

POP Series

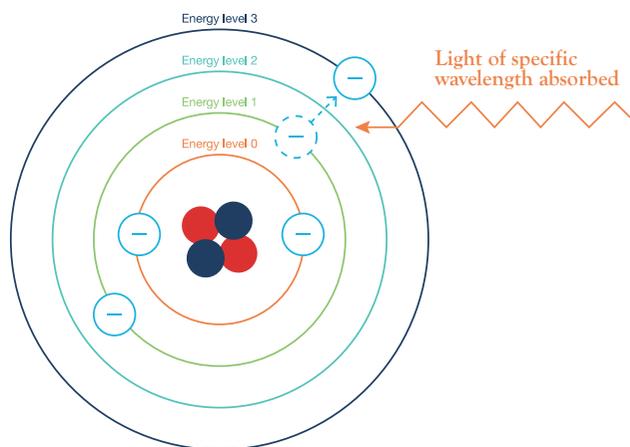
UV-VIS SMART SPECTROPHOTOMETER



UV-VIS SPECTROSCOPY

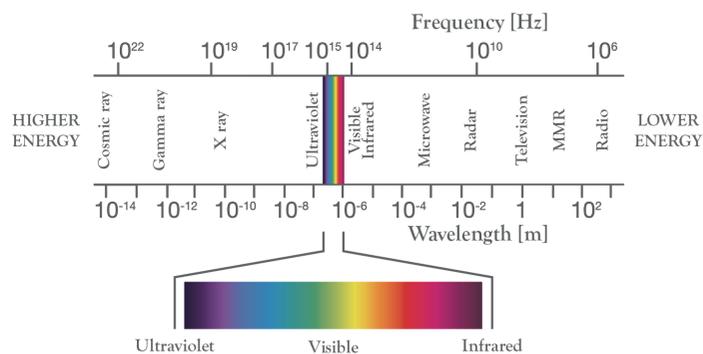
UV-Vis spectroscopy is an analytical method that can identify the characteristics of molecules through the interaction of ultraviolet and visible light with electrons. In the UV-Vis region, absorption mainly occurs among various interactions, and occurs when the energy of the electron transition matches the energy of light. The energy of light is described by the Planck equation and is determined by the wavelength (λ).

$$E=hf=hc/\lambda$$



POP can measure the transmittance or absorbance of a sample in a wide wavelength range (190 to 1100 nm) including ultraviolet and visible light. The absorption spectrum in this band indicates the molecular structure of the sample, reflecting interactions between molecules and environmental conditions. Typically, these absorption bands are broad peaks due to the large number of molecular vibrational levels of similar energy.

UV-Vis spectroscopy provides a wealth of information and is highly accessible, and is applied in a wide range of fields, from general analytical experiments to the environment, biotechnology, and chemistry.



VARIOUS APPLICATIONS

POP provides various measurement modes (photometric, quantitation, spectrum, kinetics) and can be used in various fields.



Identification

The Spectrum mode allows you to measure the absorption spectrum of a sample and qualitatively compare it with a reference spectrum to identify the substance.

Colorimeter

Colorimetric analysis can be performed by converting wavelength-specific transmittance into chromaticity.

Reaction Kinetics

Kinetic mode can be used to measure absorbance changes over time and monitor chemical reaction processes.



Water Quality (Optional)

Various pollutants can be quantitatively analyzed using reagents. POP QX provides convenient measurement by embedding information from various water quality analysis kits.

Quantitation

When the optical path is constant, the absorbance is proportional to the concentration. Concentration can be calculated using Beer's law.

- DNA/RNA quantitative analysis
 - Pharmaceutical purity verification
 - Food analysis, Cosmetics manufacturing, etc.
- It can be used in various fields.

K LAB Co.,Ltd.

POP



POP, a series of spectrophotometers from K LAB Co., Ltd, is manufactured based on high technology and strict quality control, and provides customers with superior performance, design, and convenience that are incomparable to other products.

K LAB Co., Ltd. developed Korea's first ultra-precision scanning mechanism-based monochromator and has led the development of a spectrophotometer equipped with it.

POP is equipped with a Czerny-Turner monochromator that combines the company's control know-how, providing a fast scanning rate (4000 nm/min) and excellent bandwidth (SBW < 1.8 nm).

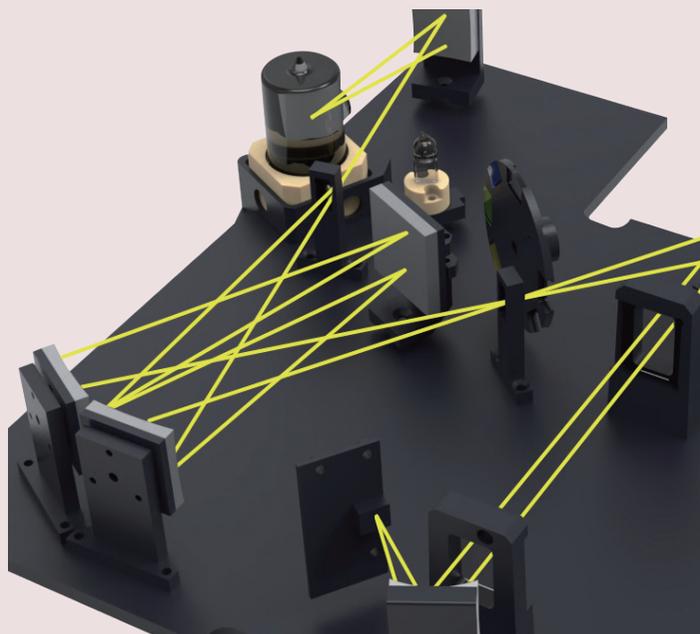
POP comes with a Multi-Cell holder as standard to automatically measure up to 8 samples. The rotating Multi-Cell holder, implemented with precise optical path design and micro-stepping control technology, enables fast and accurate sample measurement.

