UV-Visible/NIR Spectrophotometer

UH3900S/UH3900D

HITACHI

Inspire the Next

The same reliable and proven optical system equipped with,the new software UV Solution Plus, for even greater ease of operation.

Equipped with new data processing software

UV Solutions Plus improves the ease-of-operation, increasing operational efficiency

Reliable and proven optical system

Ensures data compatibility with previous models [1].

Monochromator system can be selected

UH3900S: single monochromator model for low noise, high precision analysis

UH3900D: double monochromator model for diverse measurements over a wide photometric range

Extensive applications

A full range of accessories for covering both liquid and solid sample measurements

1) Previous models: spectrophotometer U-3900 /U-3900H

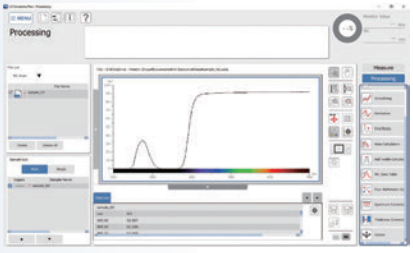
UH3900S

Single monochromator

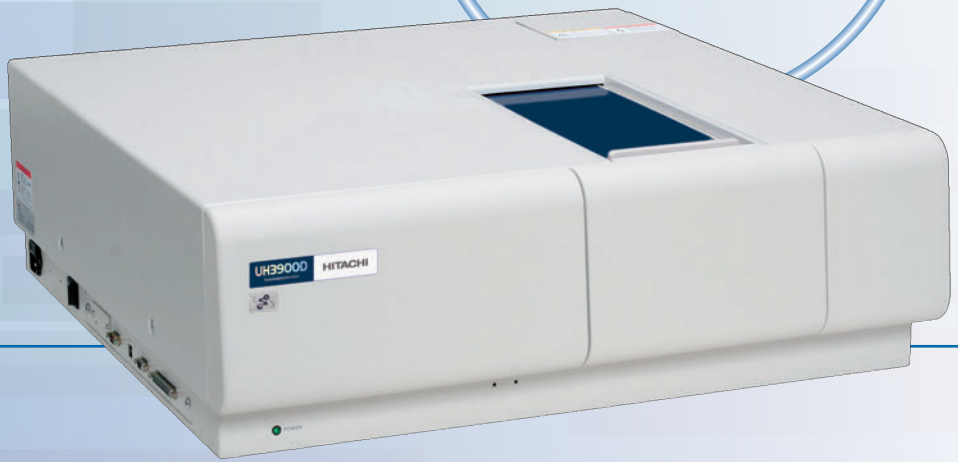
Stray light: 0.015% or less

Photometric range: −3.8–3.8 Abs

Two types available for selection according to sample and application purpose. Usable in a wide range of fields including analysis of water quality, the environment, biotechnology, drug manufacture and materials.



UV Solutions Plus



UH3900D

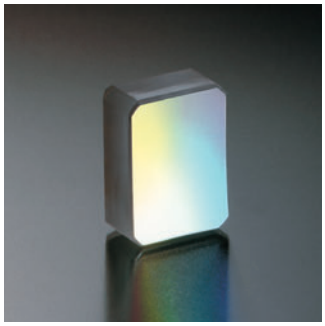
Double monochromator

Stray light: 0.00025% or less

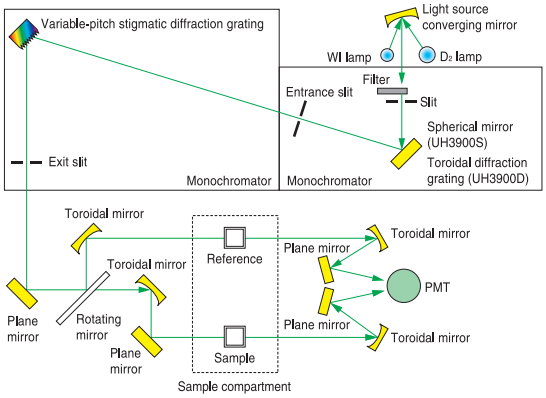
Photometric range: −5.5–5.5 Abs

Adoption of Stigmatic Concave Diffraction Grating

Hitachi Model UH3900S/D spectrophotometer adopts a Seya-Namioka mount monochromator and a stigmatic concave diffraction grating.
Because a concave diffraction grating is usable for both converging and dispersing light, it allows composition of an optical system with a small number of mirrors.
In this design, loss of light and aberration are suppressed, so a bright optical system can be configured.

