, thickness of 3 mm or less
          - **(Option) Sample holder** for P/N 134-0200 (P/N 134-6000)
        - **Specifications**
          - **Sample size**
            - 25 x 25 - 50 x 50 mm, thickness of 3 mm or less

- **Others 60 mm Hi-sensitivity Full IS**

  - **Polarizing plate, etc.**
    - **Incident angle : 0°**
      - **Diffusivity : No**
      - **Polarizing plate Measurement Accessory** (P/N 1J0-0208)
        - Used for the measurement of polarization characteristics by rotating two polarizing plates in the cross arrangement and the parallel arrangement. A polarizer and a polarizer holder (P/N 132-0325), or a depolarizer (P/N 134-6156) is needed separately.
        - **Specifications**
          - **Sample thickness**
            - 25 mm or less
          - **Sample size**
            - 30 x 30 - 100 x 100 mm
**Accessories for Transmittance and Absorbance Measurements**

- **Sample size : Small**

  - **Samples of glass, film, thin film, etc.**
  - **Transmittance Measurement Accessory for Micro Samples (P/N 1J0-0204)**
    - Used for measurement of micro samples of ø20 mm or less. It includes a mask*2 that narrows down the light beam and a holder for the Micro sample.
    - **Specifications**
      - **Mask Type**
        - ø3 mm Mask (supplied standard)
        - ø5 - ø20 mm, thickness 3 mm or less
        - ø7 mm Mask (supplied separately)
        - ø3 - ø20 mm, thickness 3 mm or less

- **Sample size : Large**

  - **Samples of glass, film, thin film, etc.**
  - **Transmittance Holder for Large Sample (P/N 1J0-0214)**
    - An transmittance holder for samples of large size of 300 × 300 mm
    - **Specifications**
      - **Sample thickness**
        - 25 mm or less
      - **Sample size**
        - 50 × 50 - 300 × 300 mm

- **Accessories for specific types of samples**

  - **Sample size : Small**
    - **A transmittance measurement accessory for small lens is available as special order.**
    - **Specifications**
      - **Incident angle**
        - 0°
      - **Measurement method**
        - Transmittance measurement
      - **Sample size**
        - Ø5 - Ø80 mm (peripheral thickness of 6 mm or less)
      - **Sample size**
        - Ø40 - Ø110 mm (peripheral thickness of 6 mm or less)

  - **Sample size : Standard**
    - **Lens Transmittance Measurement Accessory (P/N 134-0201)**

  - **Sample size : Large**
    - **Large Lens Measurement Accessory (P/N 134-0203)**

*2 It is necessary to replace the standard light source mask with the supplied ø4 mm light source mask.

---

*4 In case of very short focal length, a measurement error could occur. This is because the light may hit the detector directly due to the baffle structure of the 60 mm High Sensitivity Full Integrating Sphere. In this case, use the 60 mm High-sensitivity Integrating Sphere for reflectance measurement (UH4150 : P/N 1J1-0123, U-4100 : P/N 1J0-0210).
**60 mm High-sensitivity Full Integrating Sphere**

**UH4150 : 1J1-0124, U-4100 : 134-0206**

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**Accessories for Reflectance Measurements**

- **Sample size : Standard**

  - Samples of glass, film, thin film, powder, resin plate, etc.
  - Total reflectance, diffuse reflectance
  - Use the 60 mm High-sensitivity Full Integrating Sphere for Reflectance measurement instead of the 60 mm High-sensitivity Full Integrating Sphere, which is not capable of these measurements.

  - Samples of glass, film, thin film, etc.
  - Incident angle : Fixed
  - Specular reflectance (absolute)
  - Use the Continuously Variable Angle Absolute Reflectance Accessory. Please see page 23 for details.

  - Incident angle : Variable (in increments of 10°)
  - Specular reflectance (absolute)
  - Variable Angle Absolute Reflectance Accessory (10° - 60°) (P/N 134-0116)
  - Variable Angle Absolute Reflectance Accessory (15° - 65°) (P/N 134-0117)

  - Incident angle : Continuously variable
  - Use the Continuously Variable Angle Absolute Reflectance Accessory. Please see page 23 for details.