Schematic diagram of the POP optical system

A UV-Vis spectrophotometer shines light of wavelengths from ultraviolet to visible light on a sample and measures the intensity of the transmitted light. This gives the wavelength specific absorbance/transmittance and allows the properties of a substance to be analyzed.

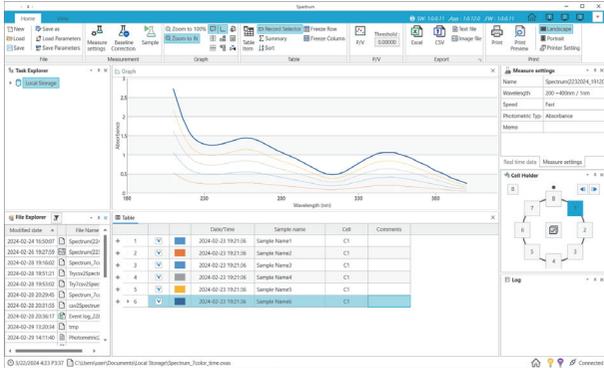
The key components are as follows:

- **Light source:** Emits light from the ultraviolet to the visible range. It consists of a deuterium lamp (ultraviolet range) and a tungsten lamp (visible range).
- **Monochromator:** Selects a specific wavelength of light. Consists of diffraction gratings and mirrors.
- **Sample compartment:** Attaches a cuvette holder to hold the sample to be measured.
- **Detector:** Measures the intensity of the transmitted light.



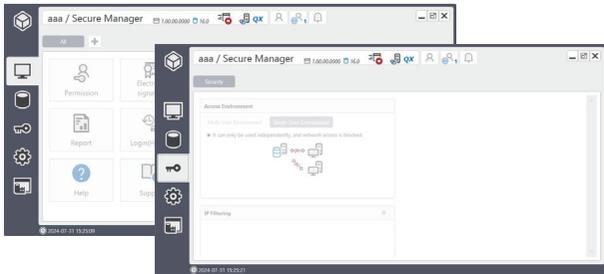
THE SMART UV-VIS SPECTROPHOTOMETER

View (PC Software)



View is a software that allows you to remotely control POP to collect and analyze data. (Provided separately)

Secure (PC Software)



Secure is a management program that can track and audit all actions performed in View. (Provided separately)

Core functions:

- Login: Access restriction based on authentication target and method, Group-specific authorization and function restriction Electronic signature.
- Authentication and non-repudiation through level-specific signature Audit trail
- Audit records based on user actions.

Vertical opening cell holder cover

With the vertical opening method, it can be easily opened and closed.

Supports various connection ports

POP supports 2 USB-A ports, 2 RS-232 ports, and 1 Ethernet port to connect various peripheral devices.

Network Printer Support

Easily print measurement data via network connection.

K LAB Single Beam Spectrometer Family

	Ultraviolet area (190 ~ 340 nm)	Visible light area (340 ~ 1,100 nm)	Various measurement modes	Water quality test
POP	O	O	O	X
POP-V	X	O	O	X
QX	O	O	O	O

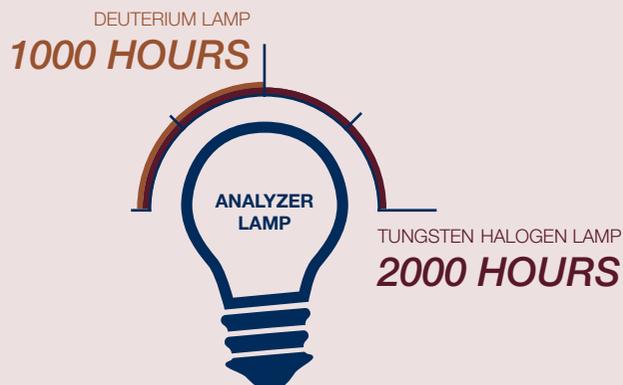


After Sales Service Policy

At K LAB Co.,Ltd., we provide systematic services based on professional expertise to meet the diverse needs of our customers.

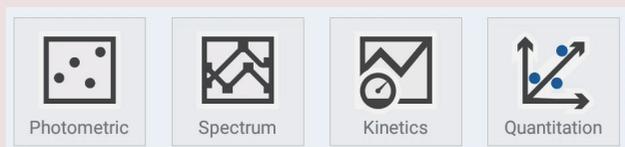
Free Warranty Service

We offer free repair and replacement services for products (excluding consumables) within one year of purchase and for lamp failures that occur within the warranty period. We strive to deliver stable performance through our structured and continuous services and extensive experience.



THE BEST VISUAL AND FUNCTIONAL EXPERIENCE

POP focuses on user convenience and has an intuitive interface that allows for accurate data measurement and analysis with a single touch. It also includes a variety of functions optimized for experimental equipment, and measurement results can be easily edited and exported.



Photometric Mode

This mode can measure the absorbance and concentration of a sample at a specific wavelength.

Quantitation Mode

This mode allows quantitative analysis of samples using a calibration curve.

Spectrum Mode

This mode allows the user to obtain absorption or transmission spectra in the desired wavelength band.

