UV-1700

PHARMASPEC

UV-VIS SPECTROMETER

SHIMADZU

Stablish year – 2009

In physics lab

Department of Pure & Applied Physics

Koni, Bilaspur (C.G.)

SHIMADZU
Access to **your** success

UV *PharmaSpec* -1700

Shimadzu UV-VIS Spectrophotometer

World-leading 1 nm resolution is the best in its class

UV–1700
PharmaSpec

▮ **Specifications (wavelength accuracy, resolution, photometric accuracy, etc.) and functions conform to the European, US, and Japanese pharmacopoeias.**

▮ **Hardware validation (9 items) as standard.**

▮ **Supports IQ/OQ ***

▮ **Compact design - 17 kg lightweight model can be easily moved by a single person.**

▮ **Simple operation with specialized function keys. Ease of operation via clear interactive LCD display.**

▮ **Comprehensive functions for quantitative and qualitative analysis installed as standard can be extended using IC cards. PC-compatibility using latest Windows software.**

▮ **Multi wavelength photometricmeasurement mode is standard.**
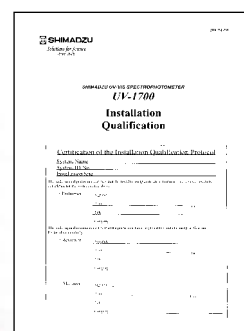
* IQ/OQ contains the following details that are checked and recorded at the time the equipment is installed. They are extremely important documents for compliance with FDA guidelines.
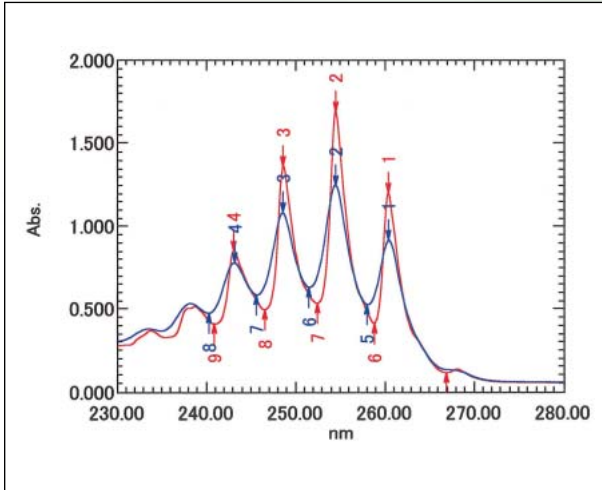
1. IQ (Installation Qualification)
Confirms that the instrument has been properly installed in the original configuration and in an appropriate environment.

**2. OQ (Operational Qualification)**
Confirms that the instrument has achieved the original target performance.

Benefits of 1nm resolution

Substances containing benzene rings exhibit sharp absorption bands near 250 nm. In such cases, a 1 nm difference in resolution is clearly apparent. The diagram above shows the spectra of an ethanol solution of benzene obtained with the UV-1700 and a previous instrument with a 2 nm resolution (bandwidth). The diagram confirms a maximum 40% difference due to the different resolutions. (Diagram displayed using the UVProbe PC software.)
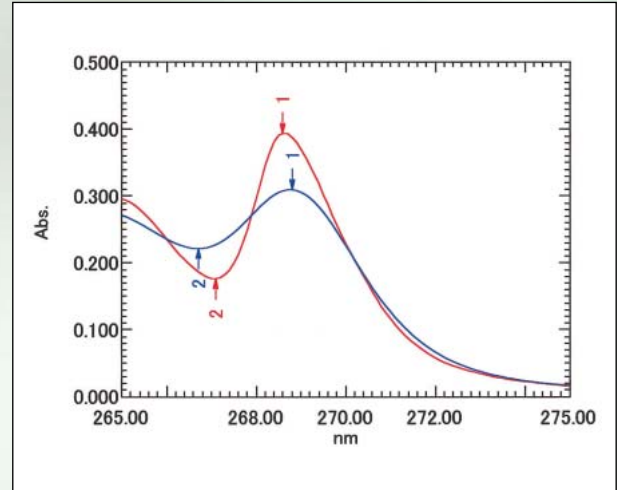
The UV-1700 comfortably clears the wavelength resolution standard prescribed in the European Pharmacopoeia. The European Pharmacopoeia demands a ratio exceeding 1.5 between the peak value near 269 nm and valley value near 266 nm for a toluene solution in hexane. This ratio is 2.23 in the diagram above obtained with the UV-1700. (Diagram displayed using the UVProbe PC software.)
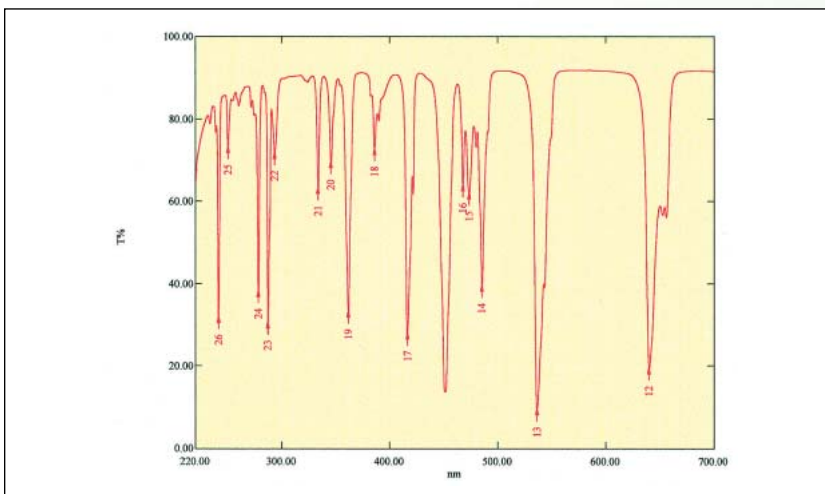
No.		Wavelength(nm)
12		640.3
13		536.3
14		485.2
15		473.3
16		467.5
17		416.1
18		385.6
19		361.3
20		345.3
21		333.3
22		293.3
23		287.1
24		278.2
25		250.0
26		241.2

The wavelength accuracy check is conducted using optical wavelength accuracy check filters.
(The diagram shows the spectrum and peak-detection results for an NIST standard holomium solution SRM2034 for wavelength calibration.)

From photometric to multi-component quantitation, almost all of the functions required in the lab are built in.

Spectrum

A samples spectrum is recorded using wavelength scanning. Repeat scans let you follow sample changes over time. Zoom in on the finished spectrum for a better view, and then use the peak/valley pick function to select maxima amd minima, and perform a wide variety of data processing functions.

Quantitation

Generates a calibration curve from measurement of standards, and then calculates the concentrations of unknowns. Allows various combinations of wavelength number (1 to 3 wavelengths, peak area values) and calibration curves (K factor, 1st to 3rd order).

Kinetics

Measure absorbance changes as a function of time, and obtain the enzymatic activity value. Select among single wavelength, multicell, double wavelength and rate measurement methods. Using the MMC-1600/1600C (8/16 cells) or the CPS-240A Cell Positioner (6 cells), multiple samples can be measured at the same time.

Time Course Scan

Measures the changes in absorbance, transmittance or energy as a function of time. Using the MMC-1600/1600C (8/16 cells) or the CPS-240A Cell Positioner (6 cells), multiple samples can be measured at the same time.

Multi-Component Quantitation

Quantitates up to 8 components mixed in a single sample. The calibration equation is determined using pure or mixed components with known values.

Optional Application Programs

In seconds, the easy-to-insert program packs reconfigure the UV-1601 for specific laboratory protocols.

Multi Wavelength Measurement

Measure the absorbance and transmittance at up to eight designated wavelengths. For absorbance measurements, calculation of data for up to four wavelengths, including the difference or ratio between two wavelengths, is possible.

Instrument Conditions

The basic instrument conditions can be set to accommodate the method of use for even greater convenience. And, built-in self-performance check functions ensure the continued reliability of measurement data.
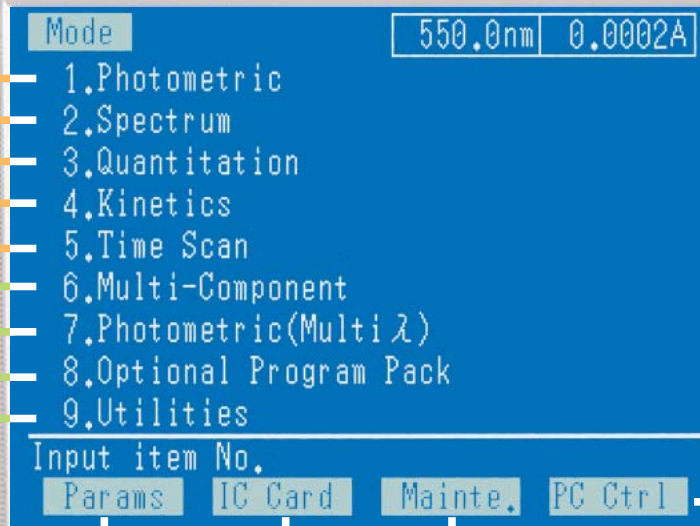
Wavelength repeatability and other automatic test functions are built-in, providing easy compliance with GLP and ISO-9000 requirements.

Photometrics

Measures absorbance or transmittance at a wavelength of your choice. By connecting an optional multicell sample compartment, up 16 samples can be measured continuously (when using MMC-1600/1600C and 16-cell micro multicell). And, data may be conveniently stored on IC cards.

PC Control

The built-in RS-232C allows connection between the UV-1700 and your PC, permitting full control from the PC, automatic system configuration, data exchange, and an expanded array of data processing functions.

```
Mode                    550.0nm  0.0002A
 — 1.Photometric
 — 2.Spectrum
 — 3.Quantitation
 — 4.Kinetics
 — 5.Time Scan
 — 6.Multi-Component
 — 7.Photometric(Multi λ)
 — 8.Optional Program Pack
 — 9.Utilities
Input item No.
   Params    IC Card    Mainte.   PC Ctrl
```

Maintenance

The maintenance functions include an indication of the date and time of the previous baseline correction, confirmation of lamp usage time, and unit validation.

