

Multiply Your Experimental Possibilities

Agilent Cary 3500 UV-Vis spectrophotometer series



Modular Design That Suits Your Application Needs

The Agilent Cary 3500 UV-Vis spectrophotometer series share a common UV-Vis engine, which produces monochromatic light that is measured by the various UV-Vis sample measurement modules.

This allows for the tailored development of specific modules for applications while maximizing the flexibility of the system. The Cary 3500 modules couple with the engine to provide measurement functionality for target applications. The Cary 3500 Multicell and Compact UV-Vis modules provide measurement solutions for cuvette-based applications, while the Cary 3500 Flexible UV-Vis module provides measurements for liquid and solid samples, and supports a range of accessories. The three variations are shown below.

Agilent Cary 3500 UV-Vis spectrophotometers series



Cary 3500 Compact UV-Vis spectrophotometer*

The Cary Compact UV-Vis is designed for measuring a single sample and reference. It is available in either an ambient or temperature-controlled configuration.



Cary 3500 Multicell UV-Vis spectrophotometer**

The Cary 3500 Multicell UV-Vis is designed for measuring up to seven samples and a reference (or other combinations in the eight cell positions). It is available in either an ambient, temperature-controlled, or multiple-temperature-zone configuration.



Cary 3500 Flexible UV-Vis spectrophotometer

The Cary 3500 Flexible UV-Vis is designed for measuring a single sample and reference. It has a large sample compartment, in which liquid and solid samples can be measured.

*Compact ambient and temperature-controlled

** Multicell ambient, temperature-controlled or multiple-temperature-zone configuration



Cary 3500 UV-Vis spectrophotometers feature a powerful xenon lamp

The Cary 3500 UV-Vis spectrophotometers use powerful, advanced xenon flash lamp technology, which collects data at a rate of 250 points per second. The lamp only illuminates the sample when data is acquired, protecting sensitive samples from photodegradation, and reducing power consumption. This lamp helps to remove any warmup burden before using the instrument. The xenon flash lamp comes with 10-year replacement warranty (for Cary 3500 instruments purchased from Agilent or participating partners) and drastically reduces the frequency and cost of lamp replacement.

Collect data once, interrogate in multiple ways

With the xenon lamp generating 250 data points per second and the wavelength drive moving at up to 2500 nm per second, you'll never miss vital data because your reaction is faster than your instrument's data collection rate.

Intuitive and Secure Software— Set Only the Parameters That Matter

Agilent Cary UV Workstation software delivers speed, data quality, and reliability with the following described features.

Cary 3500 UV-Vis spectrophotometers are compatible with the OpenLab software suite

Agilent OpenLab software provides technical controls to securely acquire and store data in laboratories that must comply with FDA 21 CFR Part 11, EU Annex 11, GAMP5, ISO/IEC 17025, and the EPA's 40 CFR Part 160 (and similar regulations in other countries). These controls include access control and secure storage in a local or central database, electronic signature workflows, and an advanced audit trail review.



Secure and manage the Cary 3500 UV-Vis spectrophotometer data with OpenLab

Agilent offers two configurations of Cary UV Workstation where data is stored in OpenLab:

- 1 Data is stored and managed locally on the PC attached to the Cary 3500 UV-Vis spectrophotometer.
- 2 Data is stored and managed centrally in one of the OpenLab options shown in Figure 1.

