UV-Visible/NIR Spectrophotometer

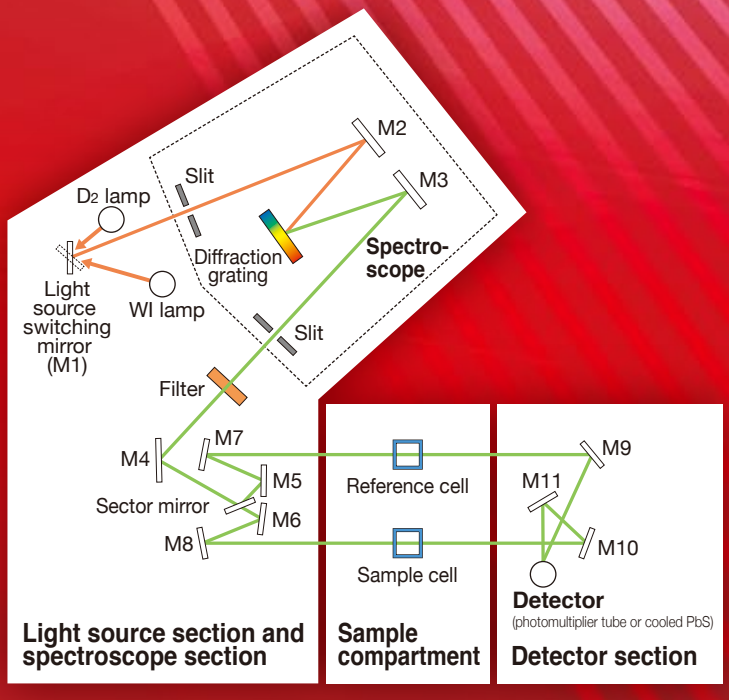
UH5700

HITACHI
Inspire the Next

Science for
a better tomorrow

Opening the way to the future, the UH5700, the spectroscopy specialist, handles the ultraviolet, visible, and near-infrared regions and strongly supports you.

Scans over
a broad wavelength
range and
is packaged in
a table-top size.



Schematic view of the UH5700 optical system

Features

Continuously Variable Slit

Through the use of a continuously variable slit, low-noise measurements can be made over a broad wavelength region including the ultraviolet, visible, and near infrared (190 to 3,300 nm)

Low Stray Light, High Photometric Range

Achieves best-in-class levels of low stray light and high photometric range through use of a Czerny-Turner mounted single-monochromator bright spectrometer and a newly-developed grating*1

Supports high-speed scanning

Employs a gear-drive system to realize high-speed scanning of the visible, ultraviolet, and near-infrared regions

New control and data-processing software

A more comfortable operating environment using UV Solutions Plus

Many accessories

A line-up of accessories to support a wide range of measurement objectives

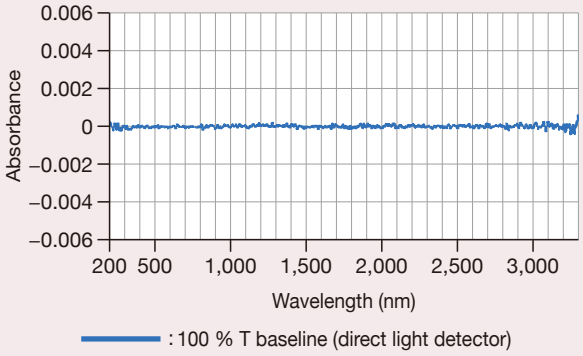
*1 Hitachi High-Tech Science survey of models marketed within Japan (single monochromator instruments supporting near-infrared wavelength range) as of April 2019

Handling the ultraviolet, visible, and near-infrared regions (190 to 3,300 nm), the UH5700 achieves both high measurement precision and high throughput

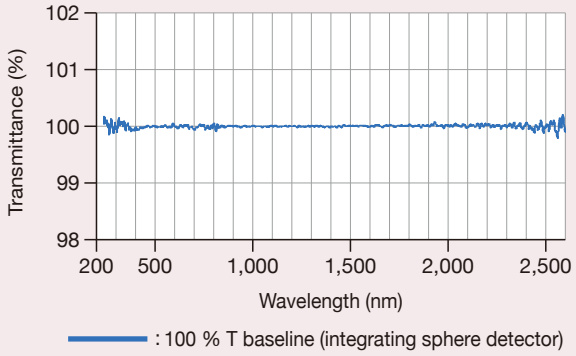
Use of a continuously variable slit

The UH5700 employs a continuously variable slit in the near-infrared region, in which the slit automatically widens when measuring low quantities of light and narrows when measuring large quantities of light, and thereby achieves low-noise measurements across a broad range of measurement wavelengths from 190 to 3,300 nm.