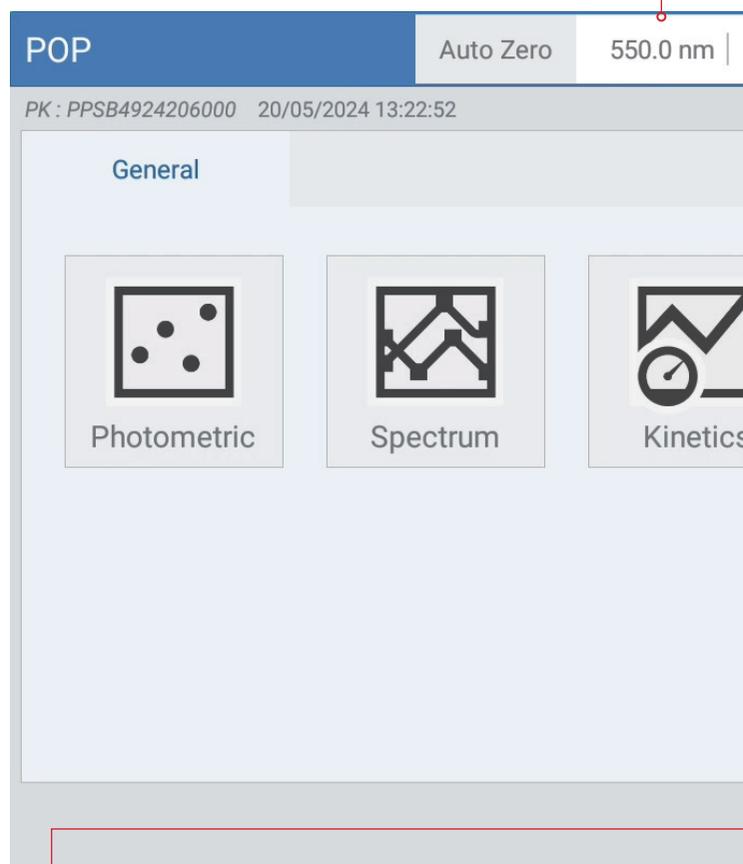
Kinetics Mode

This mode can measure the absorbance or transmittance of a sample over time.

Auto Zero

You can check the real-time measurement value.

*[AUTO ZERO] Quick button provided.



PC-Link

You can change the device mode to remote mode and use it in conjunction with a PC via View.



Provision of BIT (Built-in test)

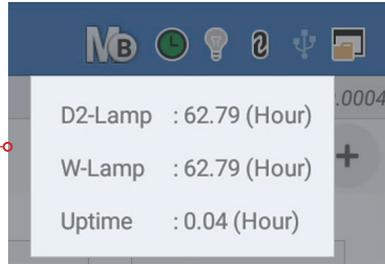
When you turn it on, it will perform a self-diagnosis to determine if there is anything wrong with the device. During the initial self-diagnosis, it will check the connection status, operation of each motor, lamp, and calibration status to determine if there is anything wrong with the device. It will check each item and display the results to always maintain the best condition.

*BIT Lists: Link, Wave Motor, Cell Motor, Filter Motor, W Lamp, D2 Lamp, D2 Lamp (Peak)



Cell status Check

You can easily check the type and location of the current cell.

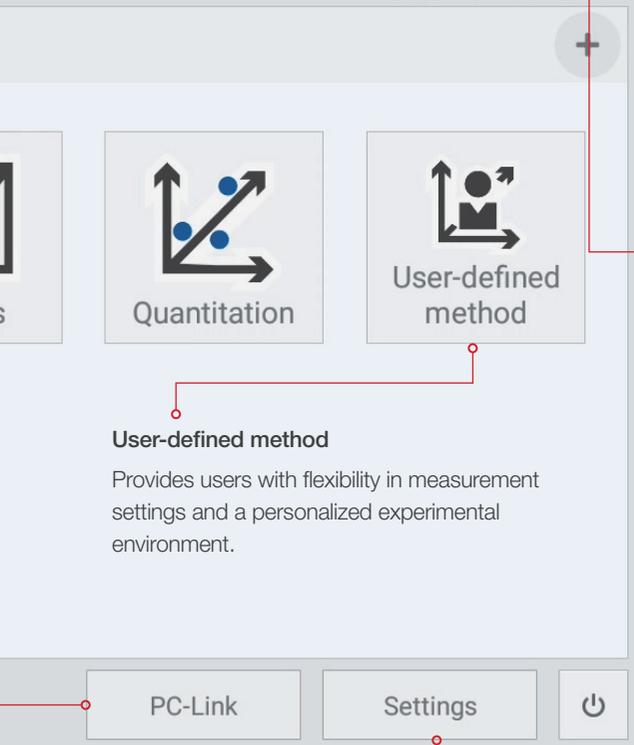


Check of Lamp preheating status

You can check the equipment operation time, lamp preheating status, and accumulated usage time in real time to measure in the optimal condition*.

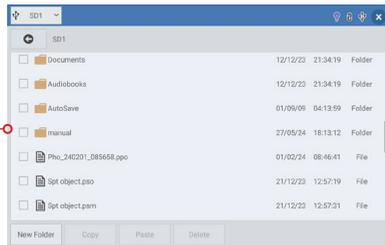
Before the lamp warms up, the icon is displayed in white. After the lamp warms up (1 hour), the icon is displayed in green.

(*) The device can be measured and operated immediately regardless of the warm-up.



User-defined method

Provides users with flexibility in measurement settings and a personalized experimental environment.

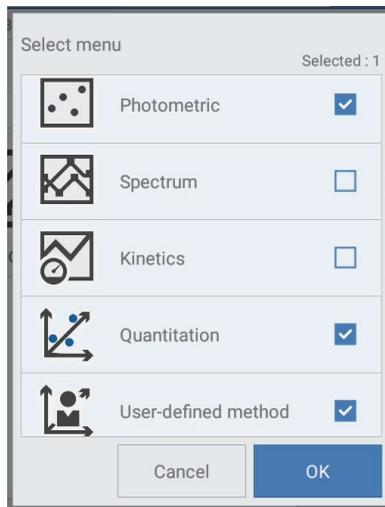


File Browser

You can create folders, copy files, and delete files in the device's storage space and external storage space.

