

Hitachi High-Tech
HITACHI

Smart

Hitachi Double-Beam Spectrophotometer

UH5300

Simple

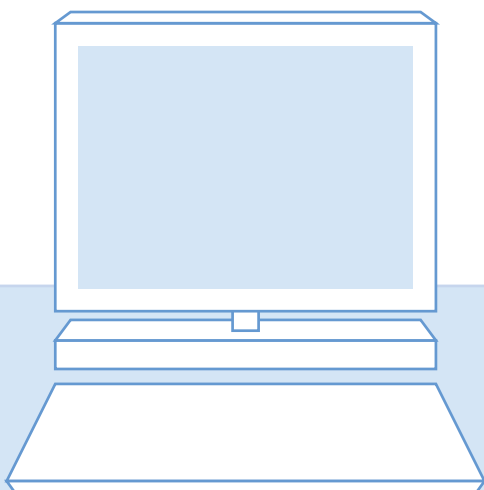


Easy

The technology for spectrophotometers continues to advance....

Hitachi designs spectrophotometers encompassing technologies for the future.

-Providing the best-in-its-class levels of performance and unprecedented operability*1-



Intuitive user interface, eliminates the need for printed manuals

Operability never before achieved

Tablet Terminal

The UH5300 can be controlled through the use of a tablet terminal*2 (iPad®). The user interface making full use of the tablet provides new, unprecedented operability.

The UH5300 is controlled via wireless connection*3, utilizing a thin and lightweight tablet terminal. Allows for future updating of its applications.

*1 : Survey by Hitachi High-Technologies Corporation. Models offered for sale in the Japanese market as of August, 2012

*2 : Windows PCs can be used to control the UH5300.

*3 : Use of a Windows PC allows wired connection. For further information on system configuration, see page 13.

Feature

Smart

- Use of long-life xenon flash lamp
 - >>>> Light source is guaranteed for seven years*⁴, resulting in lower operation cost
- Double-beam optical system
 - >>>> Ensures extended periods of data stability compared with the single-beam optical system

Simple

- Operation by use of tablet terminals
 - >>>> Simple and intuitive user interface
- Remote control through wireless communication
 - >>>> Flexible operating environment

Easy

- Simple and easy-to-understand performance check function
 - >>>> Assures the accuracy of data
- Automatic 6-cell turret as standard equipment
 - >>>> Improved efficiency and increased sample throughput

*⁴ : Registration of the product is required. For further information, please ask your dealer. The lamp is guaranteed against failure for seven years after the date of delivery or for a specified number of lamp illuminations, whichever comes first. The specified number of illuminations is represented as a percentage (%), depending on the working conditions of the lamps, in the maintenance menu of the UH5300, in reference to a lamp working condition of 100%. Assuming that the spectrophotometer is used for seven years, 240 days a year, the lamp working condition of 100% corresponds to 300 measurement events of absorbance measurement per day (number of wavelengths : one wavelength) or 20 measurement events per day for of wavelength scan measurement per day (scan range : 190 to 1,100 nm, scan speed : 200 nm/min).



Performance

Hitachi has achieved the best-in-its-class*¹ performance spectrophotometer using a combined xenon flash lamp and a stable double beam optical system.

This level of performance allows for highly accurate data to be obtained

Xenon flash lamps as long-life light sources
- Hitachi UH5300 guarantees the light sources for seven years*⁴ -

Long Life

- Unlike conventional systems*⁵, the use of xenon flash lamps reduces the frequency of lamp replacement.
- Xenon flash lamps of the Hitachi UH5300 are guaranteed for 7 years*⁴.

Wide Wavelength Range

- The UH5300 can make measurements in the entire wavelength range of 190 to 1,100 nm using a single light source.
- There is no concern about measurement error often associated with transition between light sources.

Short Stabilization Time

- Less heat emission from the lamps reduces the need for stabilization of the lamps unlike conventional devices.
- Due to its environmentally conscious design, the UH5300 consumes 25% less electricity than conventional devices*⁵.

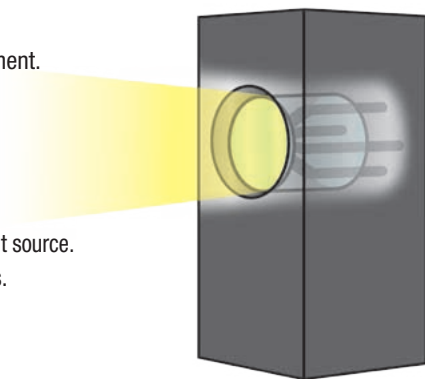


Image of xenon flash lamps

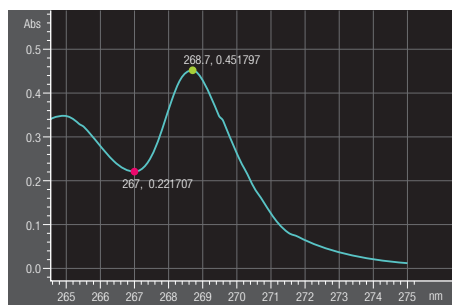
Best-of-class levels*¹ of resolution of 1 nm have been achieved.
-A uniquely designed wavelength drive system achieves a good balance between high-speed scanning and high wavelength accuracy-