Direct light detector

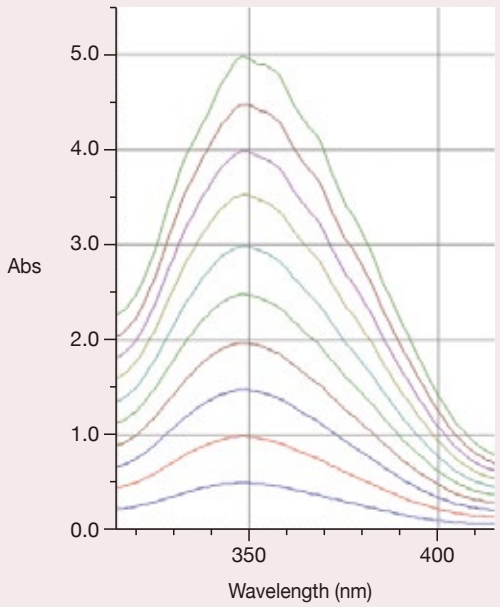


Integrating sphere detector

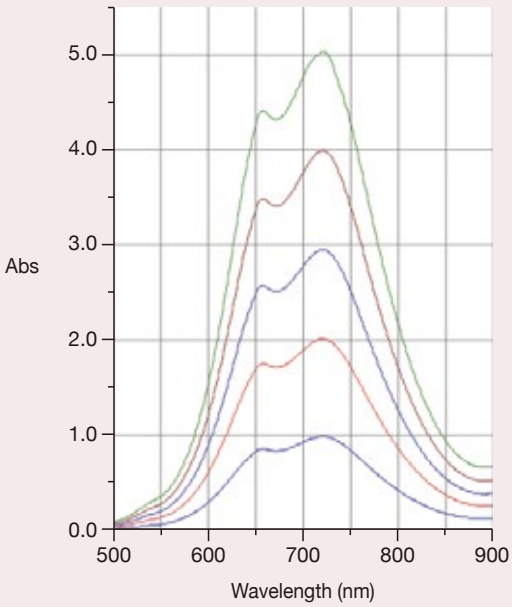


Low stray light

The UH5700 achieves best-in-class levels of low stray light and high photometric range through use of a Czerny-Turner mounted single-monochromator bright spectrometer and a newly developed grating using photolithography technology.*2



Absorption spectrum of an aqueous solution of potassium dichromate



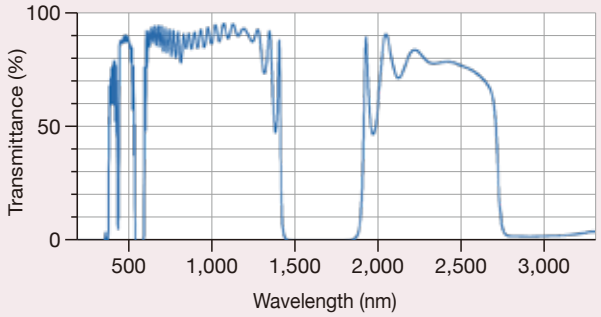
Absorption spectrum of an aqueous solution of nickel sulfate

*2 Hitachi High-Tech Science survey of models marketed within Japan (single monochromator instruments supporting near-infrared wavelength range) as of April 2019

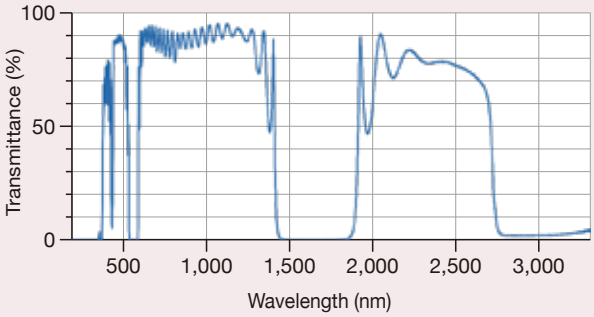
Measurement throughput improvements

By employing a gear-drive system for the wavelength drive, high scanning speeds compared to conventional instruments are achieved of approximately 0.3 to 5,000 nm/min in the ultraviolet-visible region.*3 When measuring at a 1 nm interval, a measurement made at 1,000 nm/min in the 190 to 3,300 range can be completed in approximately 4 minutes.

Comparison of 1 nm interval spectra at scanning speeds of 300 and 1,000 nm/min



Transmission spectrum of dielectric multilayer film at 300 nm/min



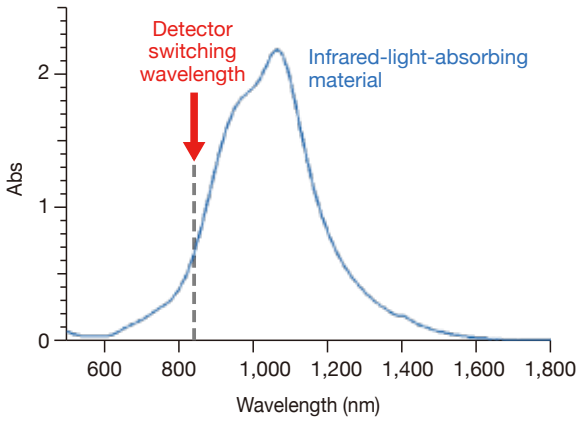
Transmission spectrum of dielectric multilayer film at 1,000 nm/min

*3 U-3900 : 1.5 to 2,400 nm/min, U-2900 : 10 to 3,600 nm/min.