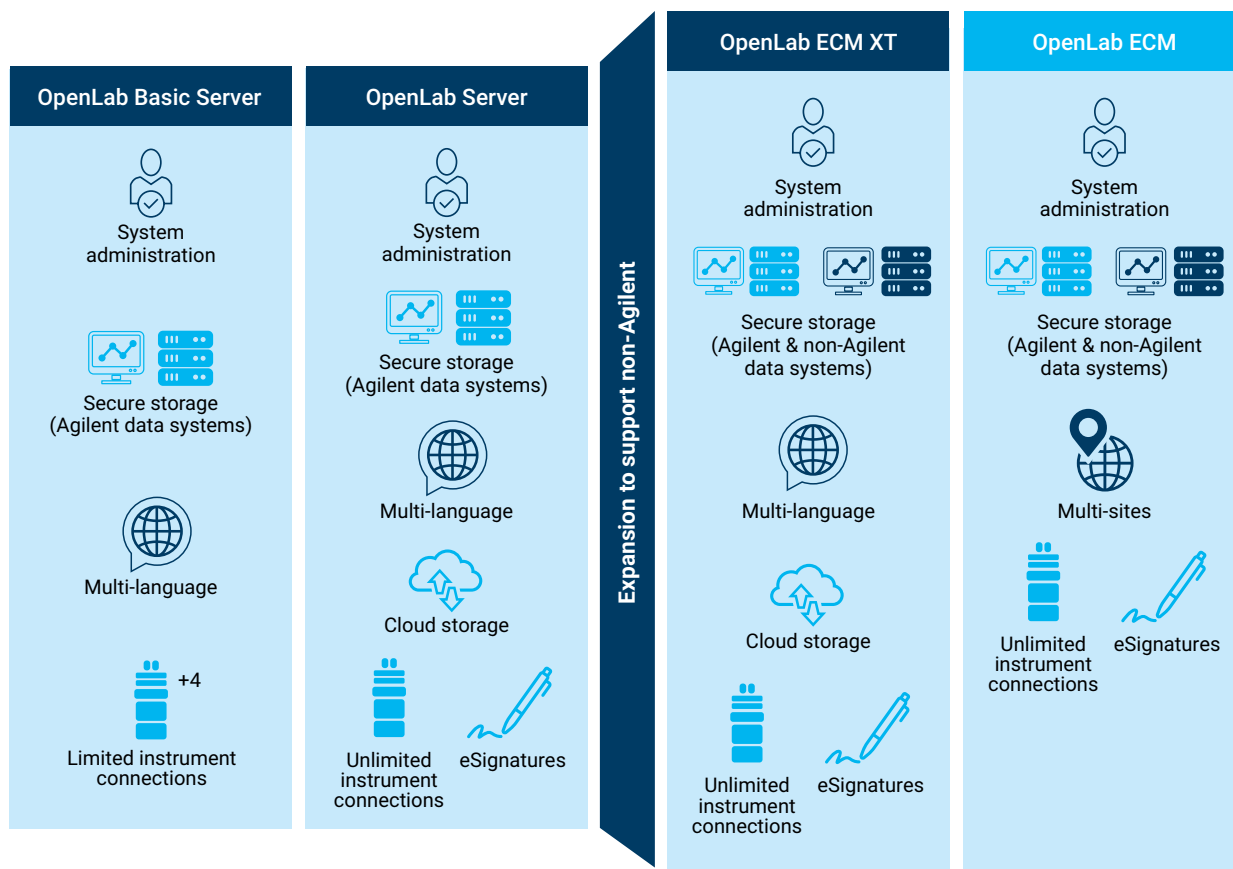


Figure 1. An Agilent OpenLab software solution can be tailored to suit the size of your organization.

Ensure compliance and data integrity with our computer system validation services

Computerized System Validation (CSV) is a regulatory requirement for all computerized systems used in regulated environments in the pharmaceutical, biotech, biopharma, and medical device industries. Agilent provides CSV services and sells a validation starter kit for the Cary 3500 UV-Vis spectrophotometers, which helps our customers validate their computerized systems with greater efficiency while enabling compliance to applicable regulations. Our Qualification (ACE) and CSV services assist customers through all phases of the validation life cycle (shown in Figure 2). Our CSV service is based on the industry best practice GAMP®5 "V-model" which focuses on customer intended use and applicable regulations with a risk-based approach. Agilent's CSV service has proven to significantly reduce Time-to-Production and burden on customer resources to successfully validate their computerized systems.

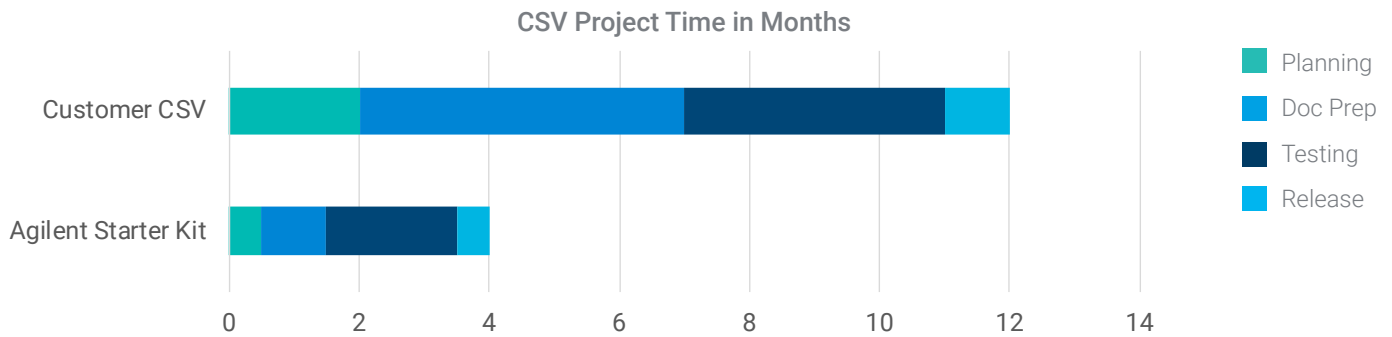
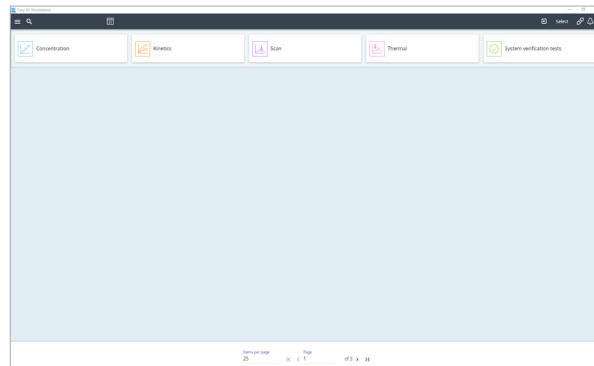