IC Cards

Special IC cards greatly extend the functionality of the UV-1700 system. IC card utilities allow data pack copying, IC card initialization, and other functions.

Parameter Recall

The measurement mode and its parameters can be stored in memory or on IC cards, available for recall and setting at any time. Operation is easy and there is less possibility of making setting errors.

From transparent samples to samples with suspended and components, they can all be measured and quantitated. Even volume and enzyme activity measurements are possible.

1. Micro Volume Sample Measurement

3uL capillary cells and 50µL ultramicro cells are available for measurement of minute volumes of sample. The spectra in the first figure were obtained from measurement of DNA in herring sperm in phosphate buffer solution. (A 3µℓ capillary cell was used.) Even though measurement was conducted in the ultraviolet region, the light beam was condensed sufficiently to provide a spectrum with a high signal-to-noise ratio. The second figure shows the linearity of the calibration curve.
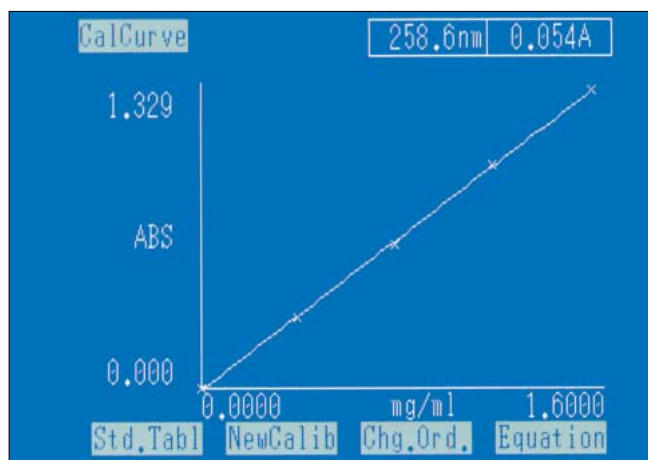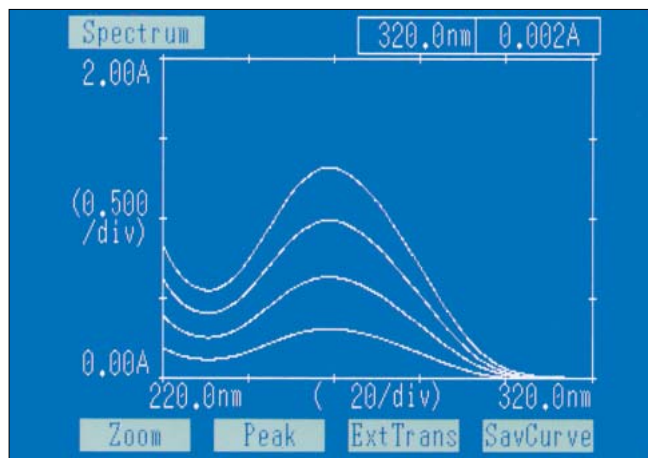
2. Multicell Kinetic Measurement

Multicell kinetics measurement can be performed using a temperature controlled cell positioner. At right, the enzyme activity of cholinesterase in blood serum was measured. Enzyme reactions can be measured in up to 16 cells at one time.
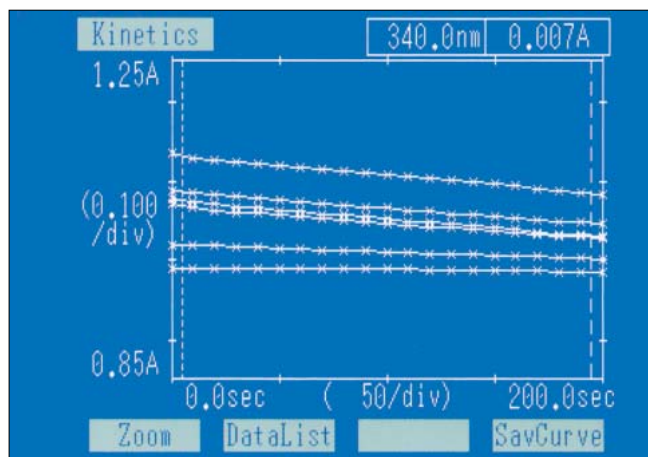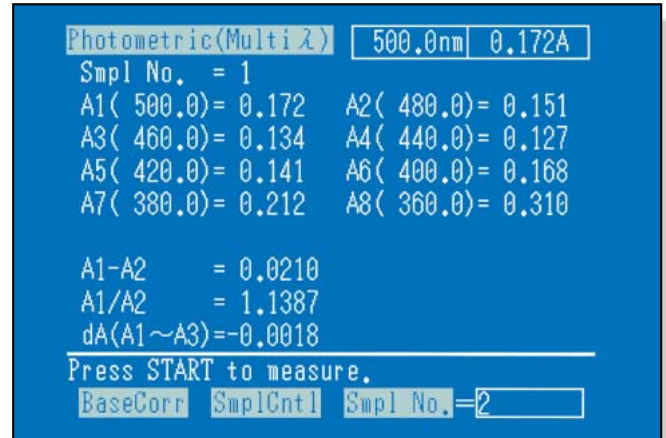
3. Multi Wavelength Measurement

Measures the absorbance or transmittance for a sample at up to eight selected wavelengths. When absorbance is measured, results can be displayed or output by calculating data using up to four wavelengths.
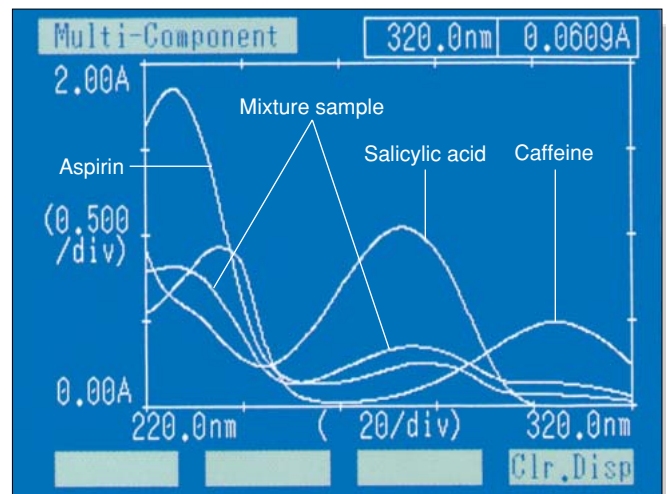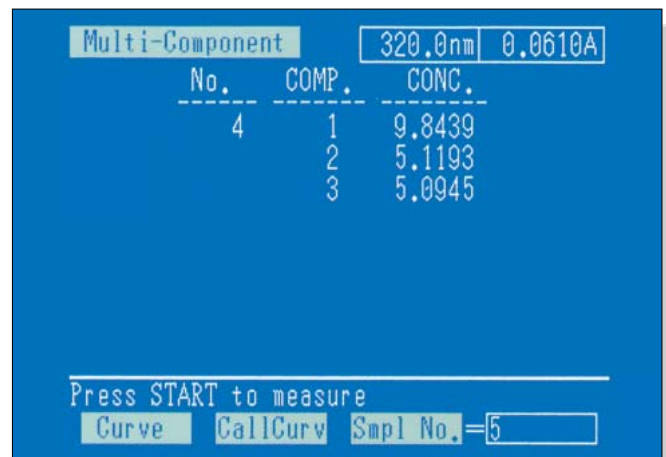
Note : If a printer is connected, results are printed after each measurement. (The data cannot be saved for individual measurements.)

```
Photometric(Multi λ)   500.0nm  0.172A
Smpl No.  = 1
A1( 500.0)= 0.172    A2( 480.0)= 0.151
A3( 460.0)= 0.134    A4( 440.0)= 0.127
A5( 420.0)= 0.141    A6( 400.0)= 0.168
A7( 380.0)= 0.212    A8( 360.0)= 0.310

A1-A2     = 0.0210
A1/A2     = 1.1387
dA(A1~A3)=-0.0018
Press START to measure.
BaseCorr  SmplCntl  Smpl No.=2
```

4. Multi-component Analysis

Quantitative analysis can be performed for up to 8 components mixed in a single sample. At right, aspirin, caffeine and salicylic acid were present in a sample in ratios of 2 : 1 : 1, as confirmed in the separated quantitation result.

The second figure shows the spectral characteristics of the three ingredients and the mixture. Note the distinctly different spectral characteristics, allowing the various compounds to be distinguished.

```
Multi-Component        320.0nm  0.0610A
        No.    COMP.     CONC.
        -----  ------  ------
         4       1      9.8439
                 2      5.1193
                 3      5.0945




Press START to measure
  Curve    CallCurv  Smpl No.=5
```
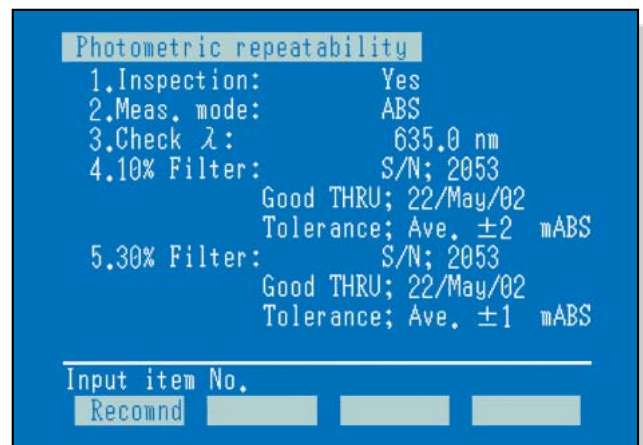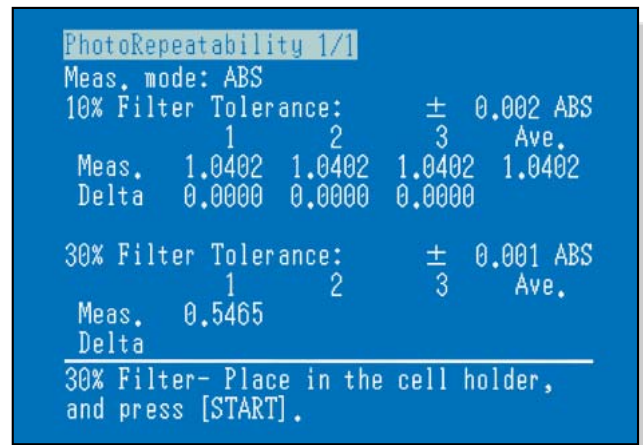
5. Instrument Validation Functions