High Resolution

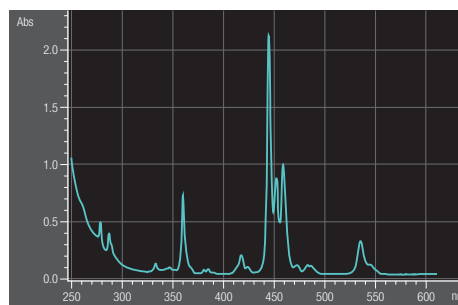
- Best-of-class*¹ resolution at 1 nm has been achieved.
- The European Pharmacopoeia specifies, as a standard of the resolution, an absorbance ratio of 1.5 or higher at the designated peaks of 0.02% (V/V) toluene solution. The absorbance ratio of the UH5300 is 2.04, surpassing the standard, as shown in the figure below.

High Speed & High Wavelength Accuracy

- The improved wavelength drive system results in a high scan speed of 6000 nm/min, while the xenon lamp-equipped system attains the highest levels*¹ of wavelength accuracy : ± 0.3 nm.
- Using a certified reference material such as holmium filter enables to check the wavelength accuracy using the peak detection function



Absorption spectrum of toluene in hexane



Absorption spectrum of holmium filter

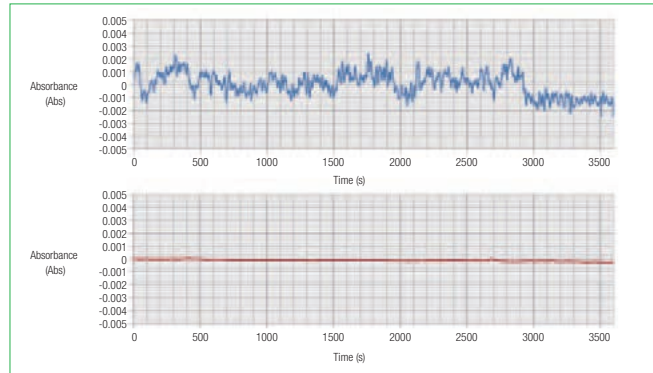
Stable optical system by using double beam - Allows extended periods of stable measurements-

High Stability

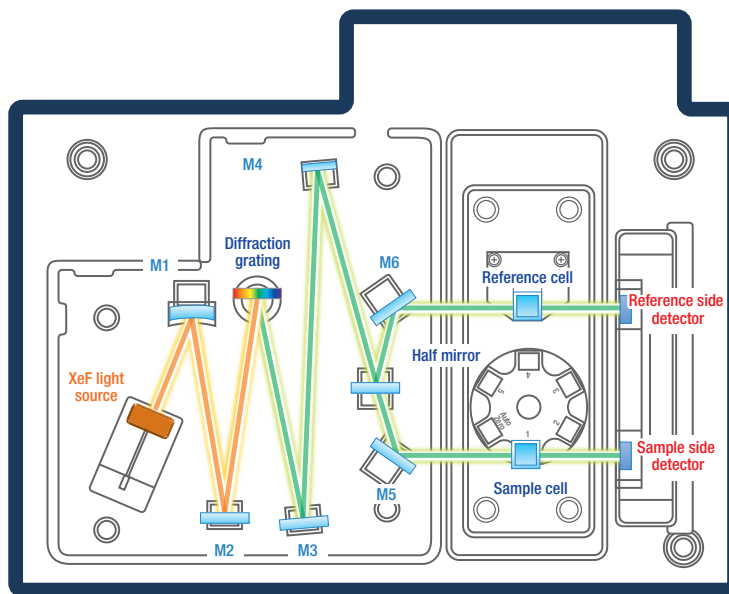
Light dispersed through a monochromator is divided into two luminous fluxes by a half mirror. The drift of the system is reduced by comparing the photometric values of the sample light and the reference light.

Features

Due to its symmetrical optical system, deviations in light intensity are corrected with high accuracy.



Comparison of baseline stability Single-beam device (above) Double-beam device (below : UH5300)



Actual optical system may be slightly different

Schematic view of the UH5300 optical system

High-throughput measurement by using the 6-cell turret -the "Intelligent Start" function makes it easier to use the device-

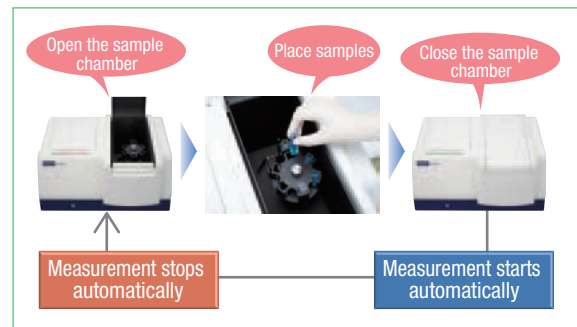
High Throughput

- UH5300 has a 6-cell turret as standard.
- UH5300 has measurement modes that allow automatic measurement of up to 6 samples in one step.

Intelligence

The Intelligent Start function provides superior operability and results in a reduction of measurement time.