Figure 2. Agilent's Validation Starter Kits - Helping customers achieve faster ROI

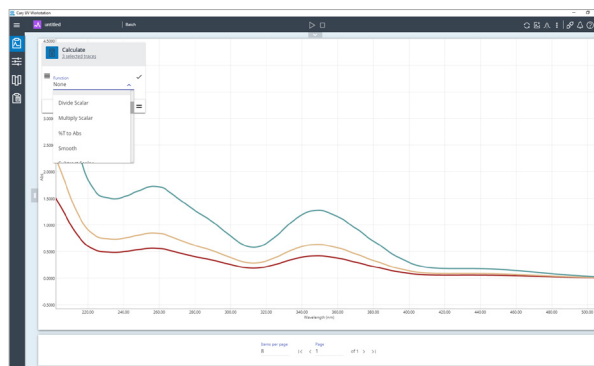
Reduce data processing and calculation burden with Cary UV Workstation software

The Cary UV Workstation software, which controls the Cary 3500 UV-Vis spectrophotometers, comes with more than 50 built-in calculations and the ability to create customized calculations. The calculations can be saved in a method, which can reduce experimental time, minimize calculation errors, improve efficiency, and increase the technical control in regulated environments. The software includes a Help and Learning Center with intuitive video tutorials to get you up and running fast.



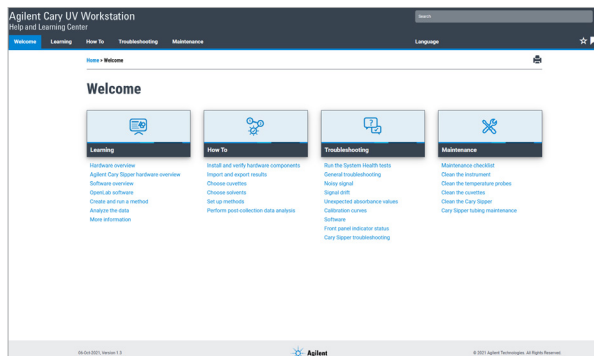
Set only the parameters that matter

Choose from time-based kinetics, concentration, wavelength scanning, or temperature-based measurements and only see parameters you need to set.



Over 50 built-in calculations

Analyze your data with one of more than 50 built-in calculations or create your own.



Video guidance for new or infrequent users

The built-in Help and Learning Center reduces training time and effort by providing easy to follow videos and information for all users.

Meeting Global Regulatory Requirements

Meet the requirements of global pharmacopeias

The Cary UV Workstation software includes a range of operational qualification tests that are automated. These tests align with the global pharmacopeia requirements of U.S. Pharmacopeia (USP) general chapter <857>, European Pharmacopeia (Ph. Eur.) chapter 2.2.25, and the Japanese Pharmacopeia (JP) chapter 2.24. The operational qualification tests are designed such that successfully passing all tests will ensure that the instrument is performing according to the USP, Ph. Eur., and JP specifications.



High degree of confidence via self-test operational checks

The self-tests within the Cary UV Workstation software are designed to check all critical instrument components and will provide a high degree of confidence that the instrument is operational and providing accurate results. After the completion of a self-test, the results are saved into the Cary UV Workstation secured database. Clicking the result card will produce a report, which can be printed or saved for archival purposes.

Reduce Sample Measurement Time and Operator-Induced Errors

The Agilent Cary Sipper flow cell pump is an optional accessory for the Cary 3500 UV-Vis spectrophotometers. It includes a novel three-channel pump that fills and rinses up to three flow cells at the same time, reducing sample measurement time and removing operator-induced errors associated with manually filling cuvettes. The Cary Sipper offers maximum sample throughput and time savings.