Setting

You can change basic information about your device, system settings (language, sound, time, etc.), and calibrate your device.



Favorites

You can make it easier to use by adding a user menu that combines the measurement modes that users frequently use.

Remote Control Mode

POP can perform measurements directly as a standalone device, but it can also be controlled remotely by connecting to a PC. In a network environment, measurements can be performed and results checked on a PC without workspace restrictions.

Touch-type graph function

The measurement results are appropriately auto-scaled and presented in the form of a table or graph. The pinch zoom function allows you to easily zoom in on a desired part of the graph as needed.

Convenient data management

You can save measurement conditions and data in the built-in memory (32GB provided as standard) and USB memory, and perform various tasks such as data conversion through View, application of conversion formulas, and export to Excel.

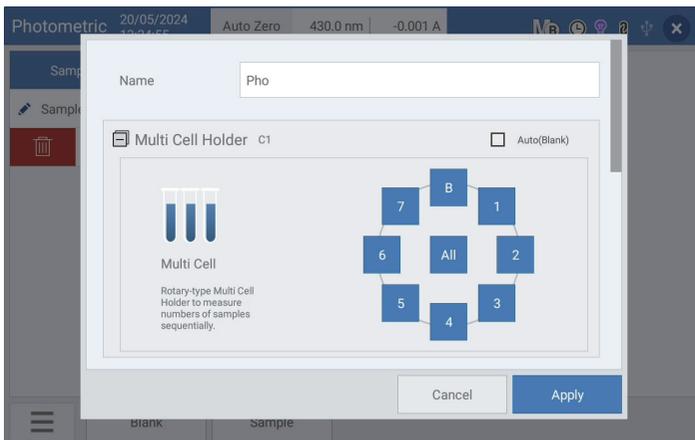
Photometric 25/01/2024 01:26:55 Auto Zero 313.0 nm | 0.118 A

Sample name	Cell	Date/Time	A313	A540	A600
Sample 1	C1	25/01/2024 01:25:46	0.173	0.197	0.031
Sample 2	C2	25/01/2024 01:26:06	0.063	0.067	0.011
Sample 3	C3	25/01/2024 01:26:25	0.119	0.133	0.022

Baseline Sample

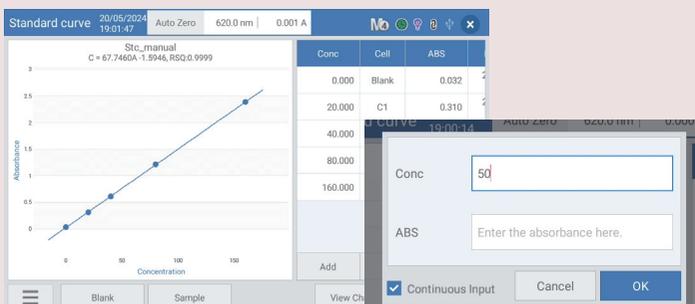
Photometric Mode

- This mode allows you to easily measure absorbance (Abs) (or transmittance (%T)) at a specific wavelength.
- You can set the factor (K) value, so you can perform a simple quantitative test ($C = K \times A$) of a sample known only by measuring absorbance (Abs).
- Up to 20 wavelengths can be set, and absorbance for each wavelength is automatically measured.
- Automatic analysis of up to 8 samples is possible using the Multi-Cell holder.



Quantitation Mode

- This is a mode for quantitative analysis using a saved standard curve.
- You can perform quantitative analysis of the sample of interest using a standard curve created with standard samples of various concentrations or directly entered values.
- More accurate quantification is possible using the results of repeated measurements.



Standard Curve Generation Mode

The mode for creating a standard curve provides four fitting options: Linear (Zero-crossing), Linear, Quadratic, and Cubic.

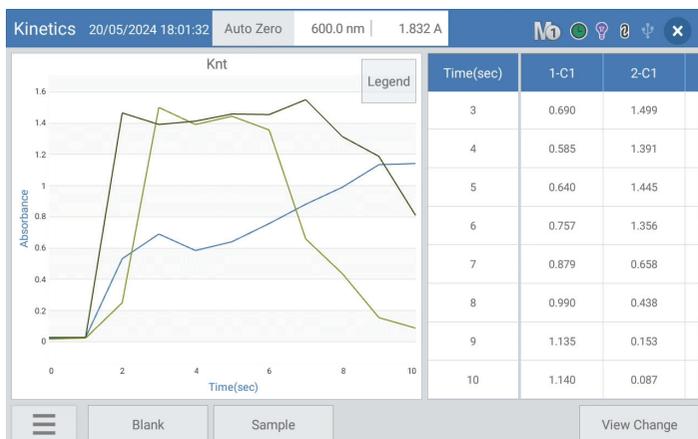
You can create a standard curve by measuring standard samples of various concentrations or directly entering concentration and absorbance.

You can modify or delete existing calibration curve data through the import function.



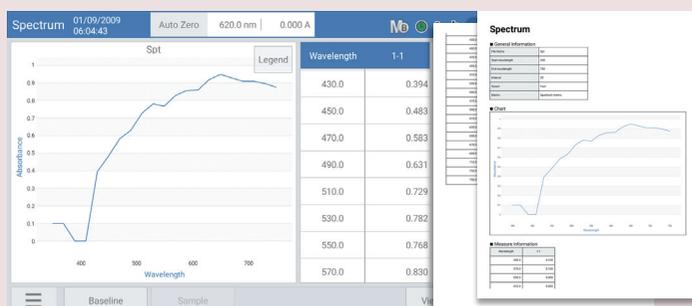
Spectrum Mode

- This mode allows the user to check the spectrum of the desired wavelength band.
- Conversion of absorbance (Abs) and transmittance (%T) data is possible through measurement settings.
- Automatic spectrum analysis of up to 8 samples is possible.
- Includes functions for section expansion and finding peak/valley locations of the spectrum.