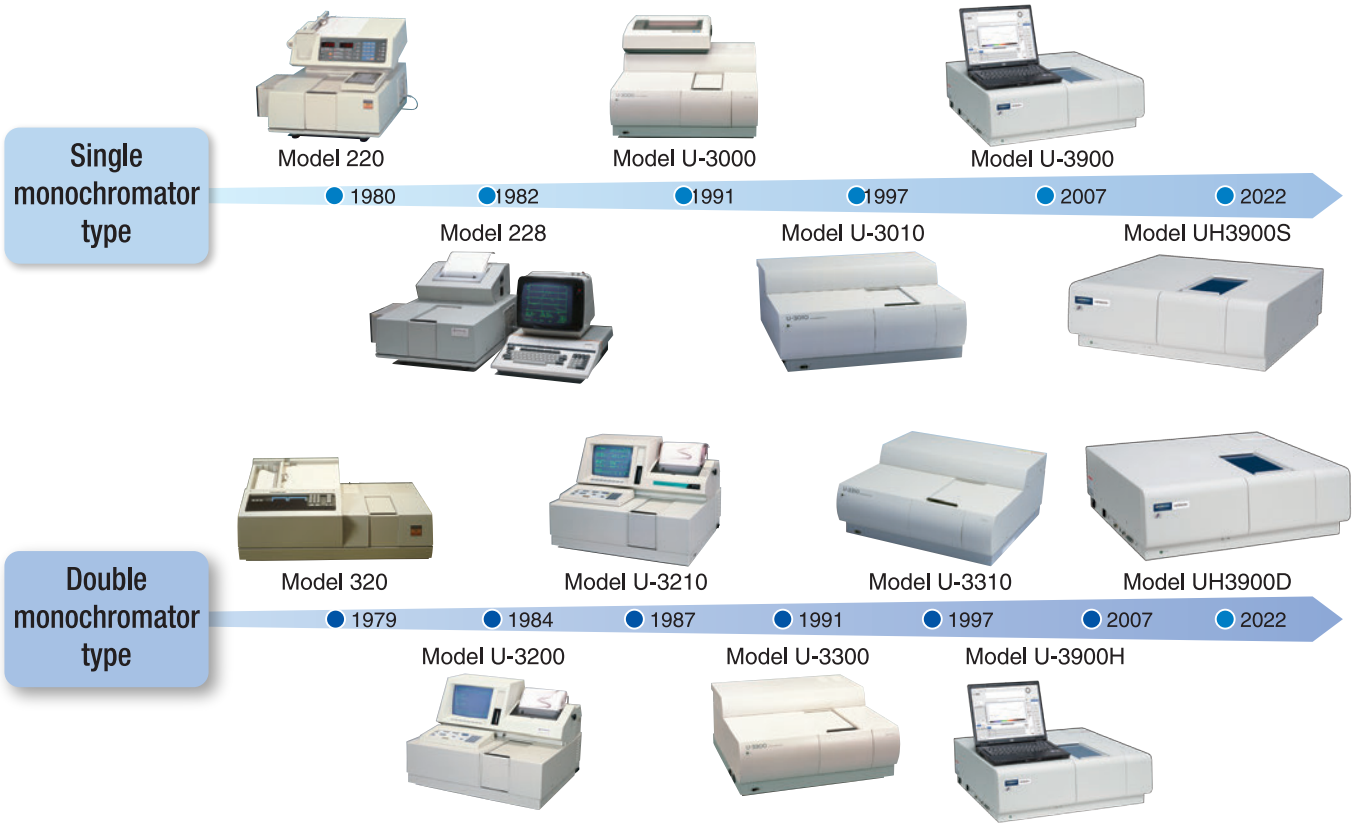


Stable Optics with Double Beam



As a light source, a WI lamp (visible region) and a D_2 lamp (ultraviolet region) are provided for selective use according to measuring wavelength range.
Double beam optics is adopted for ensuring stable measurements, in which the monochromatic beam selected with a monochromator is split into reference beam and sample beam with a rotating mirror (sector mirror) and the beams are directed into the sample compartment.
In one model, the UH3900S, a spherical mirror is used before the entrance slit. In the other model, the UH3900D, a grating is used before the entrance slit.

Since the Model 320 was launched in 1979, Hitachi medium-size spectrophotometers have been employed by customers in 25 countries.



Hardware

Hardware structure with priority given to ease of operation and data reliability.

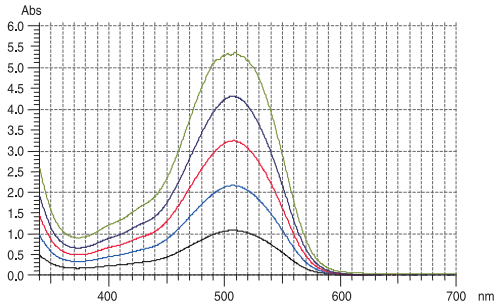
Hardware structure attaching greater importance to ease of operation

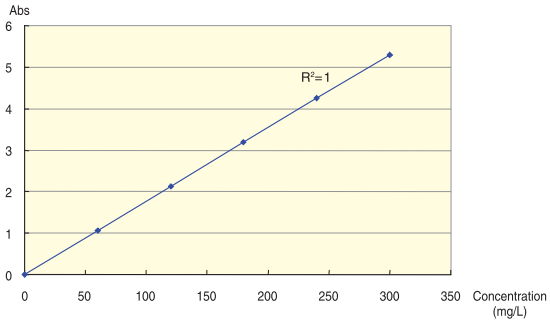
USB communication is adopted between the spectrophotometer and PC. And, because the top face of the spectrophotometer is flat, a notebook PC can be mounted on it. Therefore, the spectrophotometer and PC can be connected promptly.