Control of detector switching level difference

Generally, UV-visible/near-infrared spectrophotometers use different detectors in the UV-visible region and the near-infrared region. Because different detectors are used, a difference in photometric values may arise in switching between detectors. Through know-how developed from the fundamentals, signal processing technology, and other techniques, the UH5700 holds the level difference when switching detectors to a minimum.

Example of a measurement near the detector switching wavelength
(absorption spectrum of an infrared light absorbing material)



Common utilization of accessories

The sample compartment shares a common design with the U-2900/U-3900 spectrophotometers, so you can use the accessories you already have.*4 We offer an extensive line-up of accessory types tailored to measurement objectives.

*4 Except for certain accessories (please check with your sales representative for details)

Software

Simple operation flow and abundant data processing features make analysis pleasant

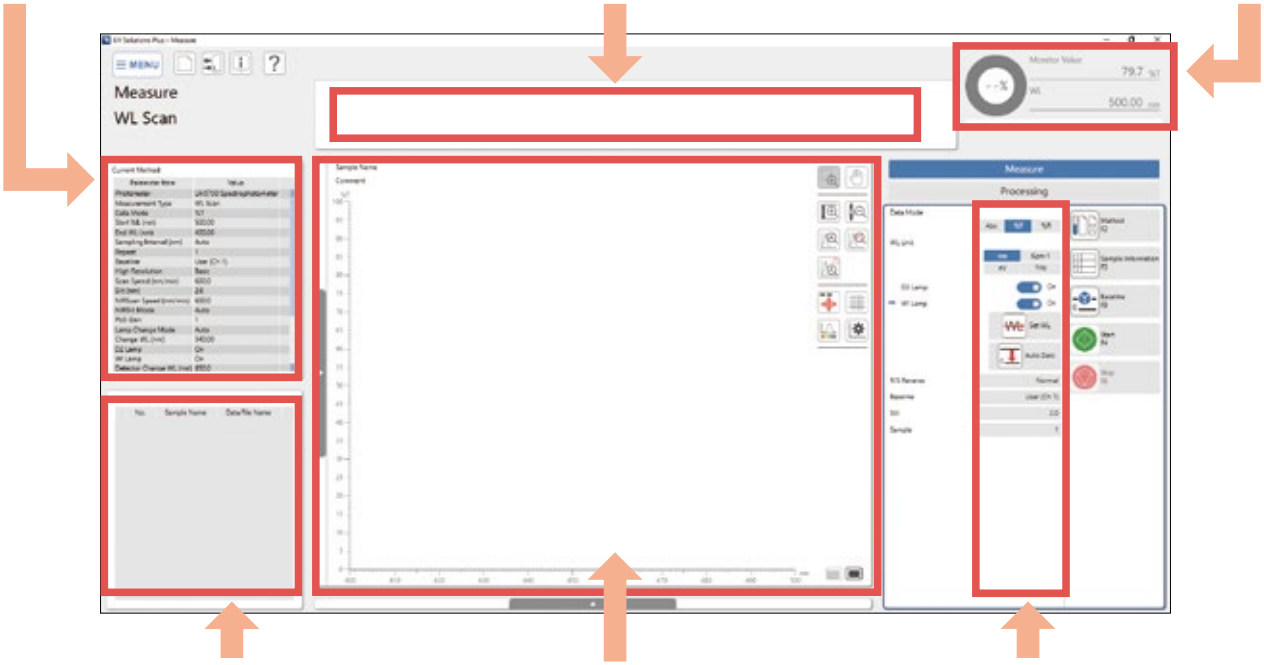
Use of new control and data processing software UV Solutions Plus

Enhancements have been added compared to the popular UV Solutions including a tabular form display feature for data lists and data processing results, a report layout feature, a performance confirmation feature, and more.

■ Measurement conditions display
Displays measurement parameters during a measurement.

Displays measurement guidance.

■ Measurement progress display
Displays measurement progress as a pie chart.



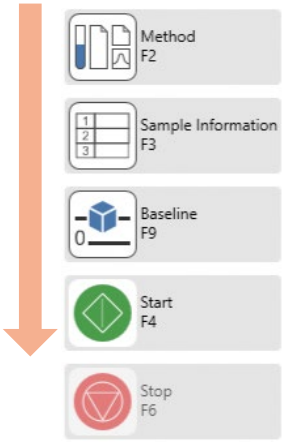
■ Sample information
Displays the sample name.