  - Incident angle : Absolute reflectance measurement;
    - 5° Specular Reflectance Accessory (Absolute) (P/N 134-0102)
    - 12° Specular Reflectance Accessory (Absolute) (P/N 134-0104)
    - 30° Specular Reflectance Accessory (Absolute) (P/N 134-0105)
    - 45° Specular Reflectance Accessory (Absolute) (P/N 134-0106)

  - Polarizer Holder*1 (P/N 132-0325)

  **Common specifications**

  | Sample thickness | P/N 134-0116 : 10° - 60° (in increments of 10°) |
  | Sample size      | P/N 134-0117 : 15° - 65° (in increments of 10°) |
  | Wavelength range | 8 × 8 - 90 × 100 mm                                    |
  | Wavelength range | 240 - 2,600 nm                                      |

---

*1 A Glan-Taylor polarizer is required.

---

**Used for measurement of reflective characteristics of metal films or glass surfaces depending on incident angle by measuring absolute reflectance using the V-N method. Transmittance measurement under the conditions of the same point and the same incident angle is also possible. In the case of the 30° and 45° Specular Reflectance Accessory, using a polarizer is required. (Some samples may require a polarizer even for 5° and 12° accessories.) Please see Reflectance Measurement Guide on page 4 for details. Samples are placed on the side of the accessory.
**Variable Angle Reflectance Accessory (Relative) (P/N 134-0118)**

The Polarizer Holder* (P/N 132-0325) is supplied standard.

**Specifications**
- **Incident angle**: 20° - 60°
- **Sample size**: 25 × 25 - 50 × 100 mm
- **Wavelength range**: 240 - 2,600 nm

---

**5° Specular Reflectance Accessory (Relative) (P/N 134-0100)**

**Specifications**
- **Sample size**: 25 × 25 - 100 × 150 mm
- **Wavelength range**: 240 - 2,600 nm

---

**Vertical 5° Specular Reflectance Accessory (Relative) (P/N 134-0101)**

**Specifications**
- **Sample size**: ø25 - ø100 mm
- **Wavelength range**: 240 - 2,600 nm

---

**Small 5° Specular Reflectance Accessory (Absolute) (P/N 134-0103)**

**Specifications**
- **Wavelength range**: 240 - 2,600 nm
- **Incident angle**: 5° ± 1°
- **Absolute reflectance and Relative reflectance**
- **Light beam size**: ø20 mm
- **Sample mounting unit**: See the table to the right

---

**Prism Measurement Unit (P/N 134-0110)**

**Specifications**
- **Incident angle**: 45°
- **Sample size**: Standard 16 - 60 mm cube Center
- **Sample size**: Small 5 - 6 mm square-cube 7 - 20 mm square-cube
- **Wavelength range**: 240 - 2,600 nm

---

**Small Prism Measurement Unit (P/N 134-0111)**

*Used for the measurement of transmittance and reflectance of various prisms at the incident angle of 45°. The Polarizer Holder* (P/N 132-0325) is supplied standard.

**Specifications**
- **Incident angle**: 45°
- **Sample size**: ø2 mm Sample size: ø3 - ø18 mm 12 mm square or less
- **Wavelength range**: 240 - 2,600 nm

---

**Top-mount Transmittance and Reflectance Measurement Unit (P/N 134-0107)**

**Common Specifications**
- **Incident angle**: 0°, Reflectance; 5° (relative)
- **Sample size**: 50 × 50 - 230 × 230 mm, ø6 inch, ø8 inch
- **Wavelength range**: 240 - 2,600 nm

---

**Top-mount Transmittance and Reflectance Measurement Unit (P/N 134-0108)**

**Common Specifications**
- **Incident angle**: 0°, Reflectance; 12° (absolute)
- **Sample size**: 50 × 50 - 230 × 230 mm, ø6 inch, ø8 inch
- **Wavelength range**: 240 - 2,600 nm

---

**Other sample holders for photomask, etc. are also available.**
150 mm Standard Integrating Sphere with Optical Trap

**UH4150, U-4100 : P/N 1J0-0212**

This integrating sphere*5 is a large-size integrating sphere of ø150 mm, which uses BaSO4 for the inner surface material. Since its opening ratio is smaller than the 60 mm integrating sphere, it is useful for diffuse reflectance and total reflectance measurement or color analysis of samples with high diffusivity. With the 150 mm Standard Integrating Sphere, the following accessories are available for respective measurement applications.