Incorporation of double monochromator

Due to mounting of a double monochromator which uses Hitachi's original stigmatic concave diffraction grating, an excellent linearity is ensured up to high concentrations. Hence, highly reliable quantitative analysis is possible.

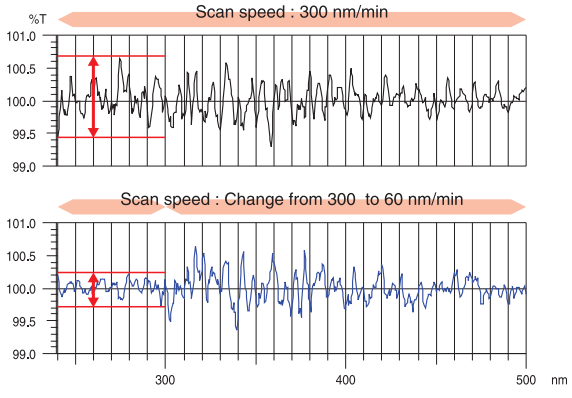
Model : UH3900D
Scan speed : 300 nm/min
Slit : 2 nm





Measurement with change in scan speed for ultraviolet range

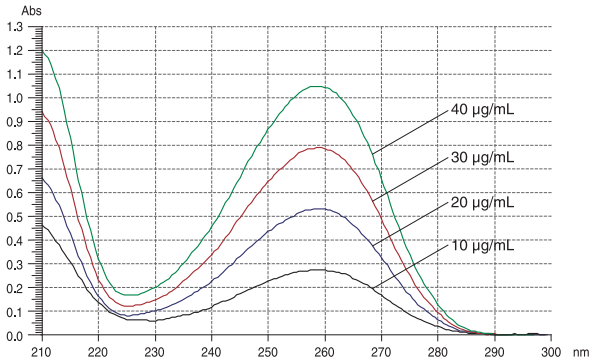
Scan speed is changeable for the ultraviolet region. In this wavelength region, noise can be reduced by slowing down the scan speed. Owing to this feature, a noise-suppressed spectrum is obtainable over the entire range from visible to ultraviolet region by a single scan.



Effective in trace sample measurement

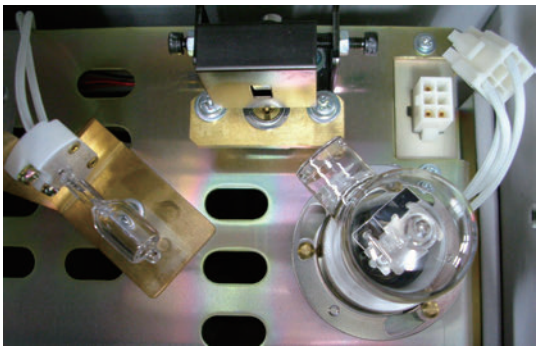
Satisfactory measurement is achievable even with 5, 25 and 50 µL micro-sample cells because the beam is finely converged in the sample compartment.
Shown here are spectra determined in the ultraviolet region by measuring nucleic-acid adenosine with a micro-sample cell (internal volume 25 µL). A high S/N ratio was obtained.

Model : UH3900S
Scan speed : 300 nm/min
Slit : 2 nm



Ease of maintenance (lamp replacement)

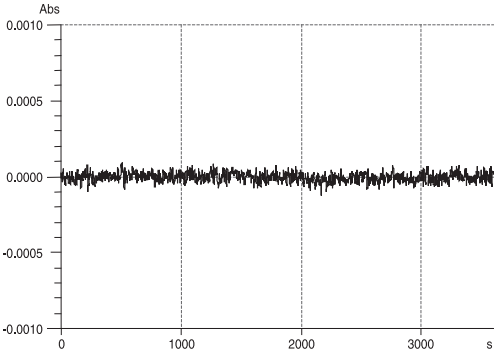
Lamp cable is connected by means of a socket, so each lamp can be removed or inserted without using a tool such as flat-head screwdriver.

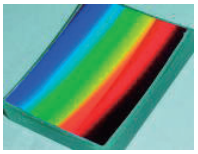


Stable baseline

The Model UH3900S series assures a stable baseline in a wavelength range from 190 to 850 nm. (Baseline flatness Model UH3900S : within ±0.0003 Abs, Model UH3900D : ±0.0004 Abs) Data can be measured stably even in a long-time measurement of enzyme activity, etc.

