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Cary Spectrophotometers

Cary spectrophotometers are manufactured according to a Quality system that is certified to the ISO-9001. The specifications listed below represent the average results of the final acceptance tests performed in the factory. With a sample of over six hundred Cary 50 instruments and over two thousand Cary 100 and 300 instruments, the specifications are indicative of the performance of Cary instruments. These specifications are not guaranteed. The guaranteed specifications are listed in a separate brochure and are based on the ± 4 sigma statistical confidence level.

Cary 50

Dual beam, Czerny-Turner 0.28 m monochromator, 190–1100 nm wavelength range, approximately 1.5 nm fixed spectral bandwidth, full spectrum Xe pulse lamp single source with exceptionally long life, dual Si diode detectors, quartz overcoated optics, scan rates up to 24 000 nm/min, 80 data points per second maximum measurement rate, non measurement phase stepping wavelength drive, room light immunity, centrally controlled by PC with Windows interface.

Cary 100/300

Double beam, dual chopper, ratio recording, Czerny-Turner 0.28 monochromator UV-Vis spectrophotometer, centrally controlled by a PC. Cary 300 has double dispersion, Cary 100 has single dispersion. High light throughput optical system with all reflective optical design, high speed accurate scanning. Optional centrally controlled accessory system. High performance R928 photomultiplier tube, tungsten halogen visible source with quartz window, deuterium arc ultra violet source. Centrally controlled by PC with Windows interface.

| | Cary 50 | Cary 100 | Cary 300 |
|---|---|--|---|
| Monochromator | Czerny-Turner 0.28 m | Czerny-Turner 0.28 m | Czerny-Turner 0.28 m plus pre-monochromator |
| Grating | 27.5 x 35 mm, 1200 lines/mm, blaze angle 8.6° at 240 nm | 30 x 35 mm, 1200 lines/mm blaze angle 8.6° at 240 nm | 30 x 35 mm, 1200 lines/mm blaze angle 8.6° at 240 nm Pre-monochromator: 1200 lines/mm blaze angle 8.6° at 240 nm |
| Beam Splitting System | Beam splitter | Chopper (30 Hz) | Chopper (30 Hz) |
| Detectors | 2 silicon diode detectors | R928 PMT | R928 PMT |
| UV-Vis Limiting Resolution (nm) | <1.5 | 0.189 | 0.193 |
| Toluene/Hexane Limiting Resolution test (nm) | 1.65 | | |
| Stray Light (%T) At 200 nm (KCl EP/BP method) | 0.53 | 0.50 | 0.32 |
| At 220 nm (10 g/L NaI ASTM method) | 0.02 | 0.0074 | 0.00008 |
| At 370 nm (50 mg/L NaNO ₂) | 0.018 | 0.0013 | 0.000041 |
| Wavelength Range (nm) | 190–1100 | 190–900 | 190–900 |
| Wavelength Accuracy (nm) | 0.07 at 541.92 nm 0.24 at 260.54 nm | 0.02 at 656.1 nm 0.04 at 486.0 nm | 0.02 at 656.1 nm 0.04 at 486.0 nm |
| Wavelength Reproducibility (nm) Peak separation of repetitive scanning of a UV-Vis line source | 0.01 | 0.008 | 0.008 |
| Spectral Bandwidth Accuracy (nm) At 0.2 At 2.0 | | 0.193 2.03 | 0.189 2.03 |
| Photometric Accuracy (Abs) At 1 Abs (NIST filter method) At 0.3 Abs (Double Aperture method) | 0.0007 | 0.00016 | 0.00016 |