- Place a sample cell in the sample chamber and close the sample chamber door to trigger an automatic measurement*6.
- The 6-cell turret, when used in auto start mode, may reduce measurement time.



Intelligent Auto Start

*6 : Patent pending (Japanese Patent Application No. 2012-181302)

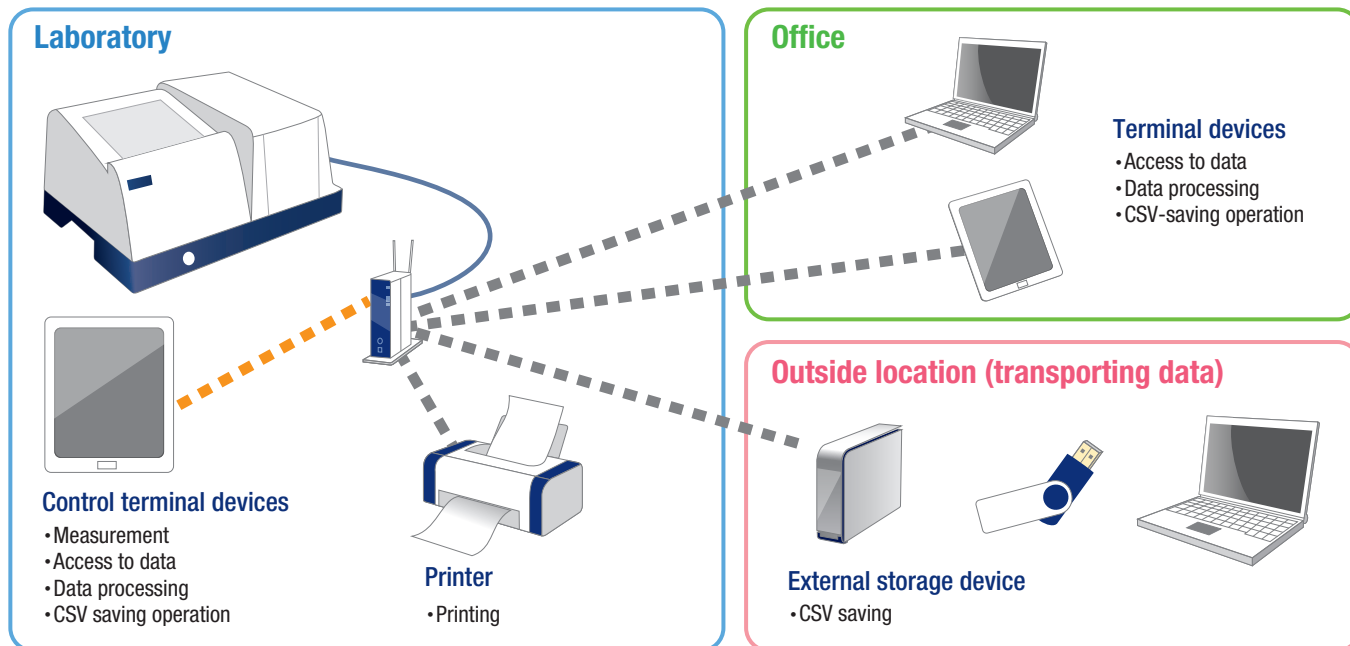


Operation

Instrument control through a wireless LAN connection

Hitachi offers a new type of operation in laboratories.

A new way of operating a spectrophotometer



Data files are stored in the internal memory.

The use of a wireless LAN connection allows instrument operators, data processors, system administrators, and various other users to have access to the instrument regardless of their location. The data acquisition status or data from measurements can also be checked while way from the instrument, providing a sense of security.

Remote Control



Remote Control

Remote control via wireless LAN allows the user to check the data in real time while away from the instrument. This is especially useful when running multiple samples or a time scan using an extended period of time.

Multi Access



Multi Access

Routers, if used, allow the connection of more than one tablet terminal or PC^{*7}. Instrument control and access to data can be achieved through control terminal devices, while access to the data stored in the device can be made through other connected terminals.

Data Retention/Printing



Data Transfer

Measurement data are stored in the internal memory of the UH5300. The data can be transferred to a USB memory drive through the USB ports. It can also be transferred to storage devices on the network.



AirPrint

An AirPrint-compatible printer, if used, allows a direct print over a wireless LAN from a tablet terminal.

Functions

Advanced touch screen user interface

Resulting in intuitive operation

Offering a new level of user simplicity

The UH5300 can be controlled using a tablet terminal (iPad®). The user interface for making full use of the tablet terminals provides new, unprecedented operability.



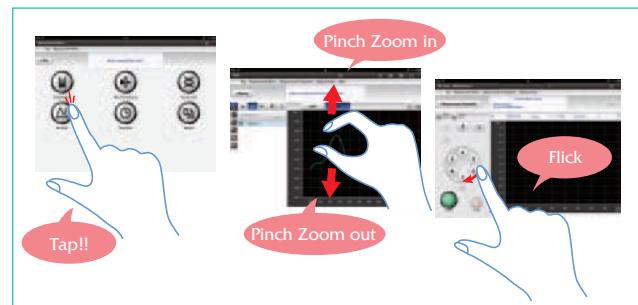
Operation through a tablet terminal

Touch panel operation



Touch Panel

Provides touch operation, pinch-zoom-in/out operation, and flick operation that are unique to touch panels. In the spectrum display screen, for example, pinch-zoom-in operation contracts a graphic image, while pinch-zoom-out operation expands it. Flick operation on the 6-cell turret on the screen also allows interlocking of the control software screen and cell movement.