Model : UH3900S
Slit : 2 nm
Wavelength : 500 nm

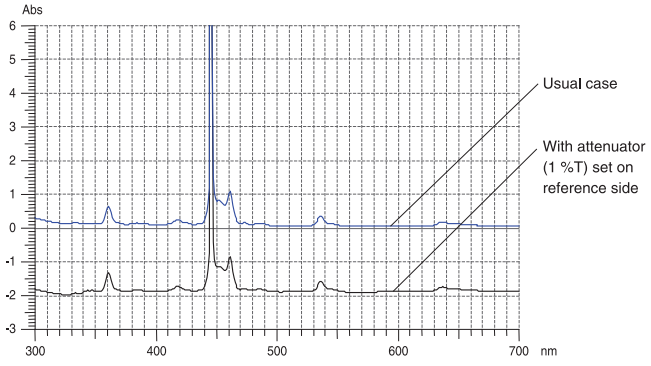




Unique differential feedback system

Sample signal, reference signal and zero point rise are always monitored and photomultiplier voltage is changed so that the sample or reference signal, whichever larger, becomes constant, whereby minus absorbance can be measured. Also, measurement in a broad dynamic range is allowed, e.g., difference spectrum measurement with different samples set on reference and sample sides.

Model : UH3900D
Scan speed : 300 nm/min
Slit : 2 nm



Software

Simple operation flow and abundant data processing features make analysis pleasant

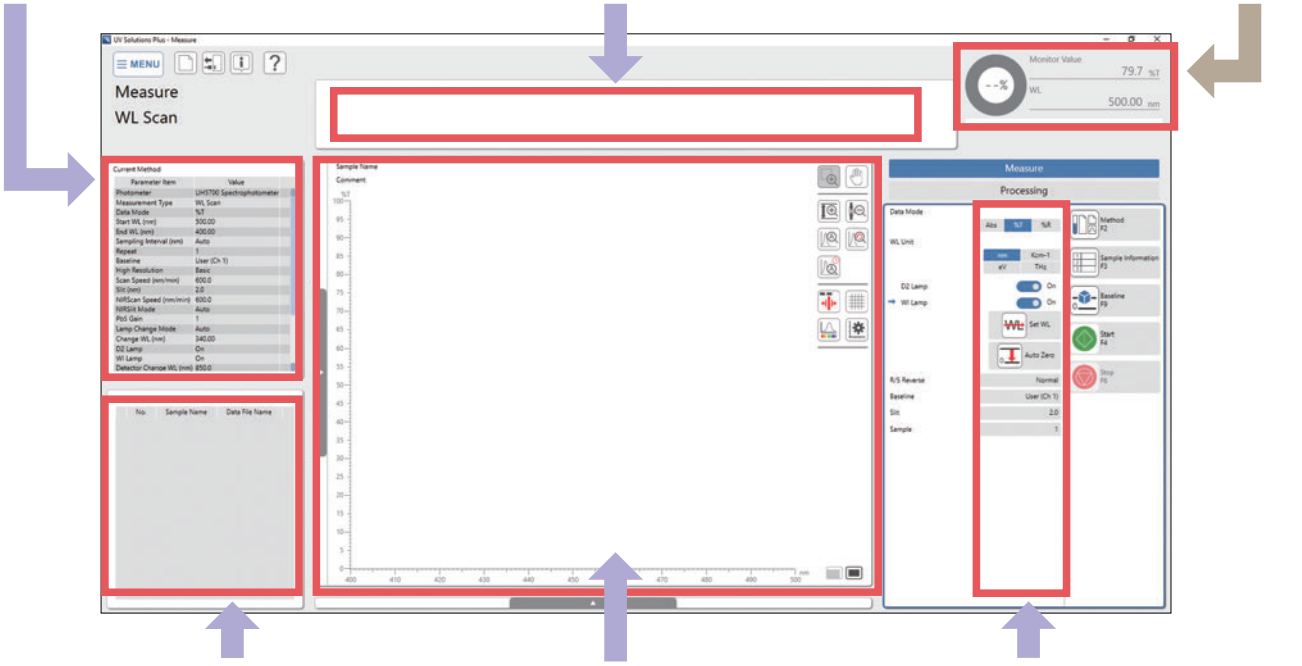
Introducing new control and data processing software UV Solutions Plus

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.



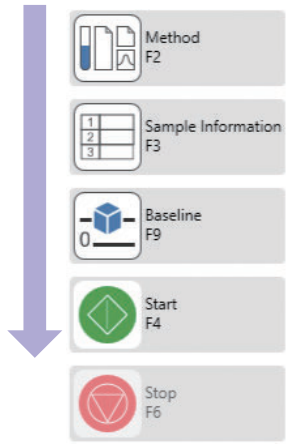
■ Sample information
Displays the sample name.