**Transmittance and Absorbance Measurement**

<table>
<thead>
<tr>
<th>Liquid samples</th>
<th>Incident angle : 0°</th>
<th>Diffusivity : Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications</td>
<td>Light beam path length</td>
<td>10, 20, 30, 40, and 50 mm; rectangular cell</td>
</tr>
</tbody>
</table>

**Reflectance Measurement**

<table>
<thead>
<tr>
<th>Samples of glass, film, thin film, powder, resin plate, etc.</th>
<th>Total reflectance and diffuse reflectance</th>
</tr>
</thead>
<tbody>
<tr>
<td>This accessory allows the measurements of the samples.</td>
<td>Opaque</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Sample thickness</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample thickness</td>
<td>ø25 - ø100 mm</td>
<td></td>
</tr>
</tbody>
</table>

*5 Produced on order item.

150 mm High-sensitivity Integrating Sphere with Optical Trap

**UH4150 : P/N 1J1-0126*, U-4100 : 1J0-0376**

This integrating sphere*5 is a large-size integrating sphere of ø150 mm, which uses Spectralon® for the inner surface material. Since its opening ratio is smaller than the 60 mm integrating sphere, it is useful for diffuse and total reflectance measurements or color analysis of samples having high diffusivity. With the 150 mm High-sensitivity Integrating Sphere, the following accessories are available for the respective measurement applications.

**Transmittance and Absorbance Measurement**

<table>
<thead>
<tr>
<th>Samples of glass, film, thin film, etc.</th>
<th>Incident angle : 0°</th>
<th>Diffusivity : Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications</td>
<td>Light beam path length</td>
<td>10 mm or less</td>
</tr>
</tbody>
</table>

**Reflectance Measurement**

<table>
<thead>
<tr>
<th>Samples of glass, film, thin film, powder, resin plate, etc.</th>
<th>Total reflectance and diffuse reflectance</th>
</tr>
</thead>
<tbody>
<tr>
<td>For diffuse reflectance measurement, an optical trap is used to remove specular light.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Sample thickness</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample thickness</td>
<td>ø30 - ø50 mm</td>
<td></td>
</tr>
</tbody>
</table>

**Continuously Variable Angle Absolute Reflectance Accessory**

Standard-sample version (UH4150 : P/N 1J1-0131), Micro-sample version (P/N 1J1-0132)

This accessory*4 is used for the measurement of transmittance and absolute specular reflectance under a desired angle from 20° to 60°, or of distribution of diffuse light by independently rotating the sample stage and the detector (full integrating sphere). Using a polarizer is required. The Polarizer Holder is supplied standard. A Micro-sample version of this accessory is also available, which includes a light source mask, a condenser lens, and a micro sample holder.

**Transmittance and Absorbance Measurement**

<table>
<thead>
<tr>
<th>Samples of glass, film, thin film, etc.</th>
<th>Incident angle : Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications</td>
<td>Wavelength range</td>
</tr>
</tbody>
</table>

**Reflectance Measurement**

<table>
<thead>
<tr>
<th>Samples of glass, film, thin film, powder, resin plate, etc.</th>
<th>Specular reflectance</th>
<th>Incident angle : Variable (free)</th>
</tr>
</thead>
<tbody>
<tr>
<td>This accessory allows the measurements of the samples.</td>
<td>Specular reflectance</td>
<td>Incident angle : Variable (free)</td>
</tr>
</tbody>
</table>

| Specifications (Micro-sample version) | Wavelength range | 340 - 2,000 nm |

*5 In order to carry out calibration and performance check of UH4150 Integrating sphere Detection System, the 60 mm integrating sphere is required.
Accessories for UH4150 Direct Light Detection System

These systems are equipped with a direct light detector instead of an integrating sphere. These systems have a wide wavelength range* and allow absorbance and transmittance measurements of a variety of samples. A 10 mm Rectangular Cell Holder is included.