Cary 3500 Flexible UV-Vis Spectrophotometer



Research-grade instrumentation at your fingertips

Advanced photometric performances in the UV-Vis

The Agilent Cary 3500 Flexible UV-Vis spectrophotometer ensures superior photometric performance that is achieved precisely and reliably. The spectral bandwidth of the Cary 3500 UV-Vis engine is variable and can be adjusted from (0.1 to 5 nm). The Cary 3500 Flexible UV-Vis spectrophotometer provides high linear dynamic range across the wavelength range, with absorbances exceeding 6 absorbance units.

Quantitative analysis of aqueous potassium permanganate (Figure 3, left) further demonstrates the excellent photometric accuracy and range of the Cary 3500 Flexible UV-Vis spectrophotometer. Taking a measurement at 525 nm with a 1 cm cuvette permits analysis up to 490 ppm without dilution. The plot of absorbance versus concentration (Figure 3, right) highlights the wide dynamic range and inherent linearity ($R^2 = 0.9997$). At the other end, the Cary 3500 Flexible UV-Vis spectrophotometer allows the analysis of extremely low concentration samples using 10 cm cuvettes (0.03 to 10 ppm of $KMnO_4$ solutions) with excellent linearity, as shown in Figure 4.

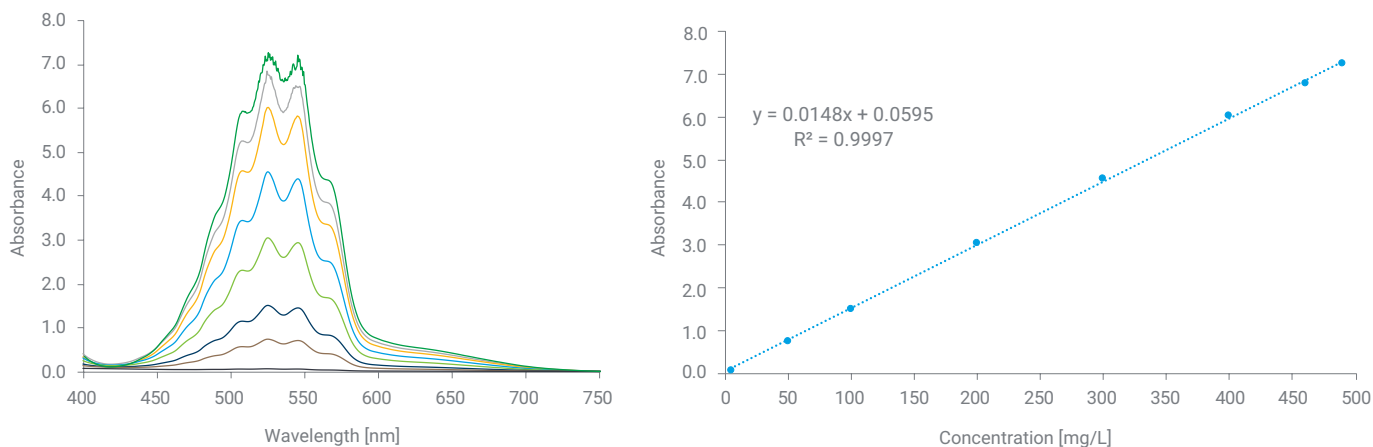


Figure 3. Analysis of high concentrations of aqueous KMnO_4 solutions up to 7 absorbance units using a standard cell of 1 cm path length and signal averaging time of 10 seconds. The UV-Vis spectra of the eight standard solutions (left); calibration plot of absorbance (at 525 nm) versus concentration (mg/L) with excellent linearity ($R^2 = 0.9997$, right).