Kinetics Mode

- This mode allows you to check the change in absorbance (or transmittance) over time at a specific wavelength.
- Measurements are made at regular time intervals, and the minimum interval that can be set is 1 second.
- The progress is displayed during measurement, and measurement is possible for up to 99 hours.
- The absorbance change of up to 8 samples can be automatically acquired.
- * The minimum measurement interval is adjusted according to the measurement range and conditions.

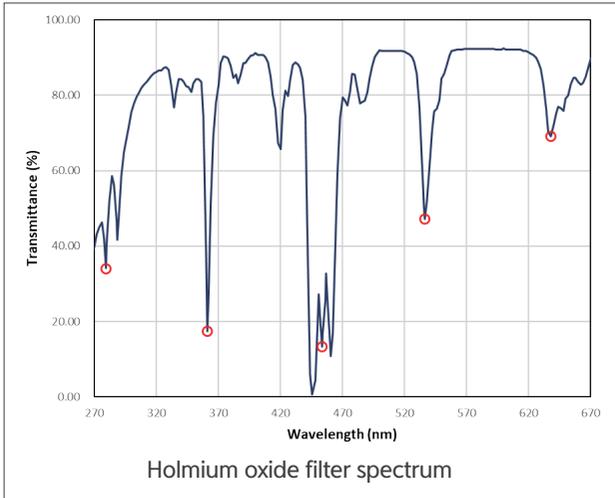


Report & Print

Users are provided with the ability to check, save (PDF/HTML), and print measured data in report format. This feature supports systematic reporting and documentation of experimental results and plays an important role in maximizing the usability and accessibility of data. These documentation and storage functions increase the reproducibility and transparency of research and ensure reliable data management.

THE UNCOMPROMISING PERFORMANCE

All POP products undergo rigorous quality testing prior to shipment to ensure proven performance.

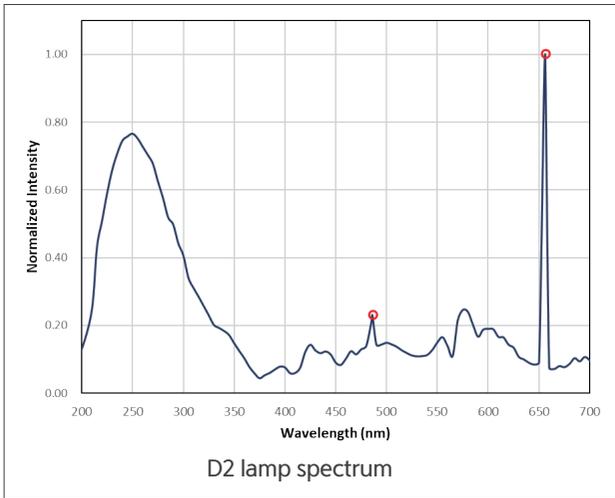


Wavelength accuracy & repeatability

POP adopts its own high-resolution wavelength measurement mechanism to ensure wavelength reproducibility of less than 0.1 nm across the entire band. The wavelength accuracy verified through a Holmium Oxide filter ($MU^* = \pm 0.2$ nm) is ± 0.5 nm, and the repeatability is less than ± 0.1 nm.

Certified Value	279.44 nm	360.89 nm	453.67 nm	536.52 nm	638.00 nm
Measured (Mean)	279.49 nm	361.00 nm	453.80 nm	536.80 nm	638.00 nm
Measured (Std)	± 0.00 nm				

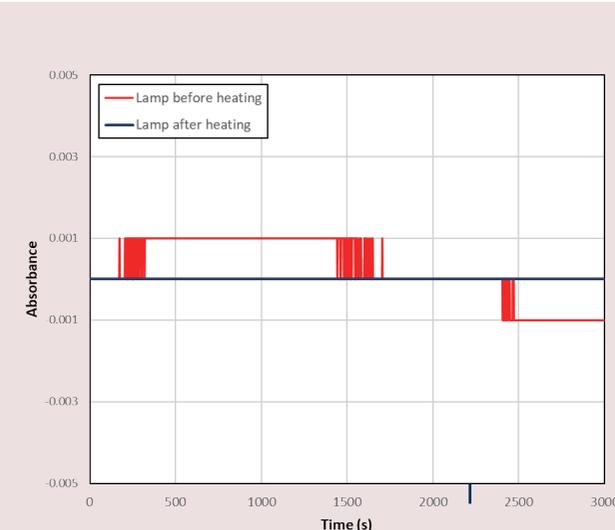
(*) MU : Measurement Uncertainty



POP automatically verifies wavelength accuracy using the Balmer lines of the D2 lamp at boot time. Using the validation mode, you can also check the wavelength width (SBW) of the product.

Certified Value	486.0 nm	656.1 nm
Measured (Mean)	486.0 nm	656.0 nm
Measured (Std)	± 0.00 nm	± 0.00 nm

Spectral Bandwidth	< 1.8 nm
Measured	1.2 nm



Baseline stability

Since POP uses a single-beam type monochromator, the measured values may fluctuate due to the light source drift phenomenon immediately after turning on the equipment. This phenomenon gradually stabilizes through the light source warm-up process. Therefore, for high-precision measurements, warm-up for about an hour or more is recommended, and in this case, stability within 0.001 Abs/h is guaranteed.