Absorbance Measurement

<table>
<thead>
<tr>
<th>P/N</th>
<th>Description</th>
<th>Accepts</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-2107</td>
<td>Rectangular long path cell holder</td>
<td>10, 20, 30, 40, 50, or 100 mm cells</td>
<td>Accepts 10, 20, 30, 40, 50, or 100 mm cells</td>
</tr>
<tr>
<td>210-2108</td>
<td>Cylindrical long path cell holder</td>
<td>10, 20, 30, or 100 mm cells</td>
<td>Accepts 10, 20, 30, or 100 mm cells</td>
</tr>
<tr>
<td>124-0357</td>
<td>10 mm Micro quartz cell</td>
<td>Mask for micro cell (mask-width of 1.5 mm)</td>
<td>A pair of two cells. Allows a sample volume of 340 μL to 600 μL. Requirements are single cell holder (3J1-0106) and mask for micro cell (200-1537 or 200-1538).</td>
</tr>
<tr>
<td>200-1537</td>
<td>Mask for micro cell (mask-width of 1.2 mm)</td>
<td>Two masks are needed. Used combined with 10 mm micro quartz cell (124-0375) and single cell holder (3J1-0106).</td>
<td></td>
</tr>
<tr>
<td>200-1538</td>
<td>Mask for micro cell (mask-width of 1.2 mm)</td>
<td>Two masks are needed. Used combined with 10 mm micro quartz cell (124-0375) and single cell holder (3J1-0106).</td>
<td></td>
</tr>
<tr>
<td>200-0551</td>
<td>Black 10 mm Micro quartz cell</td>
<td>A pair of two cells. Allows a sample volume of 340 μL to 600 μL. Mask for micro cell is not needed.</td>
<td></td>
</tr>
<tr>
<td>3J1-0106</td>
<td>Single cell holder</td>
<td>Used combined with 10 mm micro quartz cell (124-0357) and mask for micro cell (200-1537 or 200-1538).</td>
<td></td>
</tr>
<tr>
<td>122-0060</td>
<td>Micro cell holder</td>
<td>Cells are not included. Cells are supplied separately (see below).</td>
<td></td>
</tr>
<tr>
<td>130-0621</td>
<td>5 μL Micro cell</td>
<td>Used combined with micro cell holder (122-0060).</td>
<td></td>
</tr>
<tr>
<td>130-0622</td>
<td>25 μL Micro cell</td>
<td>Used combined with micro cell holder (122-0060).</td>
<td></td>
</tr>
<tr>
<td>130-0623</td>
<td>50 μL Micro cell</td>
<td>Used combined with micro cell holder (122-0060).</td>
<td></td>
</tr>
</tbody>
</table>

Transmittance Measurement

<table>
<thead>
<tr>
<th>P/N</th>
<th>Description</th>
<th>Sample thickness</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>210-2109</td>
<td>Glass Filter Holder for direct light detection (P/N 210-2109)</td>
<td>0.5 - 5 mm</td>
<td>12 × 25 - 55 × 100 mm</td>
</tr>
</tbody>
</table>

Film Holder for direct light detection (P/N 210-2112)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Sample thickness</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film frame</td>
<td>25 mm wide, 30 - 55 mm high</td>
<td>10 mm wide, 20 mm high</td>
</tr>
</tbody>
</table>

Polarizing plate

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Wavelength range</th>
<th>Sample surface area</th>
<th>Sample thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident angle</td>
<td>0˚</td>
<td>400 - 750 nm</td>
<td>12 - 25 mm to 55 - 100 mm</td>
</tr>
</tbody>
</table>

5˚ Specular Reflectance Accessory (Relative) (P/N 134-0226)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Incident angle</th>
<th>Sample surface area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample thickness</td>
<td>5˚</td>
<td>Diameter of 25 mm or more</td>
</tr>
</tbody>
</table>
# Summary of Integrating Sphere Detectors

<table>
<thead>
<tr>
<th>Appearance</th>
<th>60 mm Standard Integrating Sphere (for both total reflectance and diffuse reflectance)</th>
<th>60 mm Standard Integrating Sphere (for total reflectance)</th>
<th>60 mm Standard Full Integrating Sphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH4150</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>U-4100</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Part number</td>
<td>1J1-0120</td>
<td>1J1-0121</td>
<td>1J1-0122</td>
</tr>
<tr>
<td>Compatible system</td>
<td>Liquid sample measurement system</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Solid sample measurement system</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Large sample measurement System</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>UV Region measurement system</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Part number</td>
<td>1J0-0216*5</td>
<td>134-0218</td>
<td>134-0205</td>
</tr>
<tr>
<td>Far UV</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Near UV</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Visible</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Near infrared</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Wavelength range</td>
<td>240 - 2,600 nm</td>
<td>240 - 2,600 nm</td>
<td>240 - 2,600 nm</td>
</tr>
<tr>
<td>Inner material</td>
<td>BaSO₄</td>
<td>BaSO₄</td>
<td>BaSO₄</td>
</tr>
<tr>
<td>Sub white plate material</td>
<td>Al₂O₃</td>
<td>Al₂O₃</td>
<td>Not used</td>
</tr>
<tr>
<td>Number of ports</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Port-inclination Angle</td>
<td>Sample side</td>
<td>8°</td>
<td>10°</td>
</tr>
<tr>
<td>Reference side</td>
<td>0°</td>
<td>10°</td>
<td>No ports</td>
</tr>
<tr>
<td>Measurement</td>
<td>Transmittance</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Absorbance</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Scattered light</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Total reflectance</td>
<td>•</td>
<td>•</td>
<td>Not available</td>
</tr>
<tr>
<td>Diffuse reflectance</td>
<td>•</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>Specular reflectance</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