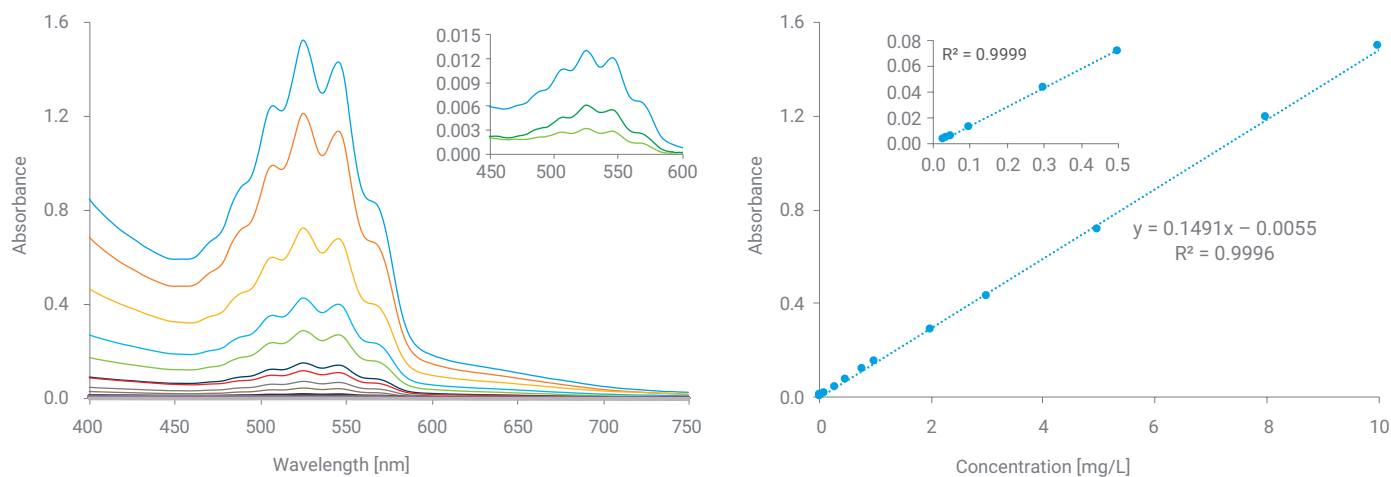


Figure 4. Spectra of standard KMnO_4 solutions measured using a rectangular cell with 10 cm path length. The inset shows the spectra obtained for the low-concentration standards 0.03, 0.05, and 0.1 mg/L (left). Linear calibration plot of absorbance (at 525 nm) versus concentration (mg/L) with a correlation coefficient of $R^2 = 0.9996$. The inset shows the calibration plot for the lowest concentration range of 0.03 to 0.50 mg/L (right).

Multiple Accessories to Enhance Your Performance

The Cary 3500 Flexible UV-Vis spectrophotometer is complemented by a range of accessories for the handling of various sample sizes and types. Its large sample compartment accommodates most sample sizes while minimizing its footprint on the lab bench.

The accessories for liquid samples include:

- Single cell holder (1 cm)
- Variable-path-length rectangular and cylindrical cell holders. The Cary 3500 Flexible UV-Vis spectrophotometer features the unique, variable-path-length rectangular and cylindrical cell holders, which enable you to change the path length quickly and reproducibly (2, 4, 5, and 10 cm). This toolless design eliminates the time-consuming alignment procedure and can be used for many applications (Figure 5).



The accessories for solid samples include:

- Solid-sample holder. This holder can be used for fixed position transmittance measurements of solid samples. The holder is supplied with several aperture masks to allow beam collimation and measurements of small samples (up to 1 mm). The holder can be adjusted to various configurations, allowing many sample types, sizes, and thicknesses to be measured.
- Thin-film holder. This accessory uses a magnetic frame with an aperture to hold samples in place that are presented as films. This design offers a toolless solution where the sample can be easily adjusted.

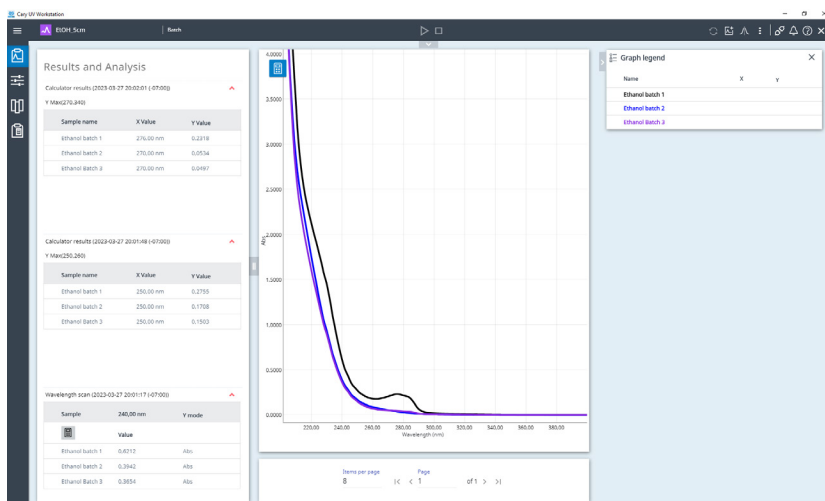
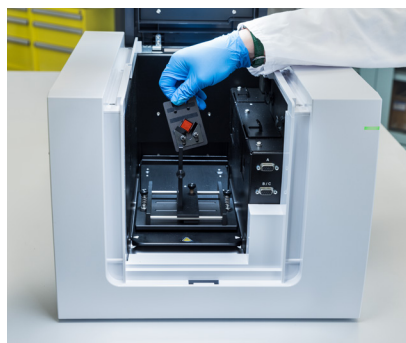
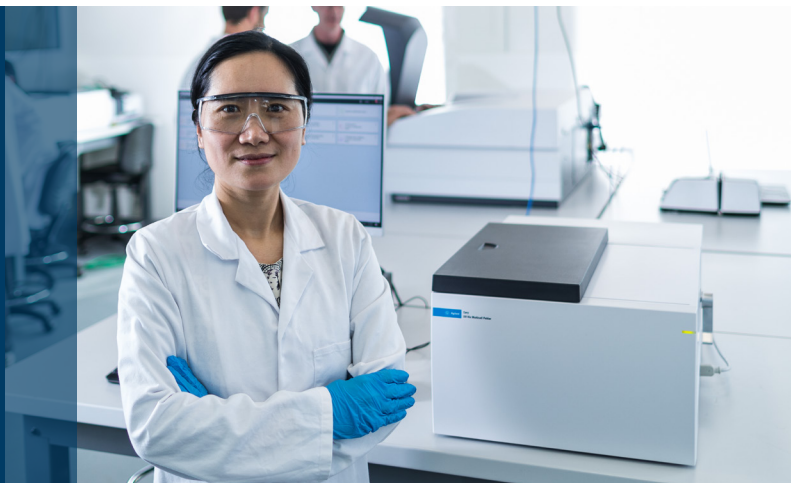