These functions can conduct performance checks (measurement, pass/fail evaluation and printing) for nine items, including wavelength accuracy.
Validation is divided into fully automatic checks, where all procedures from measurement to evaluation are automatically completed, and semi-automatic checks, where the insertion and removal of inspection jigs are required.

```
Validation
1.Semi-Auto items 2.Auto items
 PhotoAccuracy        WL Accuracy
 PhotoRepeatability WL Repeatability
 Stray Light          Resolution
                      Baseline Stability
                      Baseline Flatness
                      Noise Level
                      Init. Record

Input item No. (To start:[START])
PrintOut                        Settings
```
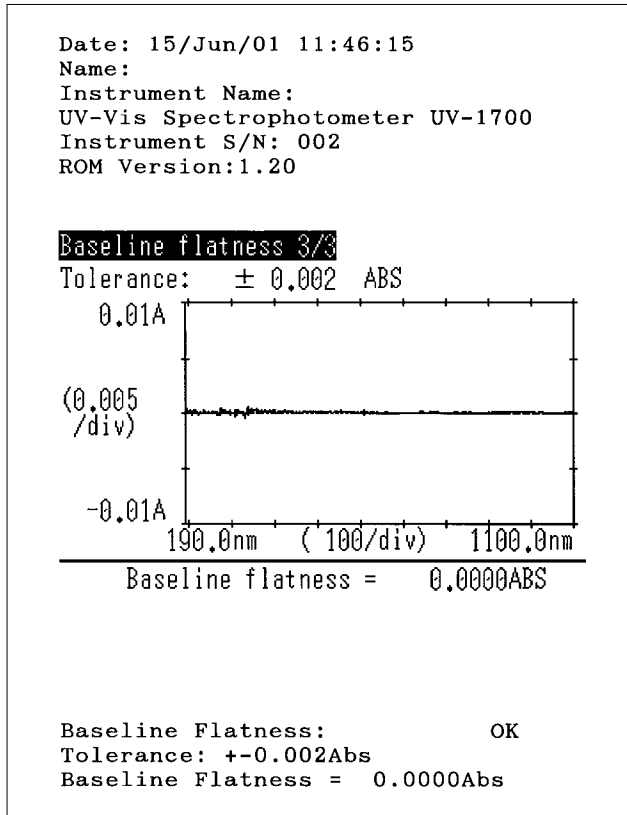
The semi-automatic checks are performed interactively. The user can conduct the validation by inserting or removing inspection jigs as instructed by messages on the screen.

```
PhotoRepeatability 1/1
Meas. mode: ABS
10% Filter Tolerance:       ±  0.002 ABS
              1       2       3     Ave.
 Meas.   1.0402  1.0402  1.0402  1.0402
 Delta   0.0000  0.0000  0.0000

30% Filter Tolerance:       ±  0.001 ABS
              1       2       3     Ave.
 Meas.   0.5465
 Delta
30% Filter- Place in the cell holder,
and press [START].
```

The control numbers and expiration date of the inspection jigs can be entered in the inspection conditions. The expiration date is automatically checked at the start of the test and the validation is discontinued if a jig is past its expiration date.

```
Photometric repeatability
 1.Inspection:          Yes
 2.Meas. mode:          ABS
 3.Check λ:             635.0 nm
 4.10% Filter:          S/N; 2053
              Good THRU; 22/May/02
              Tolerance; Ave. ±2  mABS
 5.30% Filter:          S/N; 2053
              Good THRU; 22/May/02
              Tolerance; Ave. ±1  mABS

Input item No.
Recomnd
```
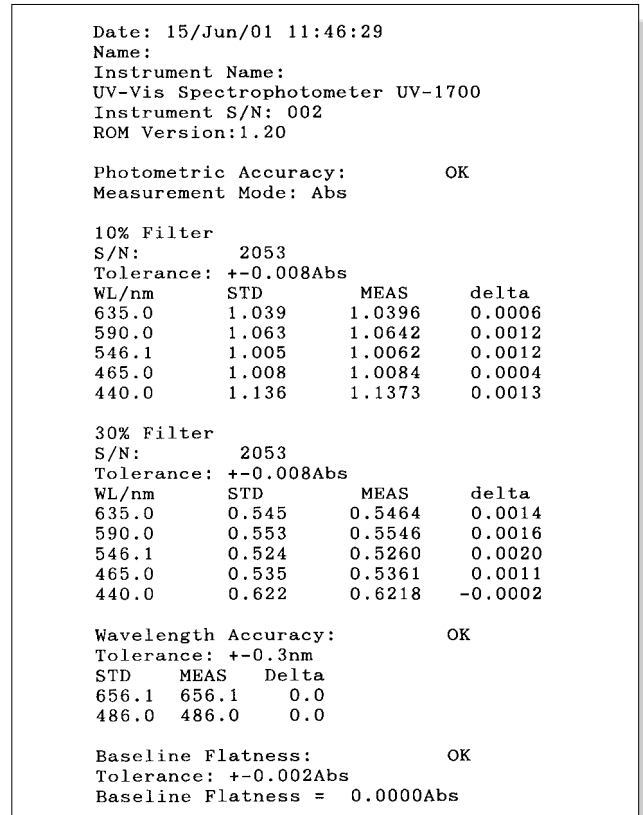
Printing Examples

Validation results can be printed out if a printer is connected. The two printed forms available are the detailed results form that shows the spectrum and time-course data (curves) and results for each test, and the general results form that lists the results for all selected validation items after they are complete.
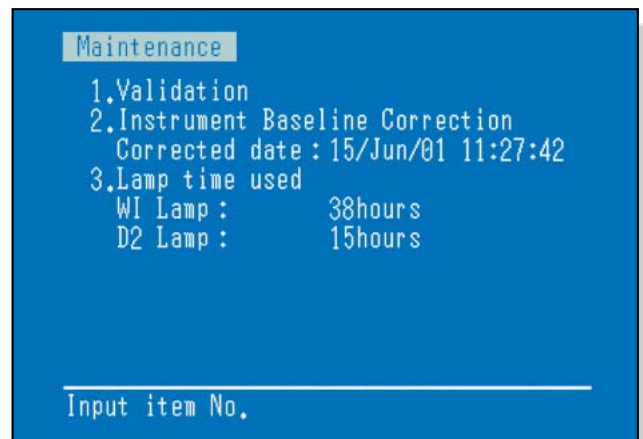
```
Date: 15/Jun/01 11:46:15
Name:
Instrument Name:
UV-Vis Spectrophotometer UV-1700
Instrument S/N: 002
ROM Version:1.20


Baseline flatness 3/3
Tolerance:   ± 0.002  ABS
   0.01A

(0.005
/div)

  -0.01A
     190.0nm   ( 100/div)   1100.0nm
      Baseline flatness =    0.0000ABS



Baseline Flatness:            OK
Tolerance: +-0.002Abs
Baseline Flatness =   0.0000Abs
```

<Detailed results form>

```
Date: 15/Jun/01 11:46:29
Name:
Instrument Name:
UV-Vis Spectrophotometer UV-1700
Instrument S/N: 002
ROM Version:1.20

Photometric Accuracy:         OK
Measurement Mode: Abs

10% Filter
S/N:        2053
Tolerance: +-0.008Abs
WL/nm       STD         MEAS      delta
635.0       1.039       1.0396    0.0006
590.0       1.063       1.0642    0.0012
546.1       1.005       1.0062    0.0012
465.0       1.008       1.0084    0.0004
440.0       1.136       1.1373    0.0013

30% Filter
S/N:        2053
Tolerance: +-0.008Abs
WL/nm       STD         MEAS      delta
635.0       0.545       0.5464    0.0014
590.0       0.553       0.5546    0.0016
546.1       0.524       0.5260    0.0020
465.0       0.535       0.5361    0.0011
440.0       0.622       0.6218   -0.0002

Wavelength Accuracy:          OK
Tolerance: +-0.3nm
STD     MEAS    Delta
656.1   656.1    0.0
486.0   486.0    0.0

Baseline Flatness:            OK
Tolerance: +-0.002Abs
Baseline Flatness =   0.0000Abs
```

<General Results form>

6. Maintenance

The lamp usage times for the deuterium (D2) and halogen (WI) lamps are counted. The lamp usage time is displayed during periodic maintenance to determine when the lamps need to be replaced.

```
Maintenance
 1.Validation
 2.Instrument Baseline Correction
   Corrected date : 15/Jun/01 11:27:42
 3.Lamp time used
   WI Lamp :        38hours
   D2 Lamp :        15hours




Input item No.
```

Spectrophotometer Specifications (UV-1700)

Item	Specification
Spectral bandwidth	1 nm (190 to 900 nm)
Dimensions	550W × 470D × 200 H (mm) (max. height 380 mm)
Weight	17 kg
Wavelength range	190.0 to 1100.0 nm
Wavelength display	0.1 nm increments
Wavelength setting	0.1 nm increments (1 nm increments when setting scan range)
Wavelength accuracy	±0.3 nm
Wavelength repeatability	±0.1 nm
Wavelength Scan Rates	Wavelength slew speed: Approx. 6000 nm/min Wavelength scanning speed: Approx. 3000 nm/min to 10 nm/min
Lamp interchange wavelength	295.0 nm to 364.0 nm (340.8 nm)
Stray light	0.04% max. (220.0 nm NaI, 340.0 nm $NaNO_2$)
Photometric system	Double-beam Optics
Photometric range	Absorbance: -0.5 to +3.0 Abs Transmittance: 0.0 to 300%
Recording range	Absorbance: -3.99 to +3.99 Abs Transmittance: -399 to +399%
Photometric accuracy	±0.004 Abs (at 1.0 Abs), using NIST930D filter ±0.002 Abs (at 0.5 Abs)