■ Measurement data
Displays the spectrum during a measurement.

■ Measurement operation display
The display mode can be changed during a measurement.

Operation flow

The measurement operation buttons are located on the right side. A measurement can be made using basic operations in four steps.



❶ Set Analysis Conditions
Press Analysis Conditions and set the conditions.

❷ Set Sample Information
Detailed conditions related to the measurement sample, the storage location for data, and other parameters can be set.

❸ Baseline
Perform baseline correction.

❹ Measurement Start
Start the measurement.

Many added features that follow in the footsteps of existing operability

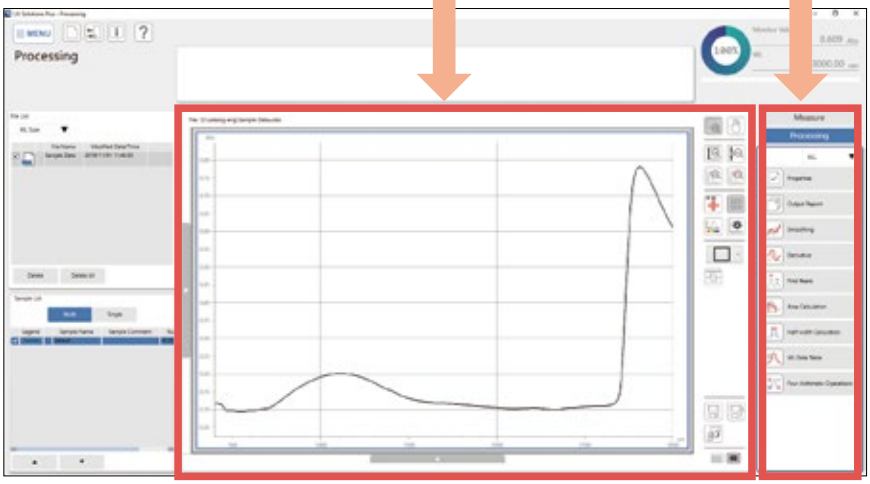
- Change the wavelength unit of a monitored value during measurement
- Measurement progress display
- Photometric value unit conversion (Abs, %T, %R, etc.)
- Direct display of the concentration calculated from coefficients
- Batch data processing of multiple files, and more

Measurement progress display

Data processing screen example

Enables switching of the display and scale in accordance with the application

Extensive data processing menu



List display feature for data processing results

Specific wavelength data, area calculation data, half-value width calculation data and other data across multiple samples can be displayed in tabular form. Comparing data between samples can be done easily. In addition, you can return to raw data after storing processed data.

Reporting function

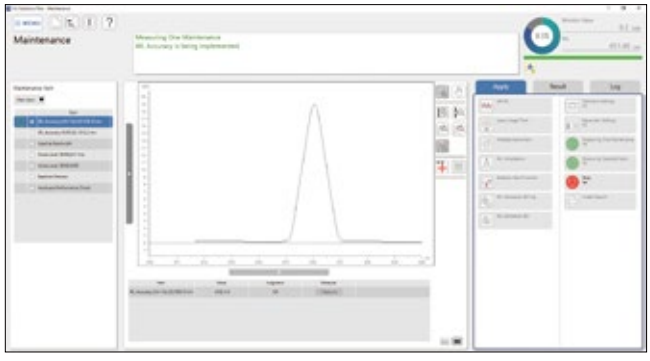
More effective for preparing reports.

You can freely lay out printable items such as analysis conditions, data processing results, spectra, etc. with the report layout feature, which did not exist in the UV Solutions software in the past. You can also print designated image data (jpg, png, and bmp).

Standard installation of performance confirmation feature

This feature can check for proper function and performance on a daily basis.

Performance confirmation feature items: wavelength accuracy, wavelength setting repeatability, noise level (RMS), baseline flatness, baseline stability, spectral band width, photometric accuracy, stray light, group editing of performance confirmation items, graphical display of performance confirmation results history.

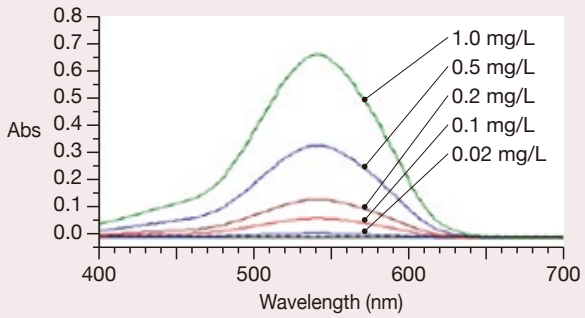


Applications

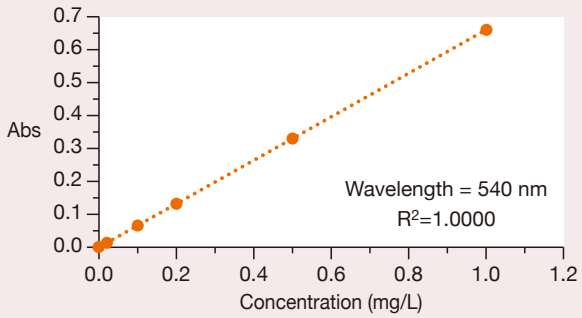
Supports problem solving for a variety of applications