Figure 5. Anhydrous ethanol measurements using the Agilent Cary 3500 Flexible UV-Vis spectrophotometer with a 5 cm cuvette



Cary 3500 Compact and Multicell UV-Vis Spectrophotometers

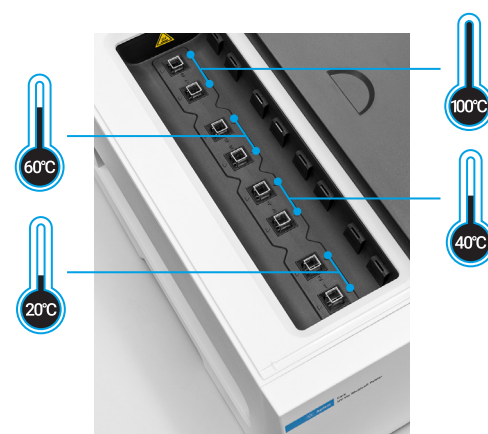


Multiply your experimental impact

The innovative Agilent Cary 3500 Compact and Multicell UV-Vis spectrophotometers can transform your laboratory. Designed from the ground up, these spectrophotometers will streamline your experimental design and amplify confidence in your results, changing the way you:

- Monitor enzymatic reactions at different temperatures
- Calibrate and determine sample concentration
- Perform temperature ramping experiments
- Quantify nucleotides and proteins

Furthermore, it offers waterless temperature control up to 110 °C. The integrated, air-cooled, Peltier-driven temperature control does not require a space-consuming water circulator. This means that there is no messy plumbing, flood risk, or maintenance. The robust design has no moving parts, and the permanent optical alignment requires no adjustment. It provides fast and accurate temperature measurements between –5 to 110 °C. Furthermore, experiments that usually require slow ramp rates can now be done at 40 °C per minute, and even show improved accuracy and reproducibility.



Small volumes, massive impact

A highly focused beam of less than 1.5 mm width delivers maximum accuracy

The extremely small and permanently focused beam of the Cary 3500 Compact and Multicell UV-Vis spectrophotometers easily passes through small apertures (Figure 6). The stationary multicell holder requires no alignment and will provide repeatable measurements of up to eight microcuvettes every time, without operator adjustment.



Figure 6. A highly focused beam of 1.5 mm width delivers maximum accuracy.

Temperature Ramping, Transformed

Confidence at any temperature ramp rate

The plot in Figure 7 shows that the melting temperature of herring sperm DNA is not impacted by the temperature ramp rate. Ramp your sample temperatures from 1 to 40 °C per minute with as much confidence.

Ramp rate (°C/min)	Replicate 1 T _m (°C)	Replicate 2 T _m (°C)	Replicate 3 T _m (°C)	Average T _m (°C)	Standard Deviation
1	87.1	87.1	87.1	87.1	0.0
5	87.0	86.6	86.5	86.7	0.2
10	86.7	87.1	87.0	86.9	0.2
20	87.1	87.1	87.1	87.1	0.0
30	87.1	87.0	86.6	86.9	0.2
40	86.6	87.0	87.0	86.9	0.2

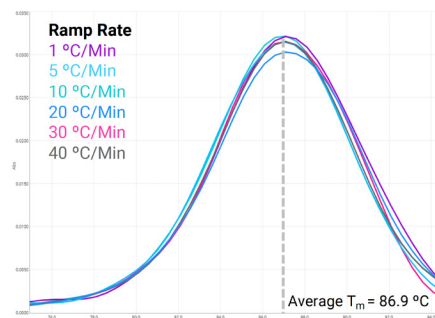


Figure 7. The measured T_m values for the herring sperm DNA sample at each temperature ramp rate and the corresponding first derivatives traces.