| | Cary 50 | Cary 100 | Cary 300 |
|--|--|--|--|
| Photometric Range (Abs) | 3.3 | 3.7 | 5.0 |
| Photometric Display (Abs) | ± 9.9999 | ± 9.9999 | ± 9.9999 |
| (%T) | ± 200.00 | ± 200.00 | ± 200.00 |
| Photometric Reproducibility (Abs) | At 465 nm | At 590 nm, 2 nm SBW | At 590 nm, 2 nm SBW |
| Using NIST 930D filters, 2 second Signal Averaging Time. | | | |
| Maximum deviation at 1 Abs | 0.004 | <0.0008 | <0.0008 |
| Standard deviation for 10 measurements | 0.00050 | <0.00016 | <0.00016 |
| | At 546.1 nm | At 546.1 nm, 2 nm SBW | At 546.1 nm, 2 nm SBW |
| 2 second Signal Averaging Time | | | |
| Maximum deviation at 0.5 Abs | 0.003 | <0.0004 | <0.0004 |
| Standard deviation for 10 measurements | 0.00030 | <0.00008 | <0.00008 |
| Photometric Stability (Abs/hour) | 30 minute warm up | 2 hour warm up | 2 hour warm up |
| 500 nm, 1 second Signal Averaging Time | <0.0004 | <0.0003 | <0.0003 |
| Photometric Noise (Abs, RMS) | 1.5 nm SBW | 2 nm SBW | 2 nm SBW |
| 500 nm, 1 second Signal Averaging Time. | | | |
| | 0.000063 at 0 Abs 0.00014 at 1 Abs 0.0018 at 2 Abs | 0.000030 at 0 Abs 0.00014 at 3 Abs, 1.5 Abs RBA | 0.000030 at 0 Abs 0.00025 at 3 Abs, 1.5 Abs RBA 0.0022 at 5 Abs, 1.5 Abs RBA |
| Baseline Flatness (Abs) | | | |
| 200 to 850 nm, smooth 21 applied, baseline corrected | 0.0006 | 0.00022 | 0.00025 |
| Sample Compartment Beam Separation (mm) | | 110 | 110 |
| Compartment Size (WxDxH) | 130 x 523 x 123 mm Note that sample compartment can be left open during measurement due to room light immunity of Cary 50 | 139 x 389 x 129 mm Extended Sample Compartment fitted | 139 x 389 x 129 mm Extended Sample Compartment fitted |
| Access | Top and front | Top and front | Top and front |
| Instrument Dimensions (WxDxH) | 500 x 590 x 205 mm | 640 x 650 x 320 mm | 640 x 650 x 320 mm |
| Purging | None | Sample compartment | Sample compartment |
| Instrument Weight | 21 kg | 45 kg | 45 kg |

Recommended environmental conditions

| | | |
|---|--|---|
| Instrument Storage | 5-45 °C at 20-80% relative humidity, non-condensing, altitude <2133 m. | |
| Instrument Operation | Below 853 metres altitude: 10-35 °C, 8-80% relative humidity, non-condensing. Between 853 and 2133 metres altitude: 10-25 °C, 8-80% relative humidity, non-condensing. | |
| Instrument Electrical Requirements | Instrument draws maximum of 26 W of power from the host PC power supply. The power rating is: +5 V DC <1A, + 12 V DC <1.5 A, -12 V DC <0.25A. The Cary 50 interface card fits into a standard ISA slot in the host PC and requires a standard PC internal Hard disk power supply connector. Operation of motor driven accessories may increase the +12 V requirement by a further 2 A (24 W maximum). The host PC must be certified to standard IEC 60950 or equivalent. | Mains supply of 100/120/220/240 volts AC ± 10%, 50 or 60 Hz ± 1 Hz with 400 VA power consumption. |