Photometric accuracy & repeatability

POP can minimize signal changes over time by automatically updating the blank signal for each measurement without separate operation by utilizing the Multi-Cell holder.

Precise signal processing provides excellent noise characteristics, ensuring photometric accuracy within ± 5 mAbs or 1% and photometric repeatability within ± 3 mAbs.

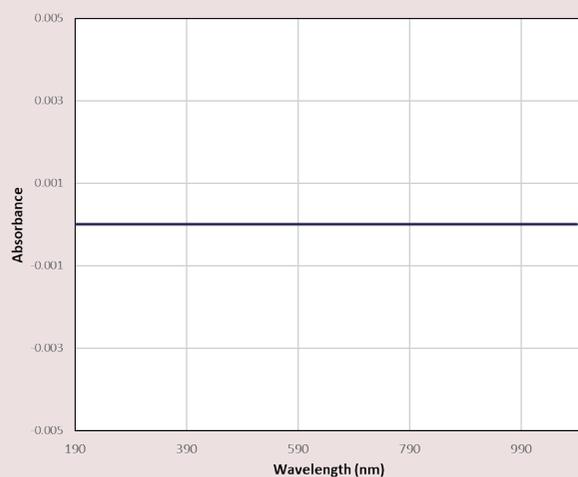
All products are verified using SRM 935a ($MU \cong \pm 5$ mAbs) and SRM 930e ($MU \cong \pm 3$ mAbs) before shipment.

Measurement results of SRM 935a + 0.001 M perchloric acid solution (60 mg/l)

Wavelength	235.0 nm	257.0 nm	313.0 nm	350.0 nm
Certified Value	0.7472	0.8637	0.2935	0.6411
Measured (Mean)	0.740	0.856	0.292	0.641
Measured (Std)	0.000	0.000	0.000	0.000

Measurement results of SRM 930e

Wavelength	440.0 nm	465.0 nm	546.1 nm	590.0 nm	635.0 nm
Certified Value	1.0218	0.9610	0.9983	1.0938	1.0738
Measured (Mean)	1.022	0.961	0.998	1.094	1.074
Measured (Std)	0.000	0.000	0.000	0.000	0.000



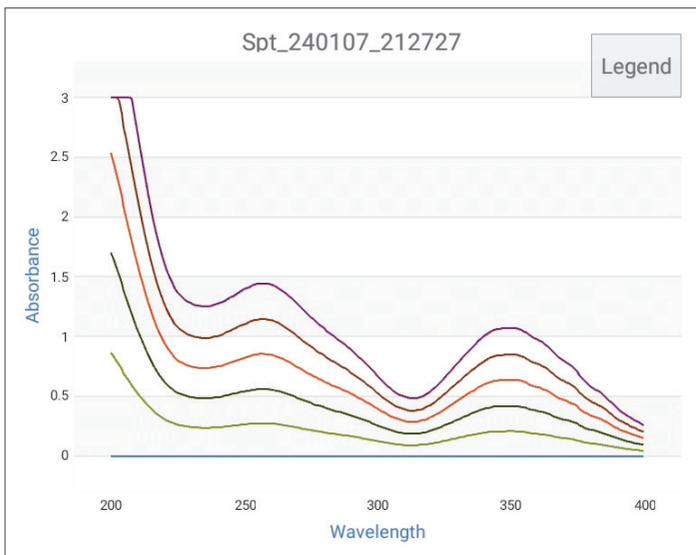
Baseline Flatness

POP automatically corrects the baseline for each measurement, providing consistent baseline flatness (< 0.001 Abs rms) without the need for separate baseline correction.

Application

Linearity & Quantitation

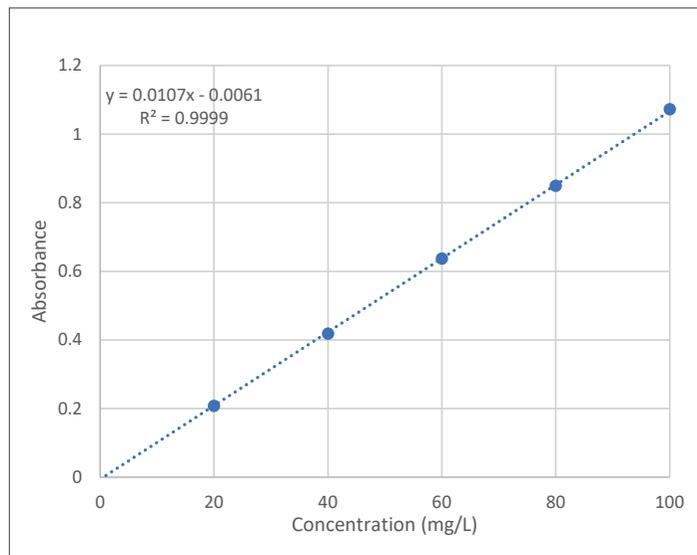
POP guarantees high linearity over the absorbance range of 0 to 3. Using the Quantitation mode, a standard curve can be created by measuring reference samples, and this can be used to estimate the concentration of an unknown sample.