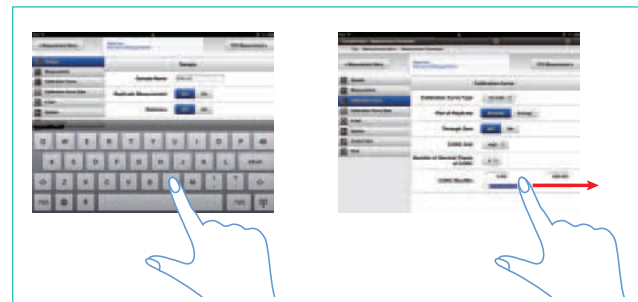
Touch panel operation



Character Input Tool

Characters can be input by using the touch keyboard displayed on a tablet terminal, and numeric characters can be input by using the slider bar.

Provides flexible input operations, both by mouse-click operation on a PC and tap operation on a tablet terminal.



Character/numeric input operation



Visual Icon

Visual icons of universal design make the operation simple. Even novice operators will find it intuitive and easy to use the instrument.



Examples of icon designs



Software

Simple and easy-to-use control software

Expand measurement possibilities just by touching the screen.

Main functions of application software -Main Menu-

The main menu provides access to various functions. The control software is designed with emphasis on simple and intuitive operability, providing an easy-to-follow measurement flow, even for someone who is unfamiliar with a spectrophotometer.

Measurement

Various measurement modes are available, including concentration, wavelength scan, and time change measurement. For details, see page 8.

Maintenance

Mode for performance check and wavelength calibration. Lamp conditions can also be checked.

Method File

Used to locate method files by specifying specific information such as analyst, sample name, etc.

Basic Settings

Basic Settings of the spectrophotometer
Used to specify a network destination for auto-saving files as well as the selection of display colors for graphs.

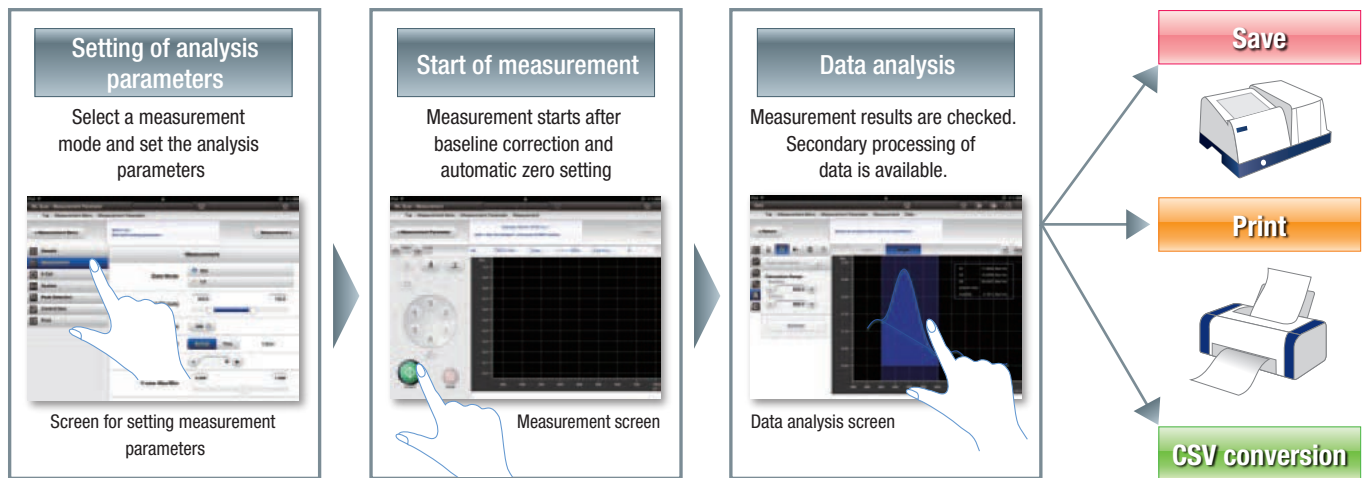


Top screen (Main menu)

Data file

Used to locate data files by specifying measurement information such as analyst, sample name, etc.

Simplified operational flow



Measurement can be accomplished in three steps: analysis parameters setting, measurement, and data processing. Measurement data are saved in the internal memory of the UH5300. The stored data can also be printed out via commercially available printers or converted into the CSV file format for storage in the USB memory, PC, or external storage devices on networks.



Measurement Menu

Various measurement modes are available to accommodate a wide range of applications.



Concentration measurement

Measures standard solutions to prepare a calibration curve and uses it to perform quantitative analysis of unknown samples. Also, provides quantitative determination using entering coefficients.