Item	Specification
Photometric repeatability	±0.002 Abs (at 1.0 Abs) ±0.001 Abs (at 0.5 Abs)
Baseline stability	0.001 Abs/h max (700 nm, After 1hour from power on)
Baseline flatness	±0.001 Abs (1100 mm to 200 mm) After 1hour from power on
Noise level	0.002 Abs (P-P) 0.0002 A (RMS) (700nm)
Baseline correction	Automatic with computer memory, in two stages of coarse and fine
Light source	20 W halogen lamp, deuterium lamp Built-in light source automatic position adjustment
Monochromator	Aberration-corrected blazed holographic grating
Detector	Silicone photodiode
Sample compartment	Internal dimensions: 110.0W × 230.0D × 105.0H (mm) Distance between light beams: 100.00 mm Installation: Fixed with two screws Beam size: 9 x 0.5 mm
Power requirements	100, 120, 220, 240 VAC 50/60 Hz, 130 VA
Ambient requirements	Temperature: 15 to 35°C, humidity: 35 to 80%

Overall Dimensions (UV-1700)

Units: mm
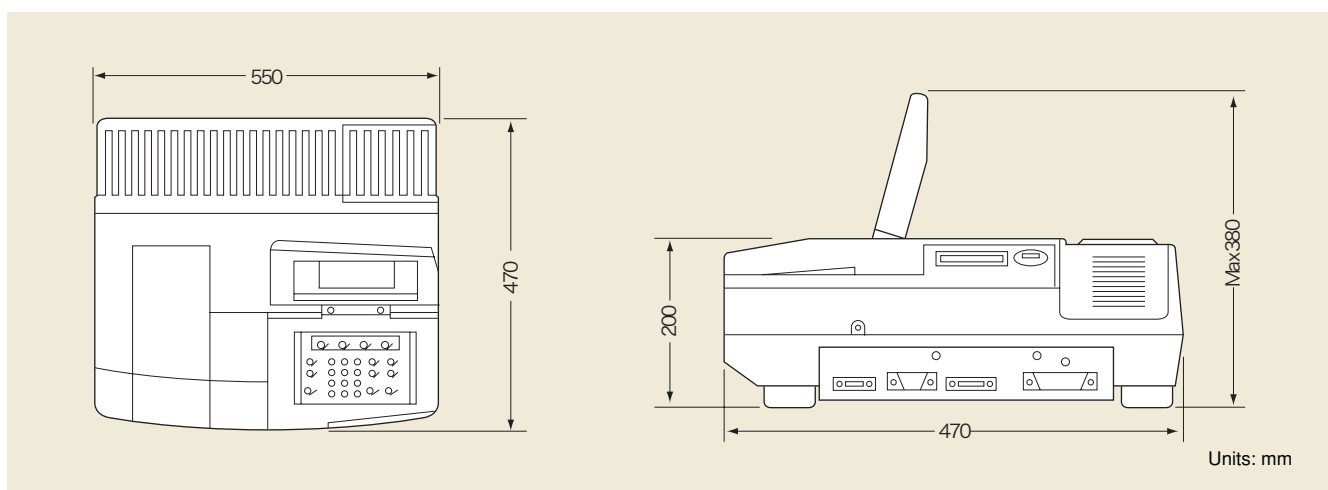
UV-1700 Software Specifications

Measurement mode	Specifications
Photometric Mode	① Measurement at user-selected fixed wavelength ② Quantitation using K-factor method ③ Photometric modes: Choice of T% and Abs ④ Data table storage and recall functions ⑤ Automatic data printout

Spectrum Mode	① Measurement modes: Abs, T%, E
	  Scanning range: 190.0 to 1100.0 nm
	  Ordinate range: Abs : -3.99 to +3.99 Abs
	              T%, E : -399 to +399%
	  Scanning speed: Very Fast, Fast, Medium, Slow, and
	               Very Slow
	  Number of repeat scans: 1 to 99
	  Recording system: Selection between single spectrum
	               and data overlay
	② Data processing
	  Peak/valley detection (up to 20 of each)
	  Area calculation
	  Arithmetic operations between data
	  Arithmetic operations between data and constants
	  1st to 4th derivative/smoothing
	  Point pick
	  Data storage and recall
	  (up to 6 in main memory, 27 in data pack)
	  Data output
	  Graph axis range change
	  Data readout at cursor-specified point
	③ Data export via RS-232C port

Quantitation Mode	① Measurement methods
	  Choice of 1-wavelength, 2-wavelength, 3-wavelength,
	  1st to 4th derivative methods
	② Quantitation methods
	  Automatic concentration calculation by K-factor
	  Automatic concentration calculation using single-point
	  calibration curve or multi-point calibration curve
	  method (1st to 3rd order regression curves)
	③ Measurement parameters
	  Number of repeat measurements: 1 to 9, to obtain a mean
	  value for quantitation
	  Order of derivatives: 1st to 4th
	  Number of standards for multi-point calibration curve: 2 to 10
	  Order of calibration curve: 1st to 3rd
	  Choice of zero or non-zero intercept
	④ Data table storage and recall
	⑤ Automatic data printout

Kinetics Mode	① Measures absorbance changes as a function of time and
	  calculates the enzymatic activity values.
	  Measurement time: 1 to 6500 sec/min
	② Measurement method: 1-wavelength, 2-wavelength,
	                     multicell and rate measurements
	③ Supports Cell Positioner CPS-240A, Multicell
	  Holder and Sipper 160
	④ Data processing
	  Recalculation
	  Graph axis range change
	  Data table display
	  Data storage and recall
	⑤ Data export via RS-232C port

Measurement mode	Specifications

Time Scan	① Measurement mode: Abs, T%, E
	  Measurement time: 1 to 6500 sec/min
	② Supports Cell Positioner CPS-240A, 6-cell Multicell
	  Sample Compartment, MMC-1600/1600C and Sippers
	③ Measures changes in Abs, T%, or energy over time
	④ Data processing: Identical to Spectrum Mode
	⑤ Data export via RS-232C port

Multi-Component Quantitation	① Up to eight components quantified at once.
	② A mixture, as well as pure components, can be used as
	  a standard.
	③ Data on standards can be stored, in addition to
	  measurement wavelengths.
	④ Quantitation of recalled spectrum data.

Multi Wavelength Measurement	① Measurements at up to eight designated wavelengths (set
	  in 0.1 nm increments)
	② Data calculation at up to four wavelengths (difference
	  or ratio between two wavelengths, calculation between
	  three wavelength, etc.) possible.
	③ Photometric mode: Abs, T%
	④ Results can be printed after each measurement. (The data
	  cannot be saved for Individual measurements.)

Maintenance	① Baseline correction
	② Lamp usage time display and reset
	③ Instrument validation functions
	1) Compatible with 9 JIS items
	  Wavelength accuracy, wavelength repeatability,
	  resolution, stray light, photometric accuracy, photometric
	  repeatability, baseline flatness, baseline stability, noise
	  level, initialization result recording
	2) Semi-automatic validation
	  Validation inspections conducted interactively while
	  inserting and removing inspection jigs.
	3) Fully automatic validation
	  Automatic validation inspections from measurement to
	  evaluation and printout.
	4) Setting inspection parameters and pass/fail criteria
	  Authority to make changes can be protected by password access.
	5) Bulk printout of results
	  Results of the previous validation inspection are printed
	  in list form. (The results of the previous inspection are
	  cleared when another inspection is started.)

Shared Functions	① Automatic setting of measurment mode after instrument
	  initialization
	  Designation of a parameter file is possible.
	② Backup of previous measurement parameters
	③ Selection of displayed number of decimal places
	  Absorbance: 3 or 4 decimal places
	  Transmittance: 3 or 4 decimal places
	④ ON/OFF of the beep function
	⑤ Number of files that can be saved:
	  Measurement parameters: 16 files max.
	  Data: 6 files max.
	⑥ Screen hard copy printout (when a printer is connected)
	  Date stamping can be selected between ON and OFF.
	⑦ PC control
	  Spectrophotometer can be controlled by an external PC
	  (via RS-2332C).
	  The optional UVProbe software controls this instrument.

ACCESSORIES

## UVProbe Software

(Cat. No. 206-89456-91)

UVProbe is software to control the UV-1700 from a PC. The all-in-one software package includes spectrum, photometric (quantitation), kinetics (time course), and report generator functions.

An RS-232C cable is required to connect the UV-1700 to the PC.