Measurement of hexavalent chromium (diphenylcarbazide absorptiometry)

We present an example of analysis by diphenylcarbazide absorptiometry of hexavalent chromium, which is subject to regulation by the RoHS directive. Hexavalent chromium was measured using “Reagent Set for Water Analyzer No. 31 Chromium (Hexavalent)” made by Kyoritsu Chemical-Check Lab., Corp. From the absorption spectrum measurement results, the presence of an absorption peak at a wavelength of 540 nm was confirmed. Good linearity was obtained for the calibration curve at the 540 nm absorption peak with R^2 = 1.0000.



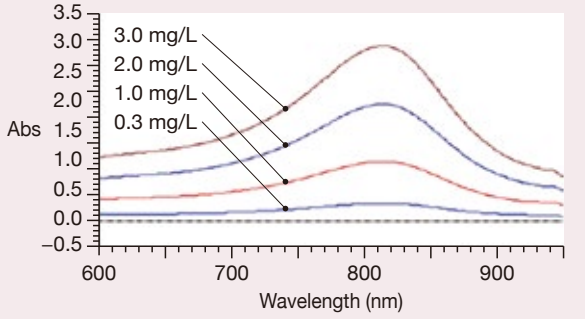
Absorption spectrum of hexavalent chromium



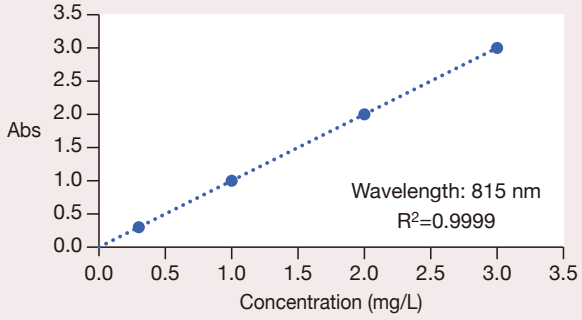
Calibration curve for hexavalent chromium

Measurement of silica (molybdenum yellow absorptiometry)

The measurement for silica by molybdenum yellow absorptiometry is prescribed in JIS K0101 Testing Methods for Industrial Water. Silica was measured using “Reagent Set for Water Analyzer Silica” manufactured by Kyoritsu Chemical-Check Lab., Corp. From the absorption spectrum measurement results, the presence of an absorption peak at a wavelength of 815 nm was confirmed. Good linearity was obtained for the calibration curve at the 815 nm absorption peak with R^2 = 0.9999.

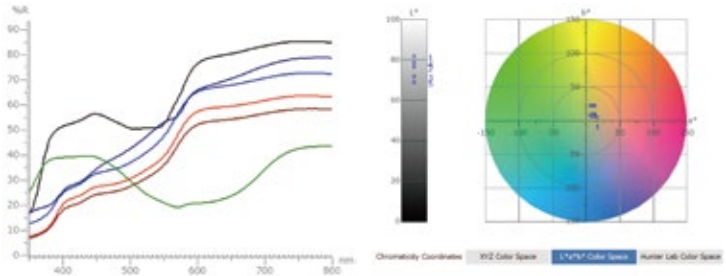


Absorption spectrum of silica



Calibration curve for silica

Color measurement (optional package)


Reflection spectra and chromaticity coordinates of cosmetic products

Data List | Color Calculation

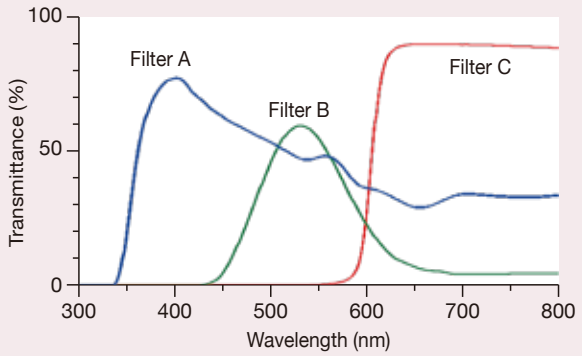
No.	Sample Name	x	y	L*	a*	b*
1	Sample 1	0.34808	0.32776	81.9807	15.9159	5.3274
2	Sample 2	0.37769	0.36709	76.7290	10.7088	22.2022
3	Sample 3	0.38313	0.36689	71.8882	12.0780	21.9181
4	Sample 4	0.36867	0.37075	78.6688	6.1955	22.1580
5	Sample 5	0.38502	0.36883	69.1062	11.6518	22.0902