Accurate and fast temperature control

The unique Cary 3500 UV-Vis in-cuvette temperature probe has a low mass, large surface area, and superfast feedback loop (Figure 8). The probe provides instantaneous temperature readings direct from the sample—which is key to the Cary 3500 Compact/Multicell UV-Vis spectrophotometers' ability to ramp the temperature of the sample between –5 and 110 °C with incredible accuracy. This accuracy is achieved even when ramping at up to 40 °C per minute. Temperature accuracy is independent of ramp rate, so you can rely on your temperature readings even when ramping faster than you thought possible. This all means more data, better data, and faster acquisition.



Figure 8. The unique Agilent Cary 3500 UV-Vis in-cuvette temperature probe has a superfast feedback loop. The probe provides instantaneous temperature readings, direct from the sample.

Streamline experimental design



The Cary 3500 Multicell UV-Vis spectrophotometer allows customers to simultaneously scan a full wavelength range on all eight channels in less than one second. Other features include:

- Ability to perform four different temperature experiments at the same time and dramatically reduce analysis time
- Accurate and quick temperature control of your samples from –5 to 110 °C without water, noise, or messy cables
- Faster sample analysis—reduce your thermal ramp time by increasing the ramp rate, without sacrificing data quality
- Simultaneous measurement of standards, samples, and controls under the same conditions
- No moving parts or alignment requirements, ensuring reproducible, and accurate results every time (even with small volumes)

Multiple Cells, Multiple Temperatures, Simultaneously

Measure samples at four temperatures, simultaneously

The Cary 3500 Multicell UV-Vis spectrophotometer (multiple-temperature-zone configuration) has no moving parts and allows up to four temperature zones to be configured. Each pair of cuvettes can be held at a different temperature, so you can perform four experiments at once. The module includes built-in, software-controlled stirring. Sample temperature can be accurately and reliably controlled by high-performance temperature probes that read the temperature immediately next to where the sample is being measured (Figure 9).