Required and recommended PC configuration for running UVProbe is as follows:
- PC with Pentium (200MHz) or better processor, or 100% compatible. (Pentium II (300MHz) recommended)
- 64MB RAM, 128MB recommended
- 50MB available hard disk capacity
- SVGA video monitor, 800 × 600 dot screen resolution (1024 × 768 recommended)
- Parallel and serial ports
- Graphic printer, or plotter (recommended for printing data)
- Mouse or similar pointing device
- CD-ROM drive

Even with the above configuration, UVProbe operating performance cannot be guaranteed, depending on Windows settings, hardware state, etc. Use Shimadzu recommended equipment, if possible.
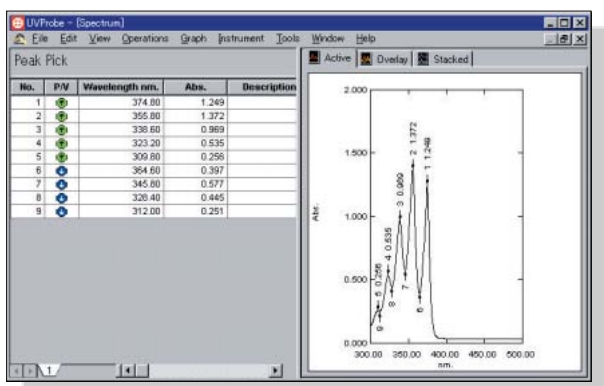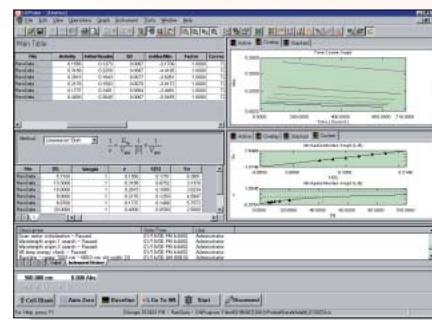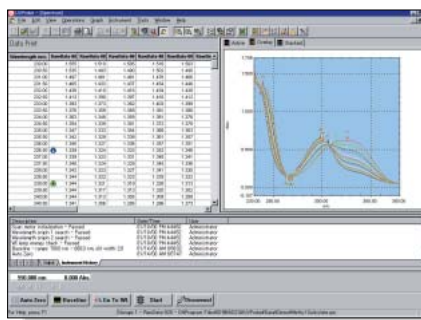
Loaded with Data Processing/Calculation Functions

Peak detection, Point Pick, area calculation, and many more– UVProbe includes all the data processing functions you'll need for spectrum and time course data. A variety of calculations are also yours for the choosing, like integration and interpolation conversions, and arithmetic operations between data.

GLP/GMP Compliant

For example, when data processing is performed, the resultant data is stored together in the same file with the original data, which remains intact. The audit trail function tracks the instrument history, and security functions, such as the limiting of individual users to specific types of software operations, ensuring full GLP/GMP compliance.
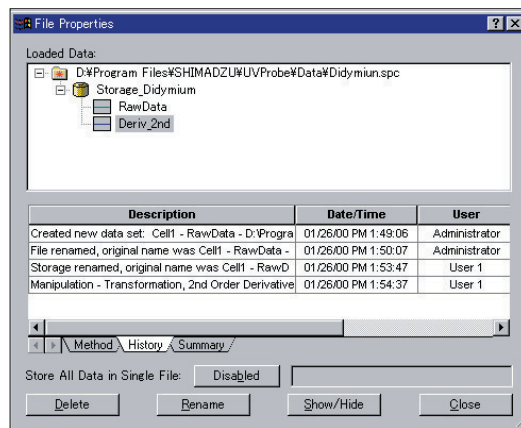
Powerful Quantitation Functions

The Photometrics module permits multi wavelength and single wavelength quantitation, and quantitation based on peaks as well as area values.

Calibration curves can be generated using K factor, single or multi point methods.

Further, customized functions can be created to determine pass/fail of measurement results.

Totally Customized Reports

Arrange graphs and data just as you wish to create informative, easy-to-read reports. Freely specify line thickness and font color and size, and place labels wherever you like on graphs.

Because the setup is all in WYSIWYG format, layouts can be stored as templates to enable fast and simple generation of future reports.

Software Specifications

Operating System	Windows NT4.0,Windows 95/98/2000
Data Acquisition Modes	Spectrum, Kinetics (time course measurement) and Photometric (quantitation)
General	• Multitasking (simultaneous measurement and data processing and other types of processing) • Customizable measurement screen layout (wavelengths, data display font and font size, colors, displayed number of rows) • GLP/GMP compliant (security, history) • Real time concentration display
Spectrum Mode	• Comparison of multiple spectra/relative processing*2 • Save all processed data with original data set including a history of all manipulations • Spectrum enlargement/shrinking, auto scale and Undo/Redo of these operations • Annotation on spectrum screen
Data Processing in Spectrum Mode	• Normalization, Point Pick, peak/valley detection, area calculation • Transformations : 1st - 4th derivatives, smoothing, reciprocal, square root, natural log, log, Abs. to %T conversion, exponential, Kubelka-Munk conversion • Ensemble averaging, interpolation, data set and constants arithmetic (between spectra, between spectra and constants)
Photometric (Quantitation) Mode	• Single wavelength, multi wavelength (includes 1, 2 or 3 wavelengths), spectrum quantitation (peak, maximum, minimum, area, etc. for specified wavelength ranges) • Multi-point, single point, K-factor calibration curves (1st, 2nd, 3rd order function fits, pass-through-zero specification) • Photometric processing with user-defined functions (+, −, ×, ÷, Log, Exp, etc. functions, including factors) • Weight correction, dilution factor correction,

	and other corrections using factors • Averaging of repeat measurement data • Simultaneous display of standard table, unknown table and calibration curves • Display of Pass/Fail indications
Kinetics (Time Course) Mode	• Comparison/relative processing of multiple time course data*2 • Single or double wavelength measurement (difference or ratio) • Simultaneous display of time course data, enzyme table and graphs • Enzyme kinetics calculation (for single or multicell) • Michaelis-Menten calculations and graph creation (Michaelis-Menten, Lineweaver-Burk, Hanes, Woolf, Eadie-Hofstee), Dixon plot, Hill plot • Unitary management of sample information including original data, sample weight and dilution factors, etc. • Event recording such as addition of reagents during measurement • Time course spectrum data processing (same as in spectrum data processing)
Report Generator	• Preview and print functions for customized formats • Layout and editing of templates • Quick printing using report templates • Multi-page printout support • Insert date, time, text, and drawing objects including lines, circles and rectangles • Insert spectrum and quantitation data, method and history • Headers and footers easily inserted • Specify graph line thickness (as in all modules), font style and size

1) PC, monitor and printer are not included.

2) Depends on PC environment (memory, etc.). As a guideline, from 20 ~ 30 spectrum data sets.

# ACCESSORIES

Time Course (Multi λ) Program Pack

(Cat. No. 206-80704-02)

Measures changes in absorbance or transmittance for up to 6 wavelengths, with respect to time. The changes are presented as time course curves for the selected wavelengths.

- Number of wavelengths : 6 max. (wavelength adjustment in 0.1 nm steps)
- Photometric mode : Abs. or T%
- Repeated measurement : Up to 99 repetitions and up to 9999 seconds measuring time
- Graphic ⇆ tabulated display changeover
- Automatic data printout
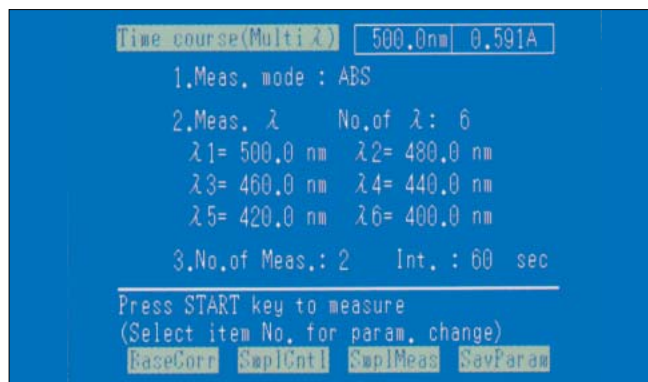
Parameter Selection
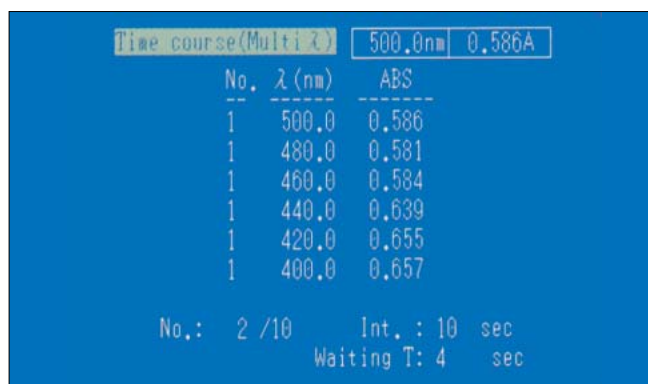
Display during Measurement

Data Pack

(Cat. No. 206-80700)

Stores operational parameters as well as data.

- Stores up to 79 sets of operational parameters per pack.
- Stores up to 27 data sets per pack.
- ∗ This Data Pack is identical to the UVmini-1240 Series Data Pack but the files are not compatible.

  The Data Pack must be initialized for use with the UV-1700.

Protein Quantitation Program Pack

(Cat. No. 206-82850-02)

Determines protein concentration in any of the four coloring methods or directly from the absorbance at 280nm. The instrument parameters for quantitation are incorporated.