Operational

| | Cary 50 | Cary 100 | Cary 300 |
|---|--|---|---|
| Spectral Bandwidth (nm) | Fixed at 1.5 nm | 0.20-4.00 nm, 0.1 nm steps, motor driven | 0.20-4.00 nm, 0.1 nm steps, motor driven |
| Signal Averaging (seconds) | 0.0125 to 999 | 0.033 to 999 | 0.033 to 999 |
| Maximum Scan Rate (nm/min) (nm/min)/(cm ⁻¹ /min [*])/Å/min) | 24000 | 3000/37046/30000 | 3000/37046/30000 |
| Maximum Slew Rate (nm/min) (changing between wavelengths, nm/min) | 24000 | 3000 | 3000 |
| Data Interval (nm) cm ⁻¹ Å | 0.15-5.0 | 0.02-1.67 5.541-20.6 0.2-16.7 | 0.02-1.67 5.541-20.6 0.2-16.7 |
| Data Collection Rate (kinetic studies) points per min per cell | | | |
| 1 cell | 4800 | 1800 | 1800 |
| 6 cells | 5 | 5 | 5 |
| 12 cells | 3 | 5 | 5 |
| 14 cells | | 3 to 4 | 3 to 4 |
| 18 cells | 2 | | |
| 6 cells, 0.0375 SAT 0.38 s Dwell time | 40 to 50 | | |
| 12 cells, 0.0375 SAT 0.38 s Dwell time | 20 to 30 | | |
| 18 cells, 0.0375 SAT 0.38 s Dwell time | 10 to 20 | | |
| 6 cells, 0.033 SAT 0.34 s Dwell time | | 50 | 50 |
| 12 cells, 0.033 SAT 0.34 s Dwell time | | 40 to 50 | 40 to 50 |
| 14 cells, 0.033 SAT 0.34 s Dwell time | | 30 to 40 | 30 to 40 |
| Repetitive Scanning | | | |
| Maximum number of cycles | 999 | 999 | 999 |
| Maximum cycle time (min) | 999 | 999 | 999 |
| Temperature Monitors | Temperature probe inside cuvette (using the Temperature Probe Accessory) | Cell block, up to 4 temperature probes inside cuvettes or elsewhere | Cell block, up to 4 temperature probes inside cuvettes or elsewhere |

Software Functionality

| | |
|---|--|
| Operating System | Windows® XP and Windows® 2000 |
| Graphical Display Options available for the display of data traces include: | <ul style="list-style-type: none"> • Data files can be retrieved with the associated Methods and all other settings. • Enhanced graphics control module with automatic peak labeling, grids, multiple line types, zoom, free and tracking cursor, multiple ordinate and abscissa formats, smart copy/paste and overlay modes for easy spectral interpretation, presentation and publication. • Graph labels and bitmaps, including chemical structures, can be displayed and saved with data files (fonts and size are selectable). |
| File Opening | <ul style="list-style-type: none"> • Files can be automatically opened by clicking on the file name. Files can be also be dragged and dropped into the application for easy opening. |
| Data Conversion | <ul style="list-style-type: none"> • Import: Cary OS/2, Cary DOS, ASCII XY formats. • Export: ASCII (*.csv format), ASCII with Audit log format. • Export data live to Excel or other compatible programs using Dynamic Data Exchange (DDE). |
| File System | Method, Report, Data, Graphic template and files can be stored individually or all together in a batch file. The number of files is limited only by hard disk capacity. |
| Fast Loading of Methods | You can set up shortcut icons on the desktop for methods used frequently in your laboratory. |
| Cursor Modes | Cross hair cursor in either tracking or free mode. Kinetics ruler mode also available. |
| Running Multiple Cary WinUV Applications | More than one Cary application may be run at any time, allowing method development or data review and manipulation while the instrument is collecting. Either multiple same or different applications may be opened simultaneously. |
| Built-in Programming Language | Applications Development Language (ADL) allows complete customization of Cary Win UV to your specific applications. ADL can be used to create new user interfaces for the software – ideal for production and routine QC applications. |
| Multimedia Help | Comprehensive multimedia help includes instructional videos, animations and speech explaining how to set up the instrument and accessories and basic maintenance procedures. |

Quantitative analysis

| | |
|---------------------------------------|---|
| Calibration Curve Fits | Linear, Linear direct and Quadratic curves fits. |
| Fibre Optics System | Remote read fibre optics system for in-situ measurements using Dip Probe (measure up to 180 samples/hr). |
| Sipper/Autosampler Support | SPS-5 Autosampler supported for fibre optic and sipper measurements. |
| Importing Sample Names | Sample names can be imported in ASCII format from disk or LAN system. |
| Calibration Standards | Up to 30 standards. |
| Maximum Number of Samples | Up to 500 samples. |
| Measurement Replicates | Up to 5 replicates of each sample may be performed. |
| Sample/Standard Averaging | Up to 3 samples/standards can be averaged. |
| User Specified Data Collection | Single wavelength measurements with on-line calculations can be performed on data collected using +, -, /, x functions. For example: <ul style="list-style-type: none"> • Abs 540 nm - Abs 700 nm • Abs 366 nm x factor |
| Weight/Volume Correction | You can correct concentration results for weight/volume differences between the sample and the nominal weight/volume in the method. |