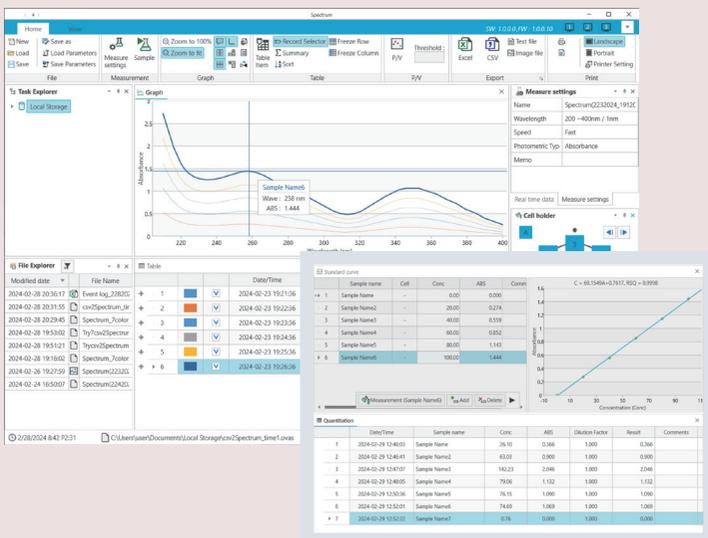
The graph on the left is the result of measuring the reference sample (SRM 930a) of 0, 20, 40, 60, 80, and 100 mg/L in Spectrum mode, and the graph on the right is the standard curve calculated based on the absorbance at 350 nm.

You can easily obtain the concentration value by entering the standard curve information obtained in Quantitation mode and measuring a sample with an unknown concentration.

You can confirm the high linearity from the R^2 value, and the slope of the standard curve, 0.0107, matches the absorption coefficient ϵ_a of SRM 930a shown in the table.



Nominal mass Fractions, $\text{g} \cdot \text{kg}^{-1}$	Specific Absorbance, ϵ_a , $\text{g} \cdot \text{kg}^{-1} \cdot \text{cm}^{-1}$
0.020	10.67
0.040	10.68
0.060	10.69
0.080	10.70
0.100	10.71

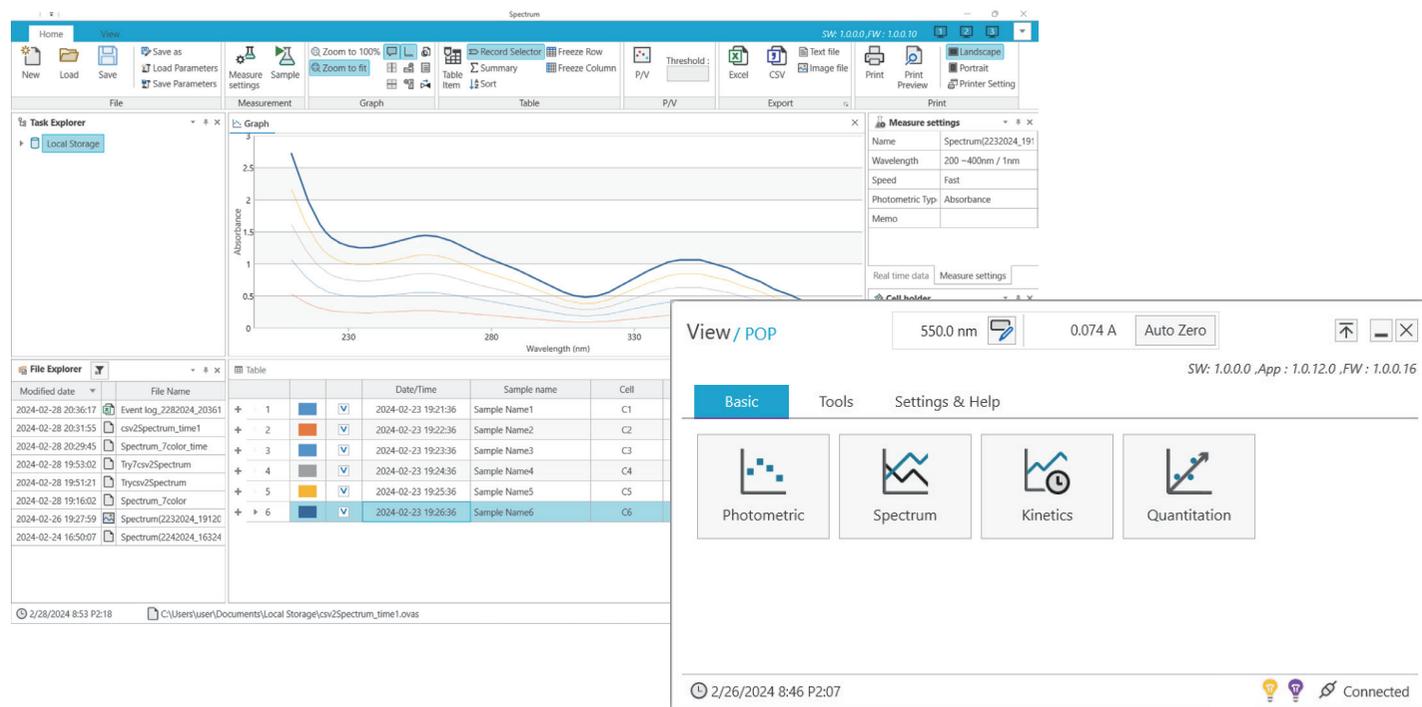


Convenient data analysis

View allows you to convert data measured in Spectrum mode into Quantitation mode data, allowing you to calculate standard curves more easily. Use the cursor crosshair function and Peak/Valley detection function to select the wavelength to be used for calibration, and use the standard curve generation function to conduct quantitative analysis right away without additional measurements.