● **The following five quantitation methods are included.**
- Lowry Method
- BCA Method (method using Bicinchoninic Acid)
- CBB Method (method using Coomassie Brilliant Blue G-250)
- Biuret method
- UV Absorption (direct measurement at 280nm)

● **Features of methods other than UV Absorption,**
- K-factor method–Values for K and B may be input for calculation using : $C = K \times ABS + B$
- In the single point calibration curve method, a single standard is measured to generate a calibration curve, which passes through the origin.
- In the multi-point calibration curve method, up to 10 standards are measured to generate either a linear calibration curve or a second order calibration curve.
- Up to 9 repeat measurements can be conducted to obtain a mean value for use in quantitation.
- Selection from any of four concentrations is possible: mg/mℓ, μg/mℓ, etc.
- The equation used for generating the calibration curve as well as any determination coefficients may be displayed.
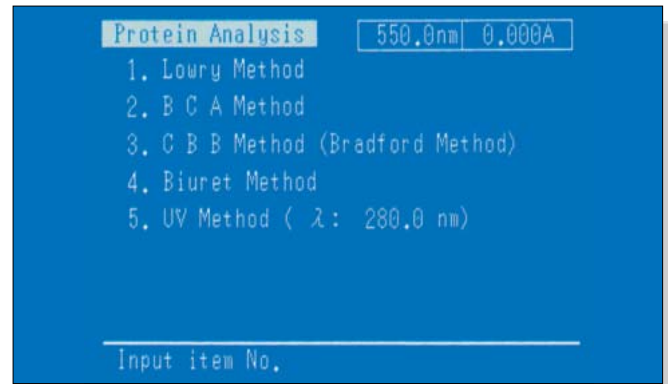
Quantitation Selection
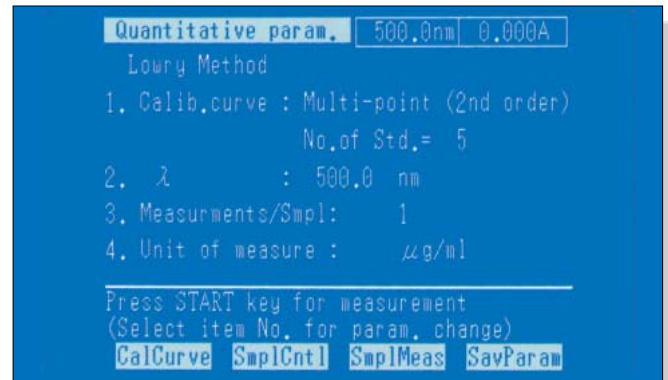
Parameter Selection (Lowry method)

DNA/Protein Quantitation Program Pack

(Cat. No. 206-82851-02)

Determines DNA or protein concentrations directly from the UV absorption bands at 230nm, 280nm and 260nm. No coloring procedure is required.
Quantitative data are obtained through simple keyboard operation, using the resident formula. The wavelengths and factors used in the computation are arbitrarily changeable.

● The following two formulas are user selectable:
1) Formula using absorbances at 260.0nm (A1) and 230.0nm (A2)
   Absorbance ratio = A1/A2
   DNA concentration = $49.1 \times A1 - 3.48 \times A2$
   Protein concentration = $183.0 \times A2 - 75.8 \times A1$
2) Formula using absorbances at 260.0nm (A1) and 280.0nm (A2)
   Absorbance ratio = A1/A2
   DNA concentration = $62.9 \times A1 - 36.0 \times A2$
   Protein concentration = $1552 \times A2 - 757.3 \times A1$

● The absorbance at 320nm can be used for background correction.
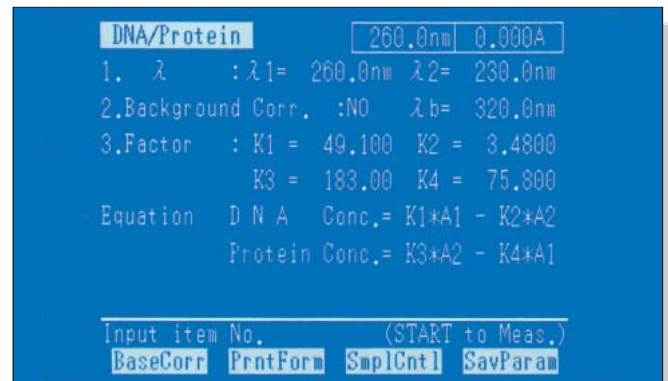
Parameter Selection
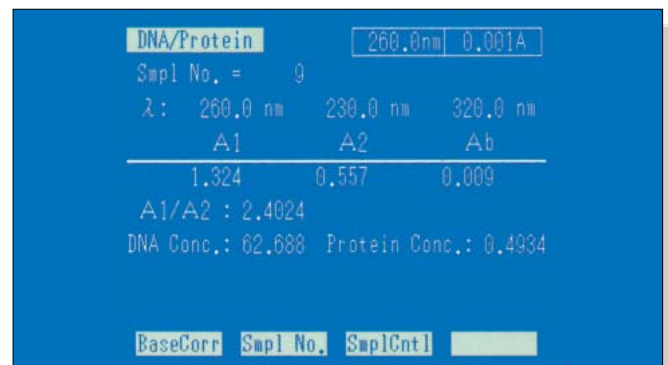
Measurement Display

15

A C C E S S O R I E S

DPU-414 Screen Copy Printer

(Cat. No. 206-55215-**)

Prints hard copies of screens, including numeric data. A printout is made after each measurement.

Spectra, kinetics reaction data, and quantitation calibration curves displayed on the screen are output in the screen print. A hard copy can be printed at any time, making it simple to record measurement parameters.

Thermal paper (10 rolls): 088-58907-04

The printer cable is included with DPU-414.

Dimensions: 160 x 170 x 66.5 mm

Interface Cable (Centronics standard)

(Cat. No. 200-91536-15)

This cable connects the UV-1700 to any general commercial printer (limited to ESC / P specifications) to allow printout. Color and monochrome printers are both supported.

Note : For information regarding specific printer types, please contact your Shimadzu representative.

Analog Output Interface

(Cat. No. 204-04757)

● Allows analog output for monitoring a liquid chromatograph, etc., and can connect to an integrator.

● Analog output full scale
100mV / 2Abs or 100mV / 100%T
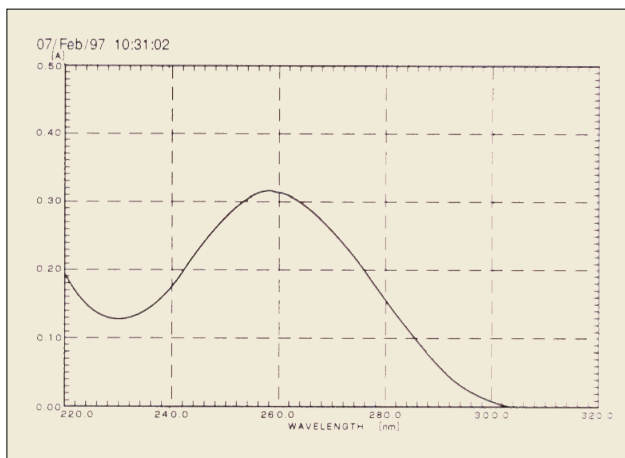
Tm Analysis Software

(Cat. No. 206-57476-91)

● This software works with the S-1700 and accumulates temperature-versus-absorbance curve data at the PC to analyze the Tm (melting temperature) of nucleic acids such as DNA and RNA. The right figure is a typical setup for this software.

● RS-232C cables (Cat. No. 200-86408) are needed to connect the PC to the S-1700 and the spectrophotometer.
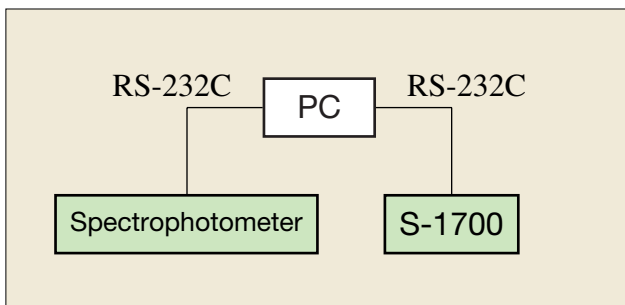
CPS-240A Cell Positioner, Thermoelectrically Temperature Controlled

(Cat. No. 204-05837-∗∗)

This attachment permits measurement of up to six sample cells under constant temperature conditions. Combination of this attachment and the Kinetics mode provides measurement of temperature sensitive enzyme kinetics of one to six samples.

- Number of cells : 6 on the sample side (temperature controlled)
  - 1 on the reference side (temperature not controlled)
- Temperature control range : 16 to 60°C
- Temperature display accuracy (difference from the true value) : ±0.5°C
- Temperature control precision (variation of temperature) : ±0.1°C
- Ambient temperature : 15 to 35°C

> Note : Sample cells (Cat. No. 200-34442) are not included in the standard contents.

TCC-240A Thermoelectrically Temperature Controlled Cell Holder

(Cat. No. 204-05557-∗∗)

Uses Peltier effect for controlling the temperatures of the sample and reference sample. No thermostatic bath or cooling water is required, so the operation is quite simple and easy.

- Number of cells : One each on the sample and reference sides
- Temperature control range : 7 to 60°C
- Temperature display accuracy (difference from the true value) : ±0.5°C
- Temperature control precision (variation of temperature) : ±0.1°C

> Note : Sample cells (Cat. No. 200-34442) are not included in the standard contents.

S-1700 Thermoelectric Single Cell Holder

(Cat. No. 206-56000-91)

This cell holder permits setting of a temperature program to increase and decrease the sample cell temperature.

- The thermoelectric system allows prompt control of sample temperature between 0°C and 110°C.
- Temperature increase/decrease speed can be changed using 12 settings, which means the holder can be used in analysis of melting curves for nucleic acids, etc., that occur during quick as well as slow heating (or cooling).
- A stirrer also is provided to ensure uniform temperature distribution throughout the cell.
- A cooling water circulation is required for Peltier element cooling. And though tap water can be used, it is recommended that a commercially available constant-temperature water circulator be used, as the following conditions must be fulfilled to exact maximum performance from the S-1700.
  - · Cooling water specification: 20 ±2°C
  - · Water flow: 4.8L / min or more
- Temperature is not controlled at the reference side.
- Cells are not supplied. Please use 10mm square tight-sealing cells (a Hellma product).

Type	Optical Path	Minimum Sample Volume Required
110-QS-10	10mm	3.5mL
115B-QS-10	10mm	400µL

- Temperature accuracy in cell (when room temperature is 25°C)
  - Within ±0.25°C (0 to 25°C)
  - Within ±1%°C of set value (25 to 75°C)
  - Within ±2%°C of set value (75 to 110°C)

A C C E S S O R I E S

Sipper Unit 160L (Standard Sipper)
(Cat. No. 204-08270-01)

Sipper Unit 160T (Triple Pass Sipper)
(Cat. No. 204-08270-02)

Sipper Unit 160C (Constant Temperature Sipper)
(Cat. No. 204-08270-03)

Sipper Unit 160U (Supermicro Sipper)
(Cat. No. 204-08270-04)

The four sippers listed above are available, depending on the flow cell shape. A peristaltic pump driven by a stepping motor ensures reliable and smooth aspiration of sample solution. (Direct drive is possible from the UV-1700, so no interface is required.)