Biochemical analysis

| | | |
|------------------------------|--|--|
| Data Comments | Extra information about the sample, which is stored with the data file | The User Data Form allows entry of information about the samples analyzed, eg: pH, ionic, substrate and inhibitor concentration etc. |
| Minimum sample volume | | The smallest volume of sample that can be measured accurately is approximately 2.5 μ L. |
| Preset methods | Methods for common measurements that are built into the software | RNA/DNA application: <ul style="list-style-type: none"> • Protein estimation • Nucleic acid estimation • 260/280 ratio readings • Warburg & Christian co-efficient Concentration application: <ul style="list-style-type: none"> • Bradford • Lowry HS, LS • Biuret • BCA • Direct UV |
| RNA/DNA Calculations | | User-selectable background correction, and Warburg Christian protein and nucleic acid factor entry. |

Biochemical analysis – Kinetics

| | Cary 50 | Cary 100 | Cary 300 |
|---|--|--|------------------|
| Temperature Measurement | Up to 2 temperature probes can be measured directly inside the cuvettes with the optional Temperature probe accessory. | Measurement via a temperature probe built into the multicell block. Additionally, up to 4 temperature probes can be measured directly inside the cuvettes with the optional Temperature probe accessory. | |
| Number of Stages | 5 different data collection rates can be specified. A different fit can be used for each stage. | | |
| Kinetics Ruler | To visually define the area of the data to be used for rate calculations, use the cursor to nominate the range for a point to point least squares slope calculation. | | |
| Plot Fits | Kinetic rate plots can be displayed with the data and stored. | | |
| Fastest data collection rate for single cells (points/sec) | 80 | 30 | 30 |
| Stop time extension | The time of the data collection can be extended without stopping the analysis. | | |
| Min/Max data collection time | 0.01 to 8000 min | 0.01 to 8000 min | 0.01 to 8000 min |
| Pause control | Measurement can be paused to allow the addition of a reagent before continuing. | | |
| Synchronized start | A 2 minute countdown is provided before data collection begins. | | |
| Cell loading guide | A visual guide is provided to show how to load the multicell holder before starting the data collection. | | |
| User specified data collection | Single wavelength, Multi-wavelength (up to 6), and combinations of wavelengths using the user collect function. | | |

Biochemical analysis – Thermal Denaturation/Renaturation (Cary 100/300 only)

| | |
|---|--|
| Thermal analysis data collection | Up to 20 different temperature ramp rates/directions can be specified for a single analysis. |
| End of measurement temperature | The user can specify what temperature the sample is held at after the data collection is complete. |
| Hold time | Holding time can be specified at the start and end of each stage of the measurement to allow the temperature to equilibrate. |
| Data smoothing | Data may be smoothed with Savitzky Golay algorithm with a selectable interval and filter size. |
| Calculations provided | Derivative and Hyperchromaticity (including alpha curve and Van't Hoff) are provided. |

Scanning

| | |
|--|--|
| Baseline Correction | <ul style="list-style-type: none"> • Unlimited Baseline scans can be stored. These baselines can be retrieved and re-used. • Baselines correction modes include: 0% and 100% correction (normal, DRA – as per ASTM E903), known mirror correction for specular reflectance measurements. |
| Ordinate Modes | A, %R, %T, Log A, F(R), Log F(R), Absorptivity, Absolute %R, Log (1/R) |
| Abscissa modes | Nm Stepped mode can be applied to this abscissa mode. (The Kinetics application provides time as an abscissa mode.) cm ⁻¹ , Å (Cary 100/300 only) Stepped mode can be applied to any of these abscissa modes. (The Kinetics application provides time as an abscissa mode and the Thermal application provides temperature as an abscissa mode.) |
| Signal to noise mode scanning (Cary 100/300 only) | A signal to noise ratio can be specified for the automatic collection of data with a constant level of precision. |
| Reports | You can choose to include method parameters, graphics and/or results tables, all with various options. |
| Spectral smoothing | Yes |
| Advanced spectrum calculator | Yes, +, -, /, x, log and Square root functions as well as: <ul style="list-style-type: none"> • Smooth (up to 101 points) Savitzky Golay • Mean • Normalize • 1st to 4th Derivative • and convert to: • %T, A, Log(A), %R, F(R), log (F(R)), Log(1/R) |