Color calculation results

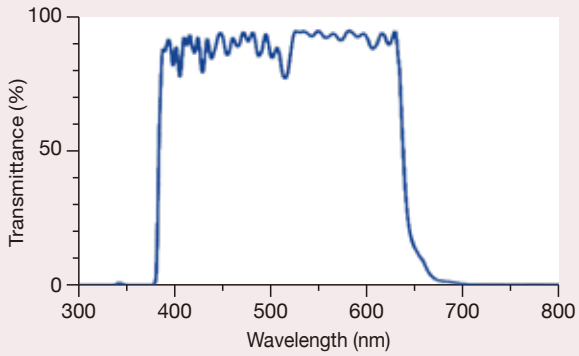
The light source, field of view, and other such parameters were set using spectra from the standard method (wavelength range 360 to 830 nm, 1 nm interval) and the practical method (wavelength range 380 to 780 nm, 5 nm interval), and color calculations were carried out. Color calculation results can be plotted onto chromaticity coordinates.

Measurement of filters

Filters allow light at specific wavelengths to pass through. Filters A, B, and C passed light in the blue, green, and red regions, respectively, and filter D passed light in the entire visible region.



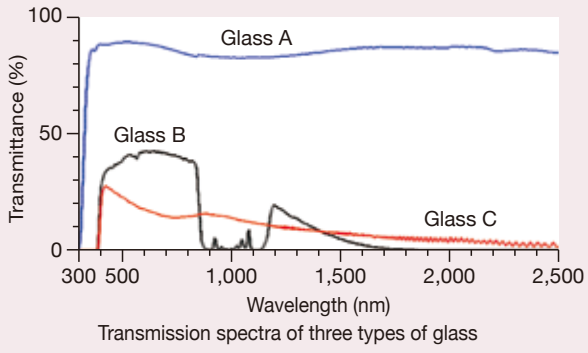
Transmission spectra of filters A, B, and C



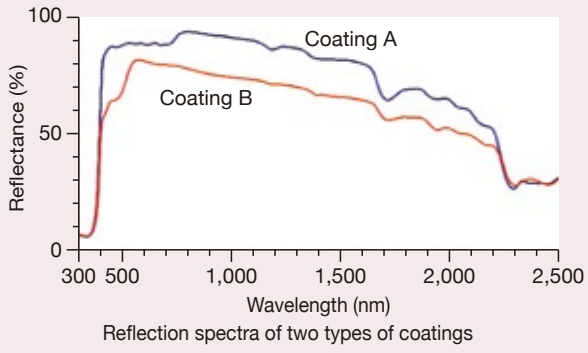
Transmission spectrum of filter D

Measurement of window glass and coatings

Near-infrared light from the sun is a source of heat that can pass through glass windows and cause the temperature of a room to rise. Because of this, functional glass has been employed in recent years that cuts near-infrared light. In addition, functional coatings have been used on the outer walls of buildings to reflect near-infrared light. The optical characteristics of functional glass and functional coatings were measured.



Transmission spectra of three types of glass



Reflection spectra of two types of coatings

Calculations using optional package

Data List | Light / Solar Direct Calculation (Glass)

No.	Sample Name	Light Calculation (%)	Solar Direct Calculation (%)
1	Glass 1	89.09	85.89
2	Glass 2	40.64	24.64
3	Glass 3	20.24	14.86

Light/solar direct (glass) calculation results

Calculations can be performed that conform to the test methods pertaining to the transmittance (reflectance) of plate glass (visible light transmittance, solar transmittance, solar reflectance) as specified in Japanese Industrial Standards JIS R3106-2019.

Data List | Solar Reflectance Paint

No.	Sample Name	Brightness (L*)	Solar Reflectance (ρ_{SR}) (%)	Judgment (ρ_{SR})
1	Paint A	95.33	84.83	OK
2	Paint B	90.16	69.79	NG

Solar reflectance (paint) calculation results

Calculations can be performed that conform to the method for obtaining the solar reflectance of paint specified in Japanese Industrial Standard JIS K5602-2008, and to the test method pertaining to high solar reflectance paint for roof use (solar reflectance) specified in Japanese Industrial Standard JIS K5675-2011.

Accessories

Accessory line up to support a broad range of measurements

The sample compartment shares a common design with the U-2900/U-3900, so existing accessories can be used.*5

*5 Except for certain accessories (please check with your sales representative for details)

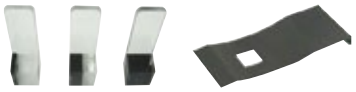
Micro cell option

Micro cells are used in combination with a mask (200-1537). A micro cell is suitable for small samples with volumes of 340 to 600 µL.