■ 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.

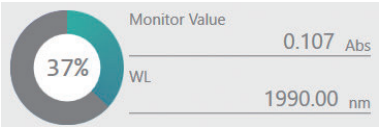
❸ Baseline
Perform baseline correction.

❹ Measurement Start
Start the measurement.

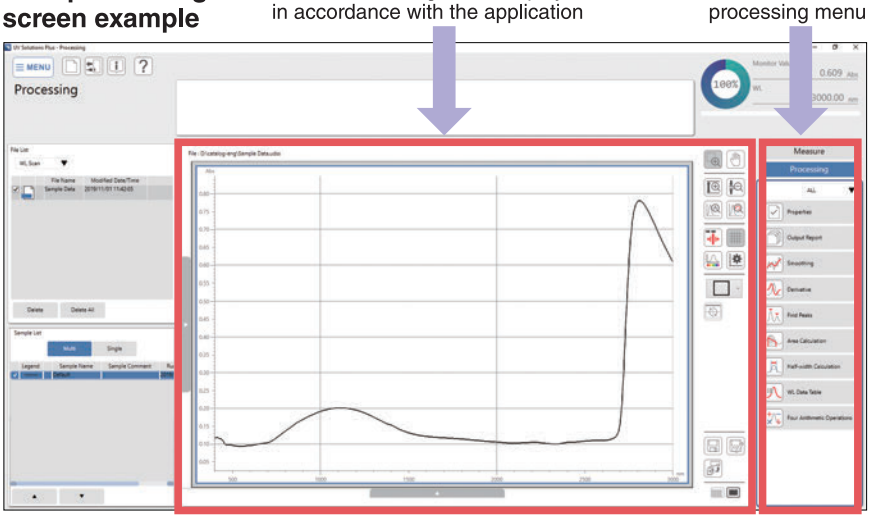
Many added features that follow in the footsteps of existing operability

- 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



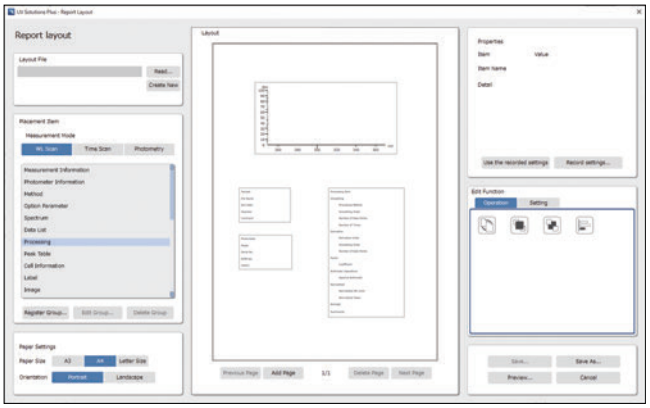
List display feature for data processing results

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.

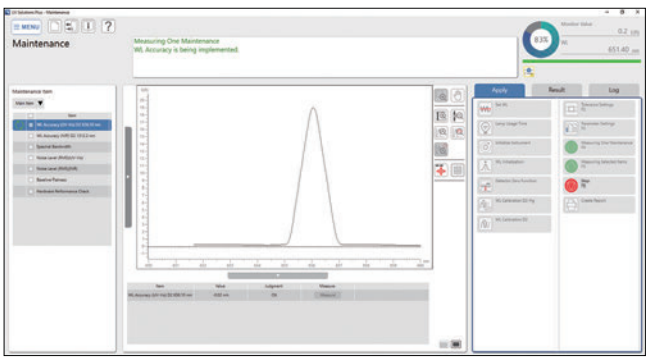
You can freely lay out printable items such as analysis conditions, data processing results, spectra, etc. with the report layout feature, which did not exist in the UV Solutions software in the past. You can also print designated image data (jpg, png, and bmp).



Standard installation of performance confirmation feature

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

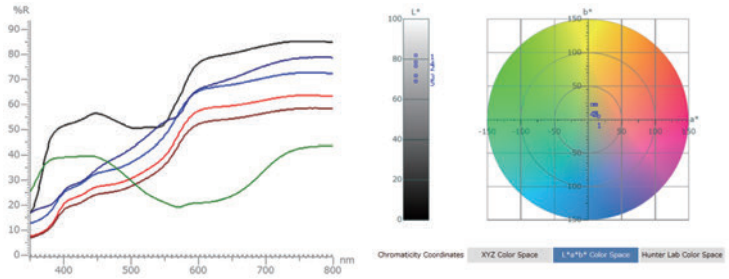
Performance confirmation feature items: wavelength accuracy, wavelength setting repeatability, noise level (RMS), baseline flatness, baseline stability, spectral band width, photometric accuracy, stray light, group editing of performance confirmation items, graphical display of performance confirmation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



Extension of UH3900S/UH3900D

A wide range of options are available to meet a variety of measurement applications.