Absorbance/Transmittance measurement

Used for continuous measurement of single-wavelength or multiple-wavelength absorbance (transmittance). Allows selection of up to 6 wavelengths.



Nucleic Acid measurement

Makes quantitative determination of nucleic acids or proteins or purity determination of nucleic acids by two-wavelength or three-wavelength absorbance.



Wavelength scan measurement

Measures an absorption/transmission spectrum in a range between 190 and 1,100 nm



Time change measurement

Measures a change in the photometric value (absorbance/transmittance) over time at a fixed wavelength for up to 100,000 seconds.



Monitor measurement

This mode is a useful mode for the measurement of either absorbance or transmittance at a single wavelength while reading the results.

Measurement supporting functions

Helps to provide intuitive operation and includes support functions when required.

File search function



Data Search Function

The file search function provides access to stored data and a search capability. Data of interest can be searched by entering a keyword using the keyboard.



Electronic operation manual

The UH5300 is shipped with a CD-ROM that contains an electronic operation manual. Because it is in PDF format, it can be viewed directly with an iPad® or PC*⁸. A keyword search in the electronic operation manual provides the necessary information, when needed.



*8 : To browse from an iPad, the free iBooks application, which is available from Apple, is required.



Application

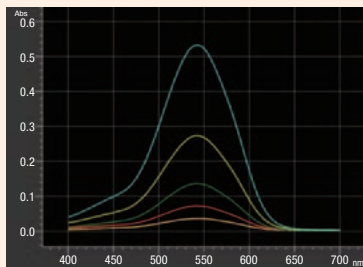
The UH5300 supports various measurement applications.



Environmental Field

Quantitative determination of hexavalent chromium (diphenylcarbazide - absorption photometric method)

Shown on the right is an example of quantitative determination of hexavalent chromium using the diphenylcarbazide - absorption photometric method. Plating by trivalent chromate treatment used to comply with the RoHS Directive can be analyzed for the presence of hexavalent chromium.



Example of absorption spectrum measurement in the wavelength scan mode



Example of a calibration curve in the concentration measurement mode

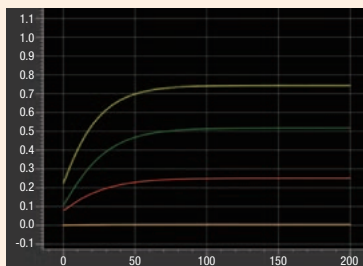
Cell Position	STD No.	Abs	CONC (mg/L)	MEAS
1	STD1	0.0000	0.000	MEAS
2	STD2	0.0000	0.000	MEAS
3	STD3	0.07287	0.100	MEAS
4	STD4	0.13007	0.200	MEAS
5	STD5	0.27439	0.400	MEAS
6	STD6	0.55878	0.800	MEAS



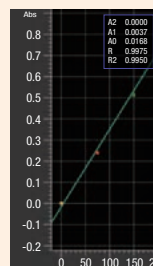
Foods Industry

Quantitative determination of D-glucose (enzyme method)

D-glucose is widely found in plants and animals and is an essential component in metabolic pathways. An example of measurement by the enzyme method using F-kit*⁹ is shown. Making use of an enzyme reaction, coenzyme NADH or NADPH is measured for absorbance at 340 nm to determine an increase or decrease.



Example of measuring absorbance vs. time in the time scan mode



Example of a calibration curve in the concentration measurement mode

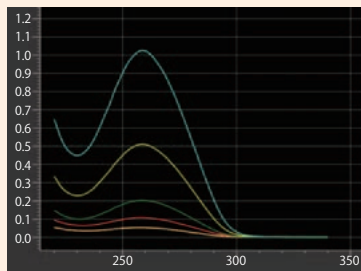
Cell Position	STD No.	Abs	CONC (mg/L)	MEAS
1	STD1	0.0000	0.000	MEAS
2	STD2	0.2000	10.000	MEAS
3	STD3	0.3700	18.000	MEAS
4	STD4	0.7000	35.000	MEAS



Bio-Technology Field

Quantitative determination of salmon testicle DNA (ultraviolet absorption method)

The absorption spectrum of a nucleic acid solution shows a minimum absorption at around 230 nm and a maximum absorption at around 260 nm. Use of the nucleic acid measurement mode allows for determination of purity from the two-wavelength ratio as well as determination of the DNA concentration from absorbance at 260 nm.



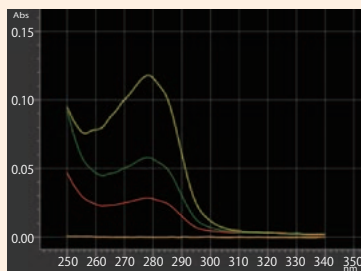
Example of absorption spectrum measurement in the wavelength scan mode

Cell Position	Sample ID	WL1 (260.0)	WL2 (280.0)	Bk.gd. (260.0)	Abs Ratio	Nucleic Acid CONC (µg/mL)	Purity
A	BLK						
✓	1	0.05365	0.02621	0.00106	1.927	2.630	107.6
✓	2	0.10791	0.05842	0.00319	1.896	5.236	105.3
✓	3	0.20335	0.10799	0.00604	1.889	10.14	105.0
✓	4	0.51108	0.27201	0.00215	1.886	25.45	104.8
✓	5	1.02661	0.54562	0.00224	1.885	51.22	104.7

Example of purity and nucleic acid concentration determination using the nucleic acid measurement mode

Quantitative determination of protein (Warburg-Christian method)

Protein (BSA) was subjected to quantitative analysis using the ultraviolet absorption method. The nucleic acid measurement mode has a built-in formula for protein concentration calculation which uses the Warburg-Christian method, thus allowing easy determination of protein concentrations.