Product name	P/N	Capacity (µL)	Optical path length
10 mm micro quartz cell	124-0357	340～600 µL	10 mm
Black 10 mm micro quartz cell	200-0551		
Mask for micro cell	200-1537	—	—

Ultra-micro volume sample measurement option

Trace sample cells are used in combination with a mask (3J1-0116) (2 included). These are suitable for ultra-micro volume with volumes of 1.5 to 90 µL.



Product name	P/N	Capacity (µL)	Optical path length
1.5 µL trace sample cell	3J2-0120	1.5 to 4.0 µL	1 mm
12 µL trace sample cell	3J2-0121	12 to 40 µL	5 mm
50 µL trace sample cell	3J2-0122	50 to 90 µL	10 mm
Mask for trace sample cell	3J1-0116	—	—

*Wavelength range: 220 to 800 nm

Rectangular long-path cell holder (P/N 210-2107)

This holder is used when using rectangular long-path cells. Low-concentration samples can be measured with a high degree of sensitivity.

Optical path length	10, 20, 30, 40, 50, 100 mm

Water-circulating cell holder (P/N 210-2111)

Water from a thermostatic circulating water bath is circulated in the cell holder, and the cell section is kept at a constant temperature. (Temperature control: both R and S)

Operating temperature range	Room temperature to 40°C
Temperature stability	Within ±0.3°C

*A thermostatic circulating water bath and front panel (P/N: 2J3-0182) are separately required when using this product .

Thermostatic cell holder with stirrer (P/N 2J3-0161)

A magnetic stirrer agitates the sample solution to limit the effect of temperature variation.

Available cells		Capacity
10 mm rectangular cell		2.4 to 3.5 mL
Magnetic stirring cell made by Starna, Ltd.	9-Q-10-MS, 29-Q-10-MS	1.0 to 1.5 mL
	18-Q-10-MS, 28-Q-10-MS	600 to 800 µL

*A thermostatic circulating water bath and front panel (P/N: 2J3-0182) are separately required when using this product.

Programmable thermostatic cell holder (P/N 131-0301, 131-0302)

In protein and nucleic acid melting measurements, the sample temperature can be changed continuously to determine the variation in absorbance. Because it is heated and cooled electronically, this cell holder is capable of rapid heating and cooling. The sample temperature can be increased and decreased isothermally, and because this holder is equipped with a stirrer, there is no temperature variation within the cell. (temperature control: both R and S)

Usable cells	10 mm cell (cell not included)
Temperature range	Can be set anywhere from 0°C to 100°C (0.1°C)
Temperature accuracy	Within ±2°C (set temperature and sample temperature error)
Temperature stability	Within ±0.5°C*
With constant temperature drop function	

*When this product is used with a room temperature of 25°C, sample is distilled water, circulating water temperature of 22°C, and a temperature setting from 10 to 60°C. A thermostatic circulating water bath and front panel (P/N: 2J3-0182) are separately required.

Auto sipper (P/N 2J3-0131)

By pressing the front sipping lever, a sample can be drawn in from the suction nozzle and tested. The auto sipper is suitable for multiple sample measurements.
By connecting it to an autosampler, analyses can be performed automatically, achieving labor savings.

Minimum sample volume	0.6 mL (when room temperature is 25 to 35°C) 0.9 mL (when room temperature is 15 to 25°C)
Wavelength range	220 to 850 nm
Carry-over	1% or less
Cell capacity	Approx. 50 µL
Sample side	10 mm optical path length flow cell*
Control side	10 mm rectangular cell can be installed

*Exchangeable with 10 mm rectangular cell holder (standard equipment). Cell is not included.
*A front panel (P/N: 2J3-0182) is separately required when using this product.

Electronic thermostatted auto sipper (P/N 2J3-0141)

This auto sipper can maintain the flow cell at a constant temperature.

Minimum sample volume	0.6 mL (when room temperature is 25 to 35°C) 0.9 mL (when room temperature is 15 to 25°C)
Wavelength range	220 to 850 nm
Carry-over	1% or less
Cell capacity	Approx. 50 µL
Sample side	10 mm optical path length flow cell*
Set temperature	20 to 40°C
Temperature accuracy	Within ±0.5°C (temperature setting and sample temperature error) When room temperature is from 15 to 25°C, sample is distilled water, and temperature setting is from 25 to 40°C.
Control side	10 mm rectangular cell can be installed

*Exchangeable with 10 mm rectangular cell holder (standardequipment). Cell is not included.
*Temperature control for flow cell only.
*A front panel (P/N: 2J3-0182) is separately required when using this product.

AS-1010 Auto Sampler (P/N 2J1-0121, 2J1-0122)

In combination with an auto sipper, this unit can make multiple automatic measurements of solution samples. A suction needle can be moved in three (XYZ) directions.

Test tube size	12 mm outer diameter, 105 mm high
	15 mm outer diameter, 105 mm high (option required)

*Test tube is separately required.