*5 In order to carry out calibration and performance check of UH4150 Integrating sphere Detection System, the 60 mm integrating sphere is required.
*6 This integrating sphere is supplied with main unit of U-4100 as standard.
*7 Produced on order item.
## Selecting a detector for the UH4150 main unit

### UH4150 Integrating Sphere Detection System

A 60 mm integrating sphere needs to be purchased with the spectrophotometer to use for calibration and performance check.

### UH4150 Direct Light Detection System

The direct light detector built in the spectrophotometer, is used for calibration and performance check. The direct light detector can be replaced with an optional integrating sphere detector.

### Table of Detector Options

<table>
<thead>
<tr>
<th>Detector Type</th>
<th>60 mm High-sensitivity Integrating Sphere (for Reflectance Measurement)</th>
<th>60 mm High-sensitivity Full Integrating Sphere</th>
<th>150 mm Standard Integrating Sphere&lt;sup&gt;5&lt;/sup&gt; (with Optical Trap)</th>
<th>150 mm High-sensitivity Integrating Sphere&lt;sup&gt;5&lt;/sup&gt; (with Optical Trap)</th>
<th>Continuously Variable Angle Absolute Reflectance Accessory&lt;sup&gt;5&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1J1-0123</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>1J1-0124</td>
<td><img src="image6.png" alt="Image" /></td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
<td><img src="image10.png" alt="Image" /></td>
</tr>
<tr>
<td>1J0-0212</td>
<td><img src="image11.png" alt="Image" /></td>
<td><img src="image12.png" alt="Image" /></td>
<td><img src="image13.png" alt="Image" /></td>
<td><img src="image14.png" alt="Image" /></td>
<td><img src="image15.png" alt="Image" /></td>
</tr>
<tr>
<td>1J0-0210</td>
<td><img src="image16.png" alt="Image" /></td>
<td><img src="image17.png" alt="Image" /></td>
<td><img src="image18.png" alt="Image" /></td>
<td><img src="image19.png" alt="Image" /></td>
<td><img src="image20.png" alt="Image" /></td>
</tr>
<tr>
<td>134-0206</td>
<td><img src="image21.png" alt="Image" /></td>
<td><img src="image22.png" alt="Image" /></td>
<td><img src="image23.png" alt="Image" /></td>
<td><img src="image24.png" alt="Image" /></td>
<td><img src="image25.png" alt="Image" /></td>
</tr>
</tbody>
</table>

### Detector Specifications

- **Spectralon<sup>®</sup>**
  - **4°:** Not used
  - **8°:** No ports
  - **0°:** No ports
- **BaSO<sub>4</sub>**
  - **2:** 5
  - **6°:** 6°
  - **0°:** No ports
- **Al<sub>2</sub>O<sub>3</sub>**
  - **2:** 5
  - **6°:** 6°
  - **0°:** No ports

---

<sup>1</sup> Spectralon<sup>®</sup>
<sup>2</sup> BaSO<sub>4</sub>
<sup>3</sup> Al<sub>2</sub>O<sub>3</sub>
<sup>4</sup> Spectralon<sup>®</sup>
<sup>5</sup> BaSO<sub>4</sub>
<sup>6</sup> Al<sub>2</sub>O<sub>3</sub>
<sup>7</sup> Spectralon<sup>®</sup>
Color Analysis

In color analysis, the Transmission or Reflectance spectrum of a sample in the range of 380 to 780 nm is used to calculate the tristimulus values (X, Y, Z), psychometric lightness values (L\*, L\*), psychometric chroma coordinates (a\*, b\*, a, b, u*, v*), chromaticity coordinates (x, y), etc. The measurement is performed under specified color analysis parameters (viewing angle and light source). Users can specify the weight factor for light sources and can perform color analysis using a desired light source. Color Difference (ΔE\*ab, ΔE\*uv, ΔEab) is calculated either by selecting a measurement data file as the standard sample or by entering the tristimulus values (X, Y, Z).

Optical Properties Measurement

Conforming to the best method for sheet glass transmittance and reflectance, specified in the JIS (Japanese Industrial Standards).