Sipper L	2.0mℓ
Sipper T	1.5mℓ
Sipper C	2.5mℓ
Sipper U	0.5mℓ
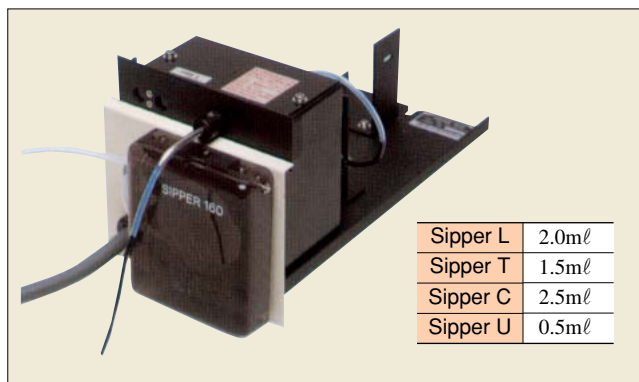
Note : The use of a Teflon Valve Unit (Cat.No. 204-06599-01) and the SWA-2 Sample Waste Unit (Cat.No. 204-29230) are recommended when strong acids, strong alkalis, or organic solvents are to be measured.

ASC-5 Auto Sample Changer
(Cat. No. 204-09100-**)

Combine with a Sipper 160 to build an automated multisample spectrophotometry system.

- The aspirating nozzle is programmed to move in the X, Y, and Z (vertical) directions.
- Up to 8 sets of operational parameters, including the size of racks and the number of test tubes, may be memorized in the battery back-up protected files.
- Up to 100 test tubes may be set together on the rack.

Note : A commercially available test tube stand, with a footprint smaller than 220 × 220 mm, is applicable

NTT-1200P Constant-Temperature Water Circulator
(Cat. No. 208-97242)

Circulates temperature controlled water to a constant-temperature cell holder.

- Temperature range: Ambient +5°C to +80°C
- Temperature control precision: ±0.03°C (40°C set temperature, 20°C ambient)
- Max. pumping rate: 27/31 L/min, 9.5/13 m (50/60 Hz)
- External circulation nozzle: 10.5 mm OD (both outlet and return)
- Tank capacity: About 10 L (9 L during use)
- Standard accessories: Lid with handles, instruction manual
- Dimensions: 270W x 560H x 400D (mm)
- Power requirements: 100 VAC, 1250 VA, with 1.7 m power cord and grounded plug

Note: Rubber hose (9 mm ID) (Cat. No. 016-31350-22) and hose clamps (Cat. No. 037-61017) are not included in the standard contents.

Multicell Sample Compartment

（Cat. No. 206-69160）

Holds up to six 10 mm square cells. No temperature control capability.

● Number of cells : 6 on the sample side
　　　　　　　　　 1 on the reference side.

Note : Cells are not included in the standard contents.
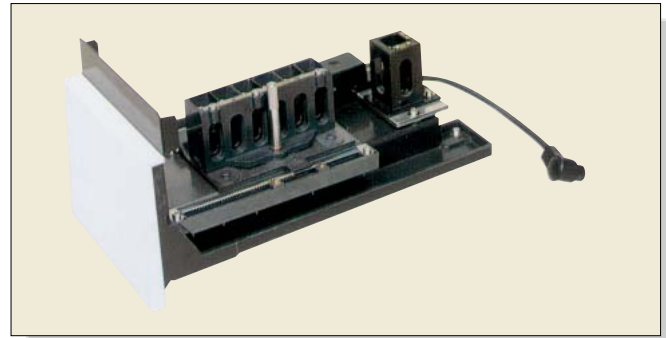
3μL Capillary Cell Set for Ultramicro Volume Measurement

（Cat. No. 206-69746）

● Recommended for small and precious samples, such as in biological application. The minimum sample volume required is $3\mu\ell$, when the tube closure is used. (theoretical value)
● Solution sample is aspirated into the capillary cell and the cell is directly subjected to measurement.
● The holder is the same size as a 10 mm square cell and can be mounted to the standard cell holder.
● Supplied with 100 capillaries (made of quartz) and a tube closure.

Supermicro Cell Holder

（Cat. No. 206-55050-91）

Holds supermicro cells for measurement of extremely small samples.
Samples of 25 to 200μ L can be measured, depending on the type of black cell used.
● Applicable cells: ⑦,⑦', and ⑧ in the cell list on the back cover
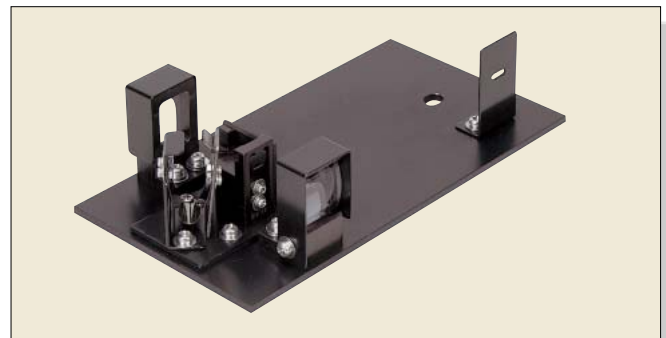
Specular Reflectance Measurement Attachment (5° incident angle)

（Cat. No. 206-14046）

The technique of specular reflectance measurement is often utilized for evaluation of semiconductors and optical materials relative to a reference reflecting surface. The 5° incident angle minimizes the influence of polarized light. Thus, no polarizer is required in measurement・・・the operation is quite simple.

● Sample as large as $100^W\times160^D\times15^T$mm can be readily measured, the minimum size is 7 mm in diameter.
● Sample placement is quite easy・・・just set it on the holder with the measuring face down.
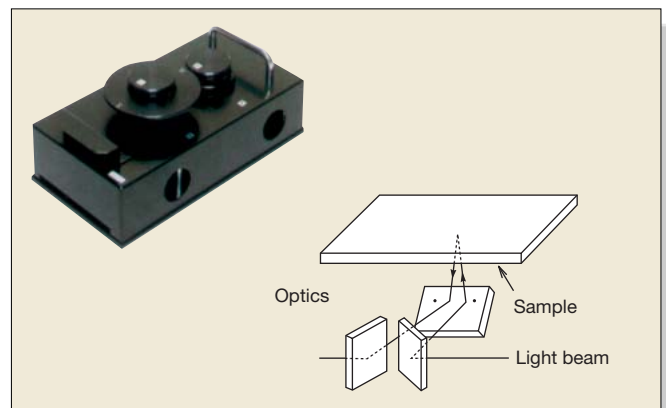
ACCESSORIES

GSC-3A Gel Scanner

(Cat. No. 204-51774-01)

Used to record stained bands on disk gels.
The record is given as a time-course curve, under Kinetics mode.

● Cell : Made of quartz, $6^W \times 77.5^L \times 11^H$mm in inner dimensions. One piece is included in the standard contents.

● Scanning range : 60 mm

● Standard contents : A main controller, a cell holder, a cell.

Constant-Temperature Cell Holder

(Cat. No. 202-30858-04)

Maintains sample and reference cells at a desired, uniform temperature by circulating constant-temperature water.

● Temperature range : 5 to 90°C (depends on the performance of the constant-temperature water circulator)

● Cell holder : Accepts a pair of 10 mm square cells
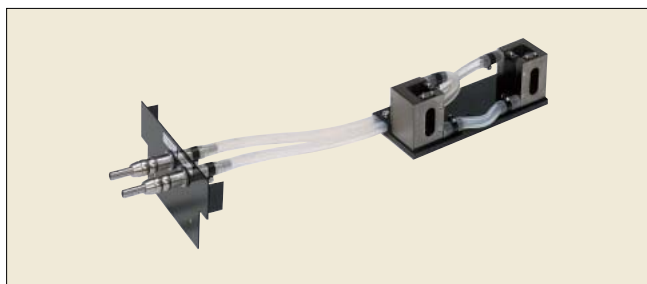
Constant-Temperature Four Cell Holder

(Cat. No. 204-27206-02)

Maintains four sample cells and a reference cell at a desired, uniform temperature by circulating constant-temperature water.

● Temperature range : 5 to 90°C

∗ The Four-Cell Sample Compartment Unit (Cat. No. 204-00850-01) is required.
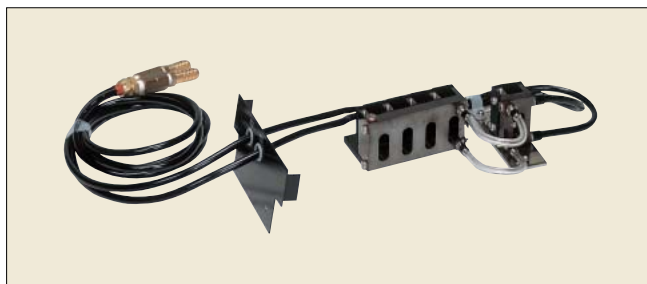
Long-Path Rectangular Cell Holder

(Cat. No. 204-23118-01)

Holds rectangular cells having an optical path of 10, 20, 30, 50, 70, or 100mm.

Universal Rectangular Cell Holder, Four-Cell Type

(Cat. No. 204-27208)

Permits manual change of four rectangular cells having an optical path of 10, 20, 30, 50, 70, or 100mm.

∗ The Four-Cell Sample Compartment Unit (Cat. No. 204-00850-01) is required.