Color measurement (Optional Package Program)



Reflection spectra and chromaticity coordinates of cosmetic products

Data List | Color Calculation

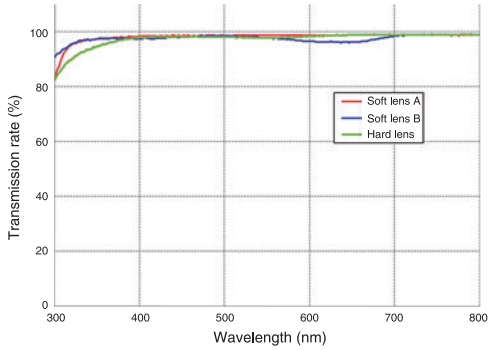
No.	Sample Name	x	y	L*	a*	b*
1	Sample 1	0.34808	0.32776	81.9807	15.9159	5.3274
2	Sample 2	0.37769	0.36709	76.7290	10.7088	22.2022
3	Sample 3	0.38313	0.36689	71.8882	12.0780	21.9181
4	Sample 4	0.36867	0.37075	78.6688	6.1955	22.1580
5	Sample 5	0.38502	0.36883	69.1062	11.6518	22.0902

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 visible light transmission (application to contact lenses)

Spectrophotometric transmittance of hard contact lenses and soft contact lenses was measured using an accessory device (custom made) for measuring the visible light transmission of contact lenses, and the visible light transmission calculated with reference to ISO18369-3.
Both types of contact lens had a high visible light transmission, and the repeatability (n=5) including device for lens removal, was good with a relative standard deviation of 0.07%.
Using the visible light transmission system will simplify measuring in the shipment inspection and other applications.



Transmission spectrum of contact lens

Results of calculation of visible light transmission

*Calculated referring to ISO 18369-3

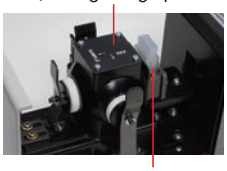
	Soft lens A	Soft lens B	Hard lens
visible light transmission (%)*	98.85	97.59	98.21

Results of repeatability of visible light transmission of soft lens A

	visible light transmission (%)
1	98.85
2	98.85
3	98.84
4	99.00
5	98.94
Ave	98.90
RSD%	0.07

Measuring device appearance

Accessory device,
60ϕ integrating sphere



Contact lens visible light transmission
Accessory measuring device (custom-made)

Accessories Expediting Application to Multi-Sample Measurement, Micro-volume Sample and Many Others

Micro cell holder
(P/N 122-0060)

Suitable for micro-sample measurement in medical and biochemical fields.

Specifications

Wavelength range	220 to 800 nm
Repeatability in cell placement	Within ±0.3 %T
Baseline flatness	Within ±0.0025 Abs (when using 50 µL micro-sample cell)

Micro-sample cell

The following cells are usable for the micro-sample cell holder.(P/N 122-0060)

Part No.	Part name	Capacity	Optical path length
130-0622	50 µL cell	50 µL	10 mm
130-0623	25 µL cell	25 µL	5 mm
130-0621	5 µL cell	5 µL	0.5 mm

Auto sipper
(P/N 2J1-0105)

This computer-controlled sample sipper is provided with a sample recovery function and other versatile functions. In combination with an autosampler, this unit makes it possible to carry out automated labor-saving analysis.

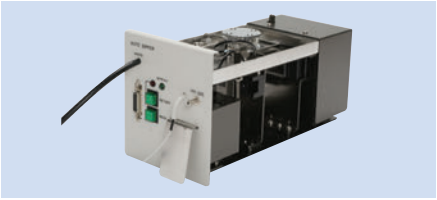
Specifications

Minimum sample volume	0.6 mL
Carryover	1 % or less
Cell capacity	Approx. 50 µL
Sample beam side	Flow cell(Path leyth:10 mm)
Reference beam side	10 mm rectangular cell mountable

*:Exchangeable with 10 mm retangular cell holder (standard equipment). Cell is not included.

Electronic thermostatted auto sipper
(P/N 2J1-0106)

The flow cell section is maintained at a constant temperature level under accurate control.



Specifications (reference beam side not temperature-controlled)

Minimum sample volume	0.6 mL
Carryover	1 % or less
Cell capacity	Approx. 50 µL
Sample beam side	Flow cell (Path leyth:10 mm)
Setting temperature	20 to 40 °C
Setting accuracy	Within ±0.5 °C
Reference beam side	10 mm rectangular cell mountable

*:Exchangeable with 10 mm retangular cell holder (standard equipment). Cell is not included.