Example of absorption spectrum measurement in the wavelength scan mode

Sample ID	WL1 (260.0)	WL2 (280.0)	Bk.gd. (260.0)	Abs Ratio	P.CONC (mg/ml)
✓	1	-0.00002	0.00005	-0.00010	0.000
✓	2	0.02377	0.02779	0.00640	0.812
✓	3	0.04622	0.05591	0.00619	0.805
✓	4	0.07679	0.11348	0.00693	0.856

Example of protein concentration determination in nucleic acid measurement mode



Option

A wide range of accessories is available to support various applications.

Sample Handling Accessories



Accessories

The UH5300 offers a variety of accessories to meet your analytical needs. These accessories support your measurement effort for a wide range of applications.



Single cell holder
(P/N 3J1-0106)

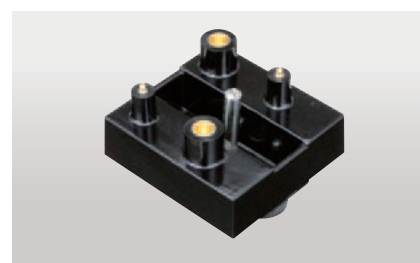
Used for measuring samples placed in a 10 mm path length cell



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

Used for measuring samples placed in rectangular long path cells of up to 100 mm path length

Light path length	10, 20, 30, 40, 50, 100 mm
Lateral width	12.75 mm

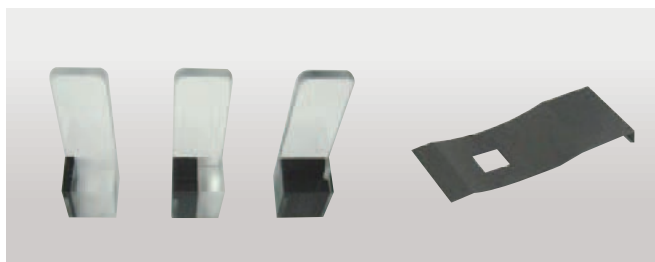


Holder base
(P/N 3J1-0109)

Used as a base when the following samples holders are used in the instrument

Options that require the holder base

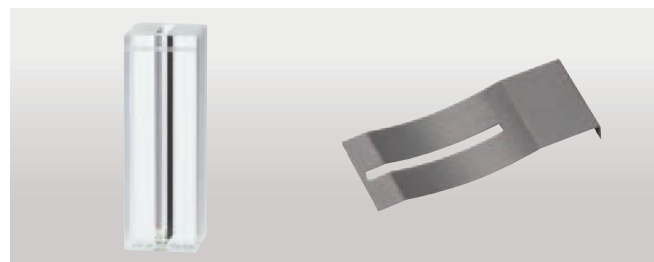
Product name	P/N
Single cell holder	3J1-0106
Rectangular cell holder	210-2107
Glass filter holder	210-2109
Film holder	210-2112
Light polarizer holder	210-2130



Ultra-micro volume sample measurement

Ultra-micro volume cells are used in the sample chamber of the UH5300 in combination with the holder base (3J1-0109), single cell holder (3J1-0106), and trace sample cell mask (3J1-0116). It is suited for the measurement of a trace sample of about 1.5 to 90 μL .

Product name	P/N	Capacity (μL)	Light path length name
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	—	—



Micro cell

Micro cells are used in the sample chamber of the UH5300 in combination with the holder base (3J1-0109), single cell holder (3J1-0106), and micro cell mask (200-1537). It is suited for the measurement of a small amount of sample of about 340 to 600 μL .

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



**Auto sipper
(P/N 3J1-0101)**

Effective for quick measurement of multiple samples. When the lever is depressed, the automatic sipper takes a sample from a test tube and measures it automatically.

Minimum sample volume	0.6 mL
Carry over	1% or less
Cell capacity	Approximately 50 μ L



**Water circulated cell holder with stirrers
(P/N 3J1-0104)**

A magnetic stirrer agitates the sample solution, allowing measurement with high temperature accuracy. Using Starna's magnetic stirred micro cells allows for measuring a small amount of sample.

Operating temperature range		5°C to 60°C
Compatible cells		Capacity
10 mm square cell		2.4 to 3.5 mL
Starna's magnetic stirring cell	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 μ L



**Electronic thermostatted cell holder (P/N 131-0301 for 115V)
(P/N 131-0302 for 200V)**

Electronically controlled constant-temperature cell holder using a Peltier device. This accessory requires front panel (P/N: 3J1-3214). Place an order separately.