∗ When a rectangular, long-path cell is used on the reference side, its holder (Cat. No. 204-28720) is additionally required.
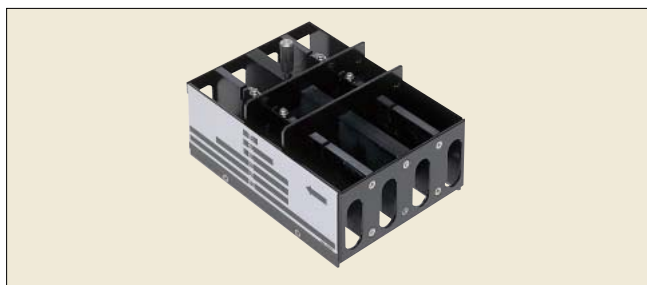
Cylindrical Cell Holder

(Cat. No. 204-06216-02)

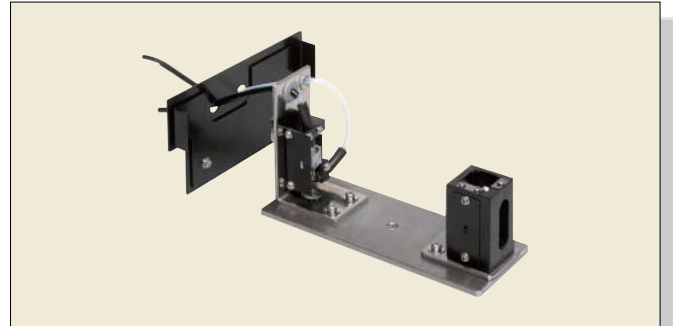Holds cylindrical cell having an optical path of 10, 20, 50, or 100 mm.

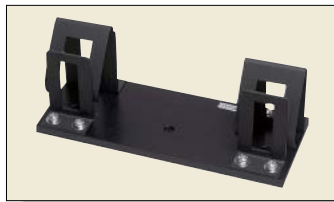## Front Panel with holes

(Cat. No. 204-27588-03)

Allows the tubes of a flow-thru cell, for example, to be connected through the front panel of the instrument.

Film Holder

(Cat. No. 204-58909)

Used in transmittance measurement of thin samples such as films and filters.
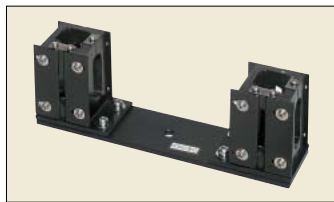
Micro Cell Holder with Mask

(Cat. No. 204-06896)

Holds a micro cell, less than 4 mm wide. (The mask width is continuously adjustable.)

Four-Cell Sample Compartment Unit

(Cat. No. 204-00850-01)

Accommodates a four cell holder of cylindrical, rectangular, and other types of cells. Incorporates a four cell holder for 10 mm square cells.

10 mm Micro Flow-thru Cell with Holder

(Cat. No. 204-06222)

5 mm Micro Flow-thru Cell with Holder

(Cat. No. 204-06222-01)

Cat. No.	optical path	volume
204-06222	10mm	0.3mℓ
204-06222-01	5mm	0.15mℓ

RS-232C Cable (Type 2)

(Cat. No. 206-86408)

This cable is required for connection of the UV-1700 to an IBM-PC compatible personal computer.

- The cable is equipped with a 9-pin female PC connector and 9-pin male connector for connection to the UV-1700.
- Three wires in the cable are used, 2 wires for output and 1 wire for ground.
- At the connector that connects to the PC, the pins for the control wires allow constant input and output from the PC.

ACCESSORIES

8/16 Series Micro Multi-Cell

■Cell Holder

Model	Cat. No.
8/16 Series Micro Multi-cell Holder MMC-1600	206-53945-91
8/16 Series Constant Temperature Micro Multi-cell Holder MMC-1600C	206-53900-91

This cell holder holds one micro multi-cell, either 8 or 16 cell, for micro volume measurement.
Two types of micro multi-cell holders are available, the standard type (MMC-1600) and the constant temperature water circulation type (MMC-1600C).

■Micro Multi-cells

Model	Cat. No.
8 Series Micro Multi-cell; optical path length 10mm, cell volume 100μℓ	208-92089
16 Series Micro Multi-cell; optical path length 10mm, cell volume 100μℓ	208-92088
8 Series Micro Multi-cell; optical path length 5mm, cell volume 50μℓ	208-92086
16 Series Micro Multi-cell; optical path length 5mm, cell volume 50μℓ	208-92085

There are two types of micro multi-cells available in both the 8 Series and the 16 Series models, a 50μℓ type and a 100μℓ type. The cell intervals of the 8 Series Micro Multi-cell are applicable for use with 8 × 12 well microplates and 8 channel pipettes. Microplate samples aspirated into multi channel pipettes can be injected directly into the cells for measurement.

● Micro volume samples can be measured
  (minimum sample volume: 50μℓ or 100μℓ, respectively)
● Support for commercial microplates and micro pipettes.
  (with 8 Series micro cells)
● Up to 16 samples can be measured at a time (with 16 Series micro cell)
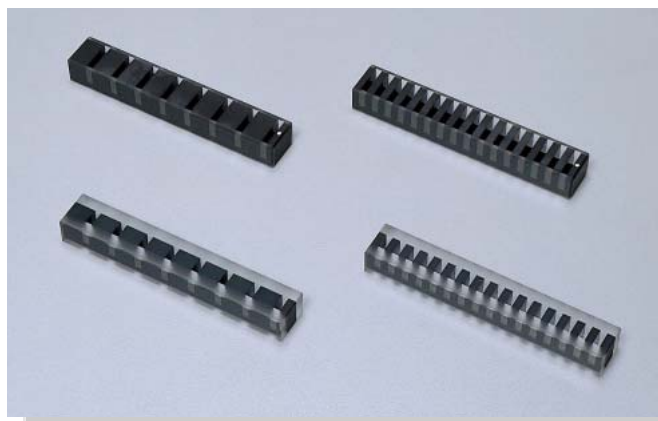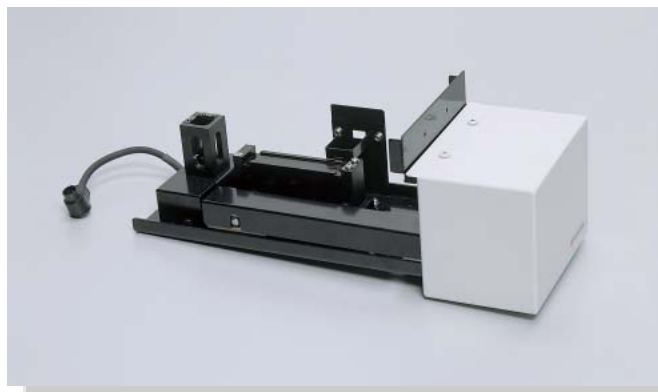
Syringe Sipper

Model	Cat. No.	Remarks
Syringe Sipper N	206-53800-93	Normal temperature type (Flow cell available separately. Choose from the recommended flow cells listed below.)
Syringe Sipper CN	206-53800-94	Constant temperature, water circulating type (Flow cell available separately. Choose from the recommended flow cells listed below.)

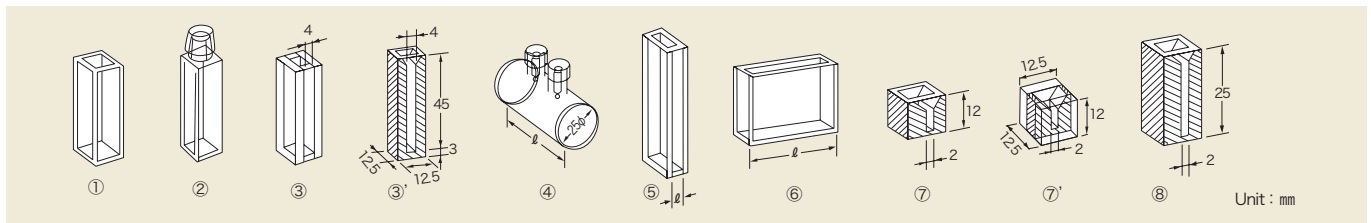| Recommended Flow Cells				
Cell Type	Cat. No.	Optical Path Length	Dimensions of Aperture	Standard Required Sample Volume
Square (Ultra-micro)	208-92114	10mm	ø2mm	0.9mℓ
Square (Micro)	208-92113	10mm	ø3mm	1.0mℓ
Square (Semi-micro)	208-92005	10mm	H11×W3.5mm	5.0mℓ

The sipper unit employs a syringe pump system. The liquid contact surfaces are composed of Teflon, glass, or quartz, imparting excellent chemical resistance and ease of maintenance, and allowing measurement of almost any sample type. Further, the extremely high repeatability of sipping volume (repeat precision: ±0.03mℓ) makes it ideal when performance validation is required.
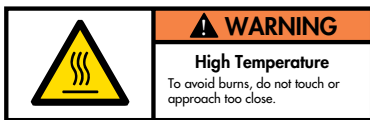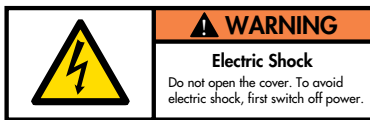
● The flow cell can be changed independently for excellent ease of maintenance.
● Excellent chemical resistance allows measurement of almost any sample.
● Excellent repeat sipping of fixed volumes.

Cells

Description	Optical path (ℓ)	Type	Fused silica (S) Cell	Glass (G) Cell
Square cell	10mm	①	200–34442	200–34565
	20mm	⑥	200–34446	200–34446–01
	50mm	⑥	200–34944	200–34944–01
	100mm	⑥	200–34676	200–34676–01
Square cell with stopper	10mm	②	200–34444	200–34444–01
Semi-micro cell	10mm	③	200–66501	200–66501–01
Semi-micro black cell	10mm	③'	200–66551	——
Super micro black cell	10mm	⑦	200–66578–11	——
	5mm	⑦'	208–92116	——
Micro black cell	10mm	⑧	200–66578–12	——
Cylindrical cell	10mm	④	200–34448 (silica window)	200–34448–01 (glass window)
	20mm		200–34472 (silica window)	200–34472–01 (glass window)
	50mm		200–34473–01 (silica window)	200–34473–03 (glass window)
	100mm		200–34473–02 (silica window)	200–34473–04 (glass window)
Short path cell	1mm	⑤	200–34660–01	200–34662–01
	2mm		200–34655	200–34662–11
	5mm		200–34449	200–34449–01

Unit : mm

◈ SHIMADZU