Film holder (P/N 210-2112)

This holder is used for measuring the transmittance and absorbance of film-like samples.

Sample size	25 mm wide, 30 to 50 mm high
Light beam aperture	12 mm wide, 22 mm high

Glass filter holder (P/N 210-2109)

This holder is used for measuring the transmittance and absorbance of solid plate samples such as glass filters.

Sample thickness	0.5 to 5 mm
Sample size	12×25 mm to 55×100 mm

Polarizer holder (P/N 210-2130)

The sample beam is linearly polarized, and the polarization properties are measured. This can be used in combination with an analyzer.

Wavelength range	400 to 750 nm
Sample thickness	0.5 to 5 mm
Sample size	Min:12×25 mm / Max: 55×100 mm

φ60 Integrating Sphere

(P/N 2J3-0176)

This is used for absorbance measurements of turbid samples and reflectance measurements of solid sample surfaces.

Wavelength range	220 to 2600 nm
Samples that can be installed	Transmission: Rectangular cells with 10, 20, 30, and 40 mm optical path length* Reflection: Plate specimens with sizes of φ30 to 80 mm, 30×30 to 80×80 mm, and thicknesses of 10 mm or less
Aperture ratio	8.1%
Incidence angle for reflection sample mounting position* *RS in reversed state	Sample side: 0° Control side: 8°

*For transmission, when measuring plate-shaped specimens, please order sample clamp with transmission opening (P/N: 130-2070) and cell stand (P/N: 130-2076) separately.

5° Specular Reflectance Accessory (relative)

(P/N 2J3-0151)

This accessory uses the mirror reflection of a sample to measure relative reflectance with respect to a standard reflection plate (aluminum-evaporated plane mirror). This is used for film thickness measurement, spectral reflectance measurement, and other such applications.

Incidence angle	5°
Size of sample surface	25 mm diameter

*Simultaneous shipment with main unit only

Reference-side attenuation filter holder

(P/N 2J3-0120)

This is used when you wish to expand the photometric range of the near-infrared region. To perform a measurement where you want to expand the photometric range in the near-infrared region, a NENIR210B near-infrared absorbing ND filter made by Thorlabs, Inc. described in the table below is needed in addition to a reference-side attenuation filter holder (2J3-0120).

Must be purchased separately (customer to install)

Product name	Manufacturer
Near-infrared region absorptive ND filter NENIR210B	Thorlabs, Inc.*

Holder set for pen-type low-pressure mercury lamp (P/N 2J3-0110)

This holder set is used when carrying out wavelength calibration or verification of wavelength accuracy using a mercury lamp. The set includes a holder to install the mercury lamp in the device and a purpose-built light source chamber cover. In addition to this product, to carry out measurements using the mercury lamp, a pen-type low-pressure mercury lamp 81-1057-98 made by BHK, Inc. and a BHK purpose-built power source 90-0005-01 are required.

Option Package Program (P/N 2J3-0191)

The UV Solutions Plus optional software is for performing calculations based on a wide variety of JIS Standard tests and various optical characteristics.
By installing this program, calculations such as color calculations, direct light/solar calculations (glass), and solar reflectance paint calculations can be performed .

Main calculation features
• Color calculation • Direct light/solar calculation (glass) JIS R 3106 • Solar reflectance paint JIS K 5602, JIS K 5675 • Film thickness calculation • Summation • Spectrum correction • Thickness conversion

Main calculation features
Tristimulus value (JIS Z 8781), XYZ color space (JIS Z8781-3), L*a*b* color space (JIS Z 8781-4), Hunter Lab color space, L*u*v* color space (JIS Z 8781-5), dominant wavelength / excitation purity (JIS Z 8781-3), whiteness (JIS Z 8715), HV/C (JIS Z 8721), yellow index (JIS K 7373), change in yellowness index (JIS K 7373), color difference (L*a*b* color space (JIS Z 8781-4), Hunter Lab color space, L*u*v* color space (JIS Z 8781-5), chromaticity coordinate display

■ Installation requirements

Item	UV-Visible/NIR Spectrophotometer UH5700
Data processing section	OS: Microsoft Windows 10 Pro (64 bit) * Display: (Desktop model) 21.5 inches wide or larger, resolution 1,920 x 1,080 pixels (full HD) (Notebook model) 15.6 inches wide or larger, resolution 1,920 x 1,080 pixels (full HD)
Dimensions (Main unit)	630(w)×695(D)×294(H) mm
Weight of main unit	46 kg
Power source	AC 100, 115, 220, 230, 240 V, 50/60 Hz 400 VA (not including personal computer or printer)
Power consumption	200 W or less
Operating temperature	15 to 35 °C
Operating humidity	25 to 80 % (No condensation, 70 % or less at temperatures of 30 °C or higher)

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Science for a better tomorrow

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CAUTION: For correct operation, follow the instruction manual when using the instrument.
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