AS-1010 autosampler
(P/N 2J1-0121/0122)

This unit is used for multiple-sample measurement in combination with an auto sipper or in flow injection analysis. A suction needle can be moved in three directions X, Y and Z.

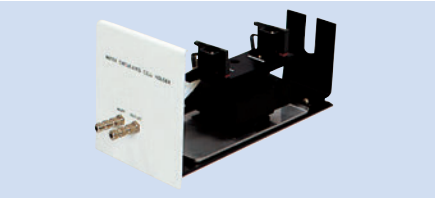
Specifications

Sample tube size	Outside diameter 15 mm, height 105 mm (option required)
	Outside diameter 12 mm, height 105 mm

*:Sample tube not included

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

Water from a thermostatic oven is circulated through this cell holder to maintain a sample cell at a constant temperature.
(Temperature control : R and S)



Specifications

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

*:Circulatory thermostatic oven and cell not included

Electronic thermostatted cell holder
(P/N 131-0306/0307)

This cell holder comes standard with an incorporated magnet stirrer. The temperature of sample in a cell is maintained at a constant level, and a temperature value down to 0.1 °C can be indicated. Since this unit is of electronic thermostatted type with forced air cooling, quick heating and cooling can be performed without a water circulating thermostatic oven.
(Temperature control : S only)

Specifications

Temperature range	10 °C to 60 °C (settable in increments of 0.1 °C, under condition of 25 °C room temperature)
Temperature control accuracy	Within ±2 °C (*) (difference between set temperature and actual sample temperature)
Temperature stability	Within ±0.5 °C (*)
Applicable cell	10 mm cell (cell not supplied)

*:Room temperature : 25 °C, sample : distilled water

Electronic thermostatted cell holder
(P/N 131-0301/0302)

In protein and nucleic acid melting measurement, sample temperature can be changed continuously to determine variation in absorbance. Being of an electronic thermostatted type, this cell holder is capable of quick heating and cooling. Sample temperature can be increased and decreased isothermally. Because this holder is equipped with a stirrer, the internal cell temperature can be kept uniform. (Temperature control : R and S)

Specifications

Applicable cell	10 mm cell (not included in this unit)
Temperature range	0 °C to 100 °C (settable in increments of 0.1 °C)
Temperature control accuracy	Within ±2 °C (*) (difference between set temperature and actual sample temperature)
Temperature stability	Within ±0.5 °C (*)
Provided with an isothermal regulating function	

*: Room temperature : 25 °C, sample : distilled water,
circulatory water temperature : 22 °C
Setting temperature : 10 °C to 60 °C
A circulatory thermostatic oven needs to be prepared separately.

*: Circulatory thermostatic oven not included

Micro flow cell unit
(P/N 210-2113)

Suitable for continuous measurement of a micro-quantity of sample.

Specifications

Cell capacity	70 µL
Optical path length	10 mm (quartz flow cell used)
Connection tubing	PTFE tube of outside diameter 2 mm and inside diameter 1 mm

Flow cell unit
(P/N 210-2173)

The inside of this cell is structured to minimize stagnation of liquid and adhesion of air bubbles.

Specifications

Cell capacity	600 µL
Optical path length	5 mm (quartz flow cell used)
Connection tubing	PTFE tube of outside diameter 4 mm and inside diameter 3 mm
Reference beam side	5 mm rectangular cell (standard accessory)

LC flow cell unit
(P/N 210-2131)

A flow cell especially designed for liquid chromatography.

6-cell positioner with temperature control

(P/N 2J1-0103/0104)

Six 10 mm cells can be mounted on the sample beam side, and they can be changed over automatically at certain intervals. (Temperature control : S only)

Specifications

Repeatability in cell changeover	Within ±0.5 % (at 100 %T)
Applicable cell	10 mm cell (not included in this unit)
Setting temperature	20 to 40 °C

*: Not including circulatory thermostatic oven and cell

Tandem cell holder

(P/N 210-2115)

A maximum of three 10 mm cells can be mounted on each of the sample and reference beam sides. Sample temperature can be maintained at a constant level by circulating temperature-regulated water through the cell holder section. (Temperature control : R and S)

Specifications

Temperature range	15 to 40 °C
Temperature stability	±0.3 °C

*: Not including circulatory thermostatic oven and cell

4-position rectangular long-path cell holder

(P/N 150-0940)

Four rectangular long-path absorption cells can be mounted on the sample beam side, and they can be changed over externally.

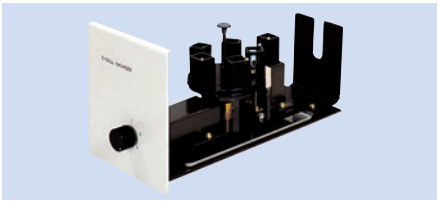
Specifications

Cell length	100 mm, 50 mm to 10 mm cells applicable

5-position turret cell holder

(P/N 210-2110)

Five 10 mm rectangular cells can be mounted on the sample beam side, and a micro-cell mask (200-1537, 200-1538) can be inserted in each cell holder. (Cells and micro-cell mask are not included.) It is recommended to prepare a set of five cells.