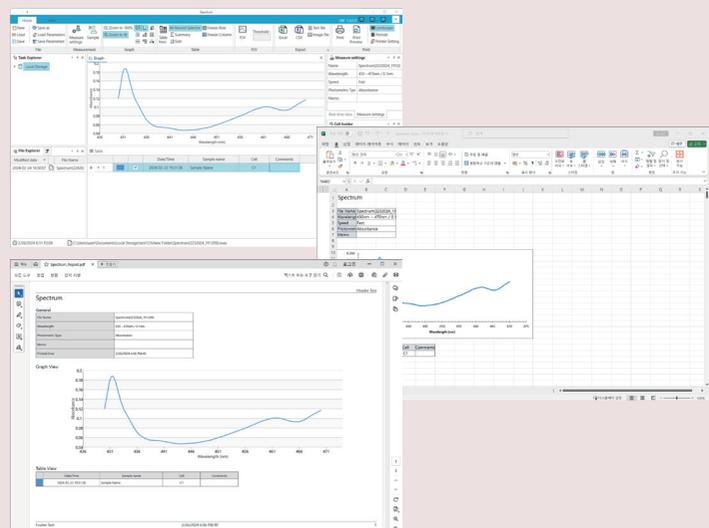
View supports extended repeat measurement functions, and allows you to analyze data with a high degree of freedom using the 'formula & function' function that supports various operations and conditional statements. If you need more detailed analysis, try using the various functions provided in View.

PC Software View (Optional)



View is a Windows-based PC software that can be used to remotely operate KLAB's spectrophotometers using a PC to acquire data, manage and analyze the measured data. It provides a continuous user experience through the familiar screen and intuitive interface of POP.

View allows you to perform measurements with a single click and check the progress of the experiment through real-time measurement data and cell holder positions displayed on the screen. It also provides a folder-based task management function for data management, and provides a convenient working environment through a layout that can be freely set, such as a ribbon menu that supports quick analysis through related arrangement, docking, and split fixation.



Multiple output formats

You can easily output measured data and analysis results in various formats. You can save them in View's own format for additional analysis, or collect only the necessary data and output them in a report format.

The supported output formats are as follows:

- Image format (.png)
- Text format (.txt)
- Excel format (.csv, .xlsx)
- Report format (.pdf)
- Native format (.ova*)

ACCESSORIES

Compatibility with various accessories provides the perfect solution for each laboratory and experimental environment.



Multi-Cell Holder (Standard)

The Multi-Cell holder to be able to measure automatically up to 8 samples.



Micro Volume Cell Holder

The single cell holder available, in case that sample's volume is below 500 μL .

Optical Path Length: 10 mm
Center Height: 15 mm



Round Cell Holder

The single cell holder available, when using circle cell to analyze a sample.

Test Tube Diameter: 16 mm / 25 mm
Test Tube Height: max. 100 mm



Long Path Cell Holder

The single cell holder is used, when measuring after lengthening a light path in order to analyze a low density sample.

Optical Path Length: 20 - 100 mm



Temperature Cell Holder (Water/Oil Circulator Type)

This is used to control the temperature of the cell holder by using a temperature circulatory device.

Tubing Size: 6 mm



Film Cell Holder

The single cell holder available for measuring the solid sample for a light to pass through such as an optical film or a slide glass.

Sample Size: max. 100 mm(H) x 70 mm(W)
Sample Thickness: max. 5 mm



Sipper

It is possible to perform automatic suction and measurement of liquid samples, and it has a built-in function to automatically correct the amount of suction, enabling accurate and stable sample processing.

Flow rate range: 0.035~570 mL/min
Speed range: 0.5~150 rpm
Speed resolution: 0.1 rpm (0~100 rpm), 1 rpm (100~600 rpm)

SPECIFICATIONS

Product Name	POP	POP-V
Photometrics System	Single-beam type	
Light Source(s)	Tungsten Halogen Lamp & Deuterium Lamp (Built-in light source auto interchanging motor)	Tungsten halogen Lamp
Detector	Silicon Photodiode	
Spectral Bandwidth	< 1.8 nm	< 1.8 nm
Wavelength Range	190 to 1100 nm	340 to 1100 nm
Wavelength Display (setting)	0.1 nm	
Wavelength Accuracy	<± 0.5 nm	
Wavelength Repeatability	<± 0.1 nm	<± 0.2 nm
Slew Rate	7,800 nm/min	
Scanning Speed	4,000 nm/min	
Photometric Range	Absorbance : -3 A to 3 A / Transmittance : 0% to 300%	
Photometric Accuracy	<± 0.003 Abs at 0.5 Abs	<± 0.005 Abs at 0.0 to 0.5 Abs
	<± 0.005 Abs at 1.0 Abs	<± 1% Abs at 0.50 to 2.0 Abs
	(NIST SRM 930e)	(NIST SRM 930e)
Photometric Repeatability	± 0.003 Abs	
Baseline Stability	0.001 Abs/h (700 nm, after one hour warm-up)	<0.002 Abs/h (700 nm, after one hour warm-up)
Baseline Flatness	<0.001 Abs rms (200 to 1,100 nm, after one hour warm-up)	<0.003 Abs rms (340 to 1,050 nm, after one hour warm-up)
Stray Light	< 0.05 % (at 220 nm with 0.1% NaI)	< 0.05 % (at 340 nm with 0.5% NaNO ₂)
	< 0.05 % (at 340 nm with 0.5% NaNO ₂)	
RMS noise	< 0.0002 Abs rms (at 700 nm)	
Monochromator	Czerny-Turner Monochromator	
Standard Cell Holder	Multi-Cell Holder(8 cells)	
Lamp Interchange Wavelength	340 to 410 nm (Default 370 nm)	-
Operating System (OS)	Android	
Display	7-inch (Resolution: 1280 x 800)	
Control Options	Stand-alone PC	
Dimensions	433(W) * 381(D) * 180(H) mm	
Power Requirement	AC 100-240V, 50/60Hz, 140VA	
Weight	10.5kg	
PC Software	View for Windows(optional)	

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