1. Visible Transmittance (Reflectance) Measurement program
Spectral transmittance τv and spectral reflectance ρv of sheet glass are measured in the visible wavelength range. Using these measured values, visible light transmittance τv and visible light reflectance ρv based on relative luminescent efficiency of CIE light adaptation are automatically calculated with respect to the standard light D65 specified by CIE.

(CE: Commission Internationale de l’Eclairage)

<table>
<thead>
<tr>
<th>λ (nm)</th>
<th>Σλτλ·λ·τ (λ)</th>
<th>Σλρλ·λ (ρ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>780</td>
<td>780</td>
<td>780</td>
</tr>
<tr>
<td>380</td>
<td>380</td>
<td>380</td>
</tr>
</tbody>
</table>

Dλ : Spectral distribution of standard illuminant Dλ
Vλ : Spectral luminous efficiency of CIE light adaptation
τ(λ) : Spectral transmittance (measured value)
ρ(λ) : Spectral reflectance (measured value)

2. Solar Radiation Transmittance (Reflectance) Measurement Program
As for the radiant flux of that solar radiation incident on sheet glass, the transmitted radiant flux (reflected radiant flux) is measured, and solar radiation transmittance τe and solar radiation reflectance ρe are automatically calculated.

\[ τ(λ) = \frac{ΣλEλ·dλ·τ(λ)}{ΣλEλ·dλ·ρ(λ)} \]

\[ ρ(λ) = \frac{ΣλEλ·dλ·ρ(λ)}{ΣλEλ·dλ·τ(λ)} \]

3. Sum-of-Products Calculation Program
The above-mentioned visible light transmittance (reflectance) and solar radiation transmittance (reflectance) conform to JIS R 3106. This program is formulated as a general form for calculation of these values for each wavelength, a measured value is multiplied by coefficient τ(λ), and a total sum value is determined for normalization. A weight factor α(λ), wavelength range, and normalization factor can be set up arbitrarily in this program.

\[ S = \frac{λ}{K} \]

Where, K = \[ \frac{Σα(λ)}{λ} \]

4. Weight Factor Input Program
With this program, a correction value (weight factor) for each wavelength interval can be input in a wavelength range of λ1 to λ2. Using the input values, the sum-of-products program is carried out. Up to five wavelength intervals can be assigned individually, and up to 500 data points can be specified.

5. Spectrum Correction Program
A photometric value at each wavelength is multiplied by correction coefficient R0(λ), and the result of multiplication is displayed and recorded in graph. A correction count value can be specified arbitrarily by the user. This program is particularly useful for absolute reflectance correction.

\[ R(λ) = R(λ)·R0(λ) \]

6. Correction Coefficient Input Program
This program is designed for input of correction coefficient data. Up to 500 points can be specified.

7. Film Thickness Calculation Program
The measured interference spectrum is used to calculate the thickness of monolayer film material. The parameters of the incident angle and the refractive index of the film must be specified. Further, by specifying a film thickness, it is possible to calculate the thickness difference between the measured film thickness and the reference film thickness.

\[ d = \frac{N-1}{2} \sqrt{n^2-\sin^2 \theta} \times \frac{1}{\lambda} \times 10^{-3} \]

d : Film thickness (μm) – value to be calculated
N : Number of interference peaks – Counted automatically
n : Reflection factor – Manually entered value
θ : Angle of incidence – Manually entered value
λ : First peak wavelength in spectrum (nm)
λ : Last peak wavelength in spectrum (nm)

8. Reflectance of solar radiation (Paint)*
Calculation method of reflectance of solar radiation is in accordance with JIS K5602 (2008). This program allows measurement of reflectance of all wavelengths required by JIS K5602 (2008). The wavelength range for calculation can be selected from three ranges (Whole wavelength : 300 - 2,500 nm, UV-VIS : 300 - 780 nm or NIR ; 780 - 2,500 nm). Furthermore, this program determine the quality using the reflectance of solar radiation and lightness value (L* value) in accordance with JIS K5602 (2008).

* This program is available using the Option Package Program P/N 1J1-0211 for UV Solutions Program ver 4.2.

Report Generator Program*
Users can generate reports of measurement results in the format that they desire by making use of Microsoft Excel®. The Report Generator Program allows the user to specify graph position and size. The user can create a wide variety of templates, such as customized reports, include tables, graphs, and desired calculations. (Microsoft Excel®, which is not included as standard, is required to use the Report Generator Program.)

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