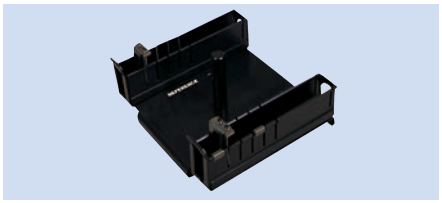
Part No. Part name

124-0352	10 mm quartz cell set (five cells in set)
124-0378	10 mm glass cell set (five cells in set)

Rectangular long-path cell holder

(P/N 210-2107)

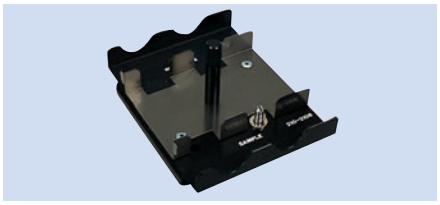
Rectangular cells having the following optical path lengths are applicable: 10, 20, 30, 40, 50 and 100 mm.



Cylindrical long path cell holder

(P/N 210-2108)

This holder is for cylindrical cell (ϕ30 mm)



Glass filter holder

(P/N 210-2109)

Used for transmittance/absorbance measurement of a solid sheet sample such as glass filter.

Specifications

Sample thickness	0.5 to 5 mm
Sample size	Minimum : 12 x 25 mm Maximum : 55 x 100 mm

Film holder

(P/N 210-2112)

Convenient for measurement of film-shaped samples.

Specifications

Film frame	Width 25 mm, height 30 to 55 mm
Beam aperture	Width 10 mm, height 20 mm

ϕ150 integrating sphere accessory

(P/N 2J2-0175)

Designed for diffuse reflectance measurement of a solid sample surface and absorbance measurement of a turbid sample. With an aperture ratio as small as 2 %, this unit is usable for high-accuracy colorimetric measurement.

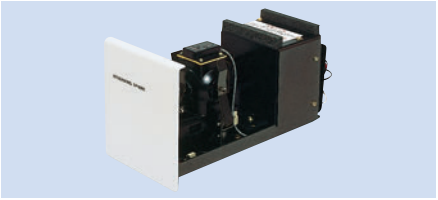
Specifications

Wavelength range	350 to 750 nm
100 %T line flatness	±0.5 %T
Aperture ratio	2 %
Light trap	Mountable

ϕ60 integrating sphere accessory

(P/N 2J2-0176)

Designed for absorbance measurement of a turbid sample and reflection measurement of a solid sample surface.



Specifications

Wavelength range	250 to 800 nm
100 %T line flatness	±1 %T
Aperture ratio	7.8 %
Specular reflection measurement attachment	Standard-equipped

5° specular reflectance accessory

(P/N 2J2-0177)

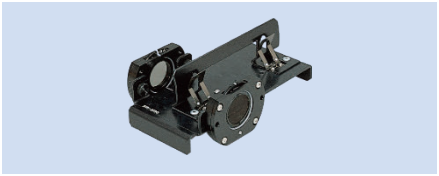
Using mirror reflection of a sample, relative reflectance is measured with respect to the standard reflection plate (aluminum-evaporated plane mirror). Applicable to film thickness measurement and spectral reflectance measurement.

Specifications

Angle of incidence	5°
Sample area	25 mm in diameter or more

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.



Specifications

Wavelength range	400 to 750 nm
Sample thickness	0,5 to 5 mm
Sample size	Min:12×25 mm / Max: 55×100 mm

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

Specifications

Model	UH3900S / UH3900D
Data processing part	OS: Windows
Dimensions (spectrophotometer main unit)	Approx. 680(W)×692(D)×257(H) mm
Operating temperature/humidity	Temperature: 15℃–35℃, humidity: 25–85% and with no condensation
Weight	Approx. 45 kg (spectrophotometer main unit)
Power consumption	AC 100 V 50/60 Hz　300 VA (Does not include a PC and printer)

Standard equipment	Qty
Spectrophotometer main unit	1 set
Tools	1 set
Instruction manual	1 set

Note: Absorption cells are not included in the standard equipment and should be prepared separately.
Note: A PC set is not supplied as standard equipment. It should be prepared separately.

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CAUTION: For correct operation, follow the instruction manual when using the instrument.
Specifications in this catalog are subject to change with or without notice, as Hitachi High-Tech Science Corporation continues to develop the latest technologies and products for its customers.
NOTICE: The system is For Research Use Only, and is not intended for any animal or human therapeutic or diagnostic use.
These data are an example of measurement; the individual values cannot be guaranteed.

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