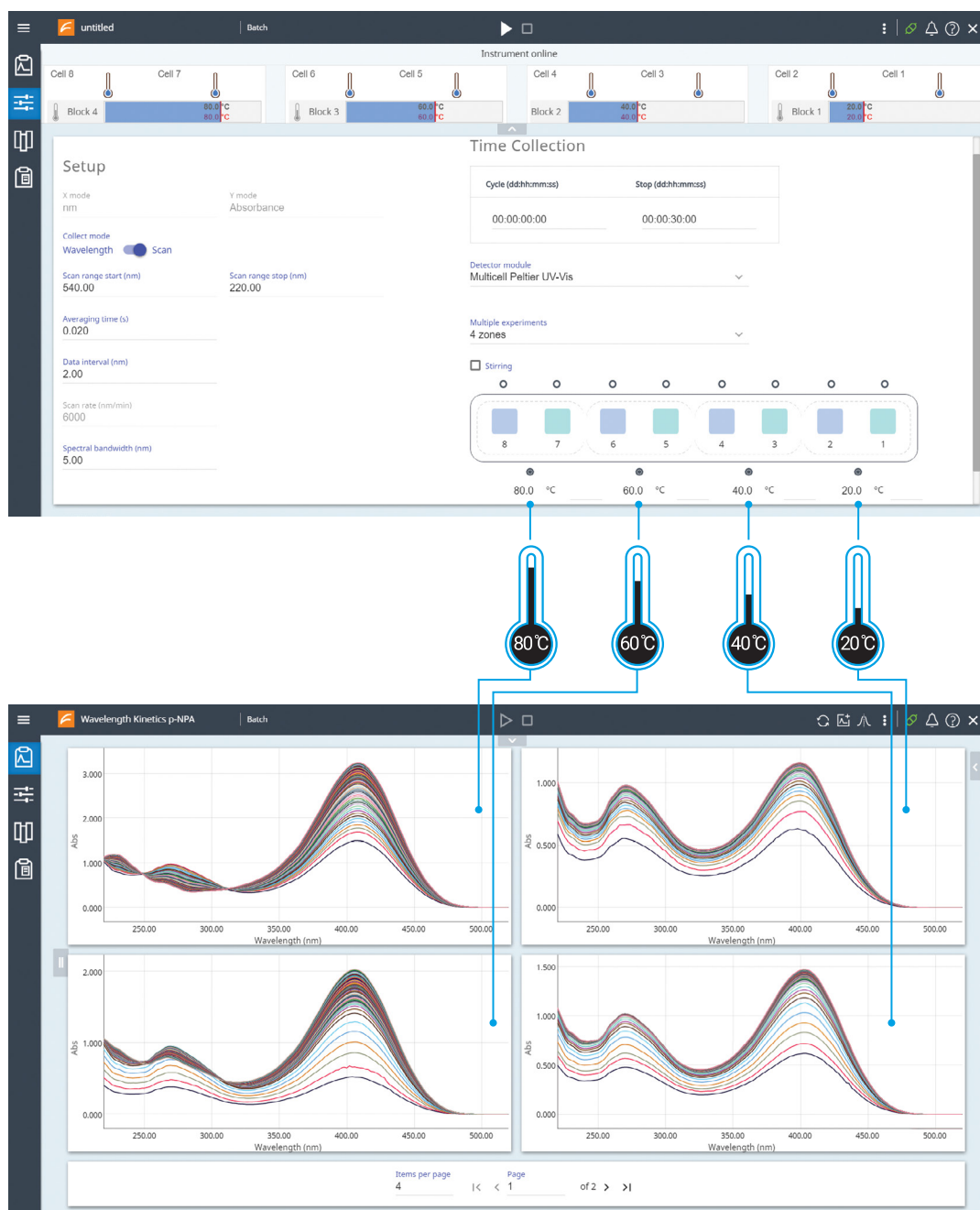


Figure 9. Collect data at four sample temperatures, simultaneously, and at 250 data points per second. Powerful Cary UV Workstation software allows you to interrogate multivariate data sets and make the most of your data.

Calibration Standards and Samples, Simultaneously

Create a calibration curve and measure samples in less than one second

Place your standards in the eight-position multicell holder and fill the other positions with samples. With the Cary 3500 Multicell UV-Vis spectrophotometer, all eight positions are measured simultaneously, under the same conditions. In the time it normally takes to collect only one spectrum, the full calibration curve and sample concentration data instantly appear (Figure 10). The double out-of-plane Littrow monochromator and powerful xenon lamp of the Cary 3500 UV-Vis allows measurements of samples that absorb up to 99.999% of the light. This means faster results with fewer dilutions and errors.

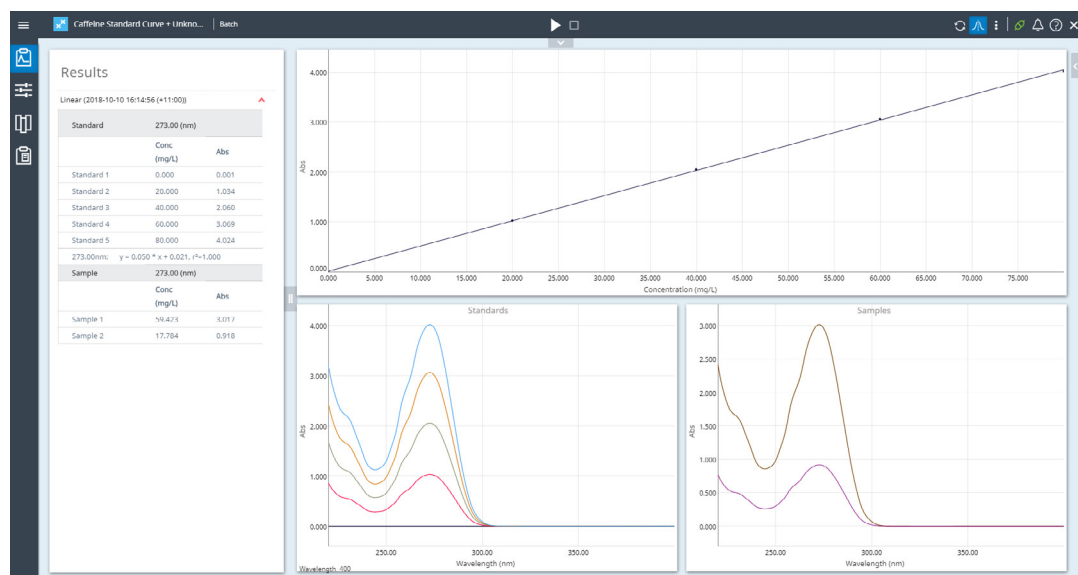


Figure 10. Simultaneously measure standards, samples, and controls, under exactly the same conditions.

Agilent CrossLab: Real insight, real outcomes

CrossLab goes beyond instrumentation to bring you services, consumables, and lab-wide resource management. So your lab can improve efficiency, optimize operations, increase instrument uptime, develop user skill, and more.



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