Instrument validation

Validation tests are supplied as a standard with all software packages. The tests comply with: USP, EP/BP, TGA (Australia). Also provided are all the performance tests used during instrument manufacture as well as other specification tests. The results of tests performed using the Instrument Validation package are automatically stored by the system.

| Instrument validation | US Pharmacopeia | European Pharmacopeia | Australia Code for GMP for Therapeutic Goods | Additional test |
|--|-----------------|-----------------------|--|-----------------|
| Wavelength Accuracy | | | | |
| Holmium Oxide test | • | | • | |
| Holmium Perchlorate | | • | • | |
| Xe emission lines (Cary 50 only) | | | | • |
| Wavelength Reproducibility | | | | • |
| Resolution Power | | | | |
| Maximum resolution | | | | • |
| Toluene/Hexane test | | • | • | |
| Baseline Flatness | | | • | • |
| Photometric Noise | | | | • |
| Stray Light | | | | |
| NaI test at 220 nm | | | | • |
| NaNO ₂ test at 370 nm | | | | • |
| KCl test at 200 nm | | • | • | |
| K ₂ Cr ₂ O ₇ test at 370 nm | | | • | |
| Photometric Linearity | | | | • |
| Photometric Accuracy | | | | |
| NIST filters test | • | | | |
| K ₂ Cr ₂ O ₇ test | • | • | • | |
| KNO ₃ test | | | • | |
| Photometric Stability | | | | • |

GLP, 21 CFR Part 11 and Validation functionality

Compliant with Good Laboratory Practice (GLP) requirements for password protection and record keeping, setting of privileges for users or groups of users. Allows password protection of data and methods from change or deletion. Audit log saved with all data collected. Inclusion of operator name and Lab ID, data file name, report creation date and time, full documentation and parameters in reports.

Optional software is able to assist in achieving compliance to US Food and Drug Administration's Part 11 "Electronic Records; Electronic Signatures" of Title 21 of the Code of Federal Regulations (21 CFR 11) for electronic signatures and data security.

Optional Validation package documenting Varian's Design Qualification (DQ), Installation Qualification (IQ), Operating Qualification (OQ) and Performance Qualification (PQ) for the Cary series of spectrophotometers. Includes details of all development and design history, company compliance standards, installation and operation tests.

Computer minimum requirements

The following configuration is suitable for operation of the Cary Win UV software.

Pentium® III processor with 128 Mbytes of RAM, 10 Gigabyte hard drive, 8 speed CD-ROM, 16 bit sound card, super VGA monitor with high color (16 bit) display, 800 x 600 resolution, 101 keyboard and mouse, one PCI compatible slot for IEEE communications card, Windows 2000/XP, compatible laser printer recommended.

For recommended PC configurations, refer to www.varianinc.com/osi/general/

Ordering information

For part numbers and other ordering details, please consult either your Varian sales person or the Varian parts and supplies catalog on Varian's web site.

Varian Customer Support Policies

| | |
|-------------------------|---|
| Warranty | Warranty on parts, labour and freight (one way) for 12 months, although this may vary according to location. Warranty does not include on-site labour. Varian paid installation includes 90 days on-site warranty and the nine months workshop warranty as above. An extended three year warranty is available. Two year Xenon Lamp module warranty. Covers total failure only (i.e. fails to strike). |
| Hardware support period | Five (5) years from date of last unit manufacture. After this time, parts and supplies will be provided if available. |
| Software support | Telediagnostic capability is available for some instrument models. Availability of Telediagnostic