Temperature range	0 to 100°C (can be set in increments of 0.1°C) (normal temperature : 25°C)
Temperature accuracy	within $\pm 2^\circ\text{C}^*$ (difference between set temperature and sample temperature)
Temperature stability	within $\pm 0.5^\circ\text{C}^*$
Includes constant temperature drop function	

*Room temperature : 25°C Sample: distilled water
Circulating water temperature: 22°C Set temperature : -10°C to 105°C
A circulating constant-temperature bath is required.



**Glass filter holder
(P/N 210-2109)**

Used to measure the transmittance or absorbance of a plate-like solid sample such as a glass filter.

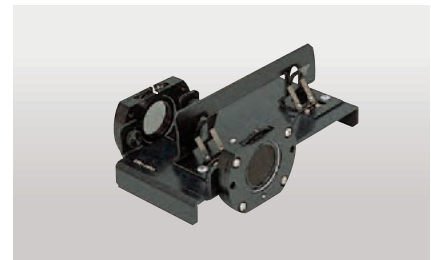
Sample thickness	0.5 to 5 mm
Sample size	12 \times 25 mm to 55 \times 100 mm



**Film holder
(P/N 210-2112)**

Used to measure a film-shaped sample

Film frame	width : 25 mm, height : 30 to 50 mm
Opening for light flux	width : 10 \times height: 20 mm



**Polarizer holder
(P/N 210-2130)**

Linearly polarizes light flux sample and measures polarization.

Wavelength range	400 to 750 nm
Sample thickness	0.5 to 5 mm
Sample size	Minimum : 12 \times 25 / Maximum : 55 \times 100 mm



4 Position rectangular long path cell holder (P/N 150-0940)

Four rectangular absorption cells can be mounted on the sample side, and these cells can be switched from the outside. This accessory requires a front panel (P/N: 3J1-3214). Ordered separately.

Cell length	100 mm, 50 to 10 mm long path cells are usable
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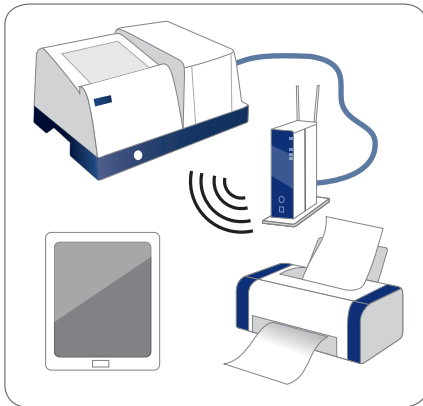
System

Choosing system configurations -Available systems-

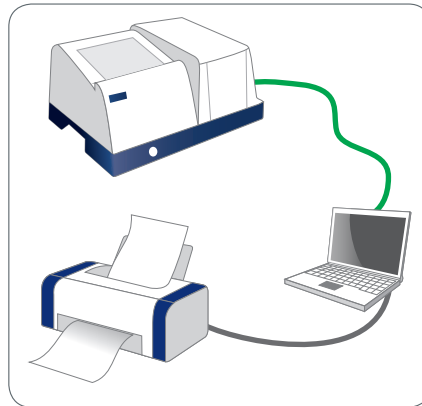


LAN connection

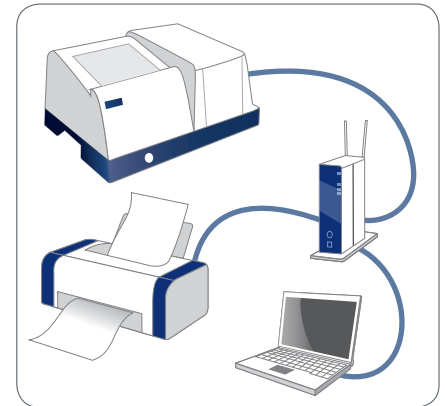
The UH5300 is equipped with LAN ports that not only provide a wireless connection through wireless LAN routers but also direct the connection via LAN cables (cross type) to other equipment. Use of a router provides flexible building systems to suit customers' requirements.



(a) Tablet terminal control (wireless LAN connection)



(b) PC control (wired LAN connection)



(c) PC control (network connection)

(a) An example of a system configuration under the tablet terminal control (customer-supplied items)

Item	Contents
Tablet terminal	Fourth generation iPad® installed iOS 6 (as of May 2013**10) (Activate (or authenticate) your iPad® in your Internet environment before using it.)
Wireless LAN router	Wi-Fi (802.11a/b/g/n) -compatible router
LAN cable (straight cable)	Category 5e or higher cable (not required if it is supplied with a wireless LAN router).
Printer	For connection to iPad : AirPrint-compatible printer

(b) An example of a system configuration under PC control (customer-supplied items)

Item	Contents
Windows® PC	PC meeting the recommended specifications in the table below
LAN cable (cross cable)	Category 5e or higher cable
Printer	Windows-compatible printer that can be used with your PC

(c) An example of a system configuration under PC control (customer-supplied items)

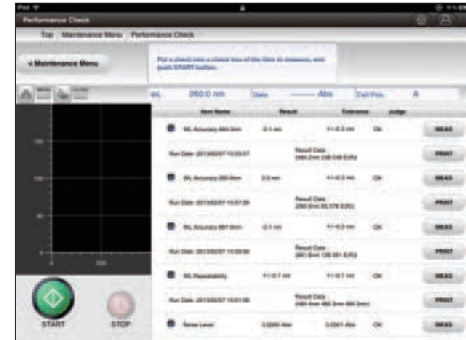
Item	Contents
Windows® PC	PC meeting the recommended specifications in the table below
Router	Router-compatible with your PC or network environment
LAN cable (straight cable)	Category 5e or higher cable
Printer	Windows-compatible printer that can be used with your PC

Recommended Windows® PC specifications

Item	Contents
OS	Windows® 7 Professional (32 bit or 64 bit)
CPU	CPU compatible with the above OS
Memory	Minimum of 2 GB or more recommended
Hard disk	Free space of 5 GB or more
Display	Display with a possible resolution of 1024 × 768 pixels or more
CD-ROM drive	24× or more recommended
Interface	Wired LAN : Pursuant to Standards IEEE802.3ab (1000BASE-T), IEEE802.3u (100BASE-TX), IEEE802.3 (10BASE-T)
Web browser software	Safari® 5.1.7
Mouse	Wheel-fitted mouse

Performance check

- Simple and easy-to-understand performance check feature is available.
- Assures the accuracy of data.



Screen of Performance check

Specifications

Optical system	Czerny-Turner mount, Double beam monochromator
Wavelength range	190 to 1,100 nm
Spectral band width	1 nm
Stray light	198 nm (KCl) : 1.0 % or less 220 nm (NaI) : 0.05 % or less 340 nm (NaNO ₂) : 0.05 % or less
Wavelength accuracy	±0.3 nm (Xe : 260.6, 484.3, 881.9 nm, Hg : 253.7, 435.8, 546.1 nm)
Wavelength repeatability	±0.1 nm
Photometric range	Abs : -3.3 to 3.3 %T : 0 to 300
Photometric accuracy (certified according to NIST SRM 930)	±0.002 Abs (0 to 0.5 Abs) ±0.004 Abs (0.5 to 1.0 Abs)
Photometric repeatability (repeatability according to NIST SRM 930)	±0.002 Abs (0 to 1.0 Abs)
Scan speed	10, 40, 100, 200, 400, 800, 1,200, 2,400, 4,800, 6,000 nm/min
Response	Fast, Medium, Slow
Baseline stability	0.0005 Abs/h (260 nm after a two-hour warm-up period)
Noise level	0.0001 Abs (RMS, 260 nm, 0 Abs)
Baseline flatness	±0.0009 Abs (200 to 950 nm)
Light source	Xenon flash lamp
Detector	Silicon photodiode
Cell holder	Automatic 6-cell turret *Single cell holder are available as an option.
Printer output	For connection to iPad : AirPrint-compatible printer For connection to PC : PC-compatible printer
Interface	LAN port : connected to a router or PC USB port : connected to USB memory for use when transferring CSV-format files
Size (main Unit)	510 (W) × 490 (D) × 280 (H) mm
Weight	19 kg
Power	100, 115, 220, 230, 240V, 50/60 Hz, 150VA
Power consumption	70 W or Less
Ambient temperature	15 to 35 °C
Ambient humidity	25 to 80 % (no condensation, to be 70 % or less at temperatures exceeding 30 °C)

* Operation software is built into the UH5300.

* iPad, AirPrint, iBooks, and Safari are registered trademarks or trademarks of Apple Inc. in the U.S. and other countries.

* For information on AirPrint-compatible devices, see the Apple website.

* The latest iBook and Safari can be downloaded from the Apple website.

* Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the U.S. and other countries.

Software functions

- **Basic functions**
 - 6-cell mode setting function
 - Automatic monitor power-off time setting function
 - Intelligent start function
- **Measurement modes**
 - Concentration measurement
 - Absorbance/transmittance measurement
 - Nucleic acid measurement (nucleic acid purity, nucleic acid concentration, protein concentration calculation)
 - Wavelength scan
 - Time change
 - Monitor measurement
- **Data/measurement condition saving functions**
- **File search function**
- **Maintenance functions**
 - Wavelength calibration
 - Lamp usage time monitoring
 - Sample chamber opening/closing detection
 - Performance evaluation
 - Performance evaluation using mercury lamps
 - Maintenance history storage
- **Data processing functions**
 - Scale changing
 - Trace
 - Statistical calculation
 - Spectrum overwriting
 - Peak detection
 - Smoothing
 - Differentiation
 - Area calculating
 - Rate calculating
- **Output capability**
 - File output in CSV format
 - Report output

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-Technologies Corporation continues to develop the latest technologies and products for our customers.

NOTICE: The system is For Research Use Only, and is not intended for any animal or human therapeutic or diagnostic use.

Hitachi High-Technologies Corporation

Tokyo, Japan

www.hitachi-hitec.com/global/science/

24-14, Nishi-shimbashi 1-chome, Minato-ku Tokyo 105-8717, Japan

*For technical consultation before purchase, please contact:
contact@nst.hitachi-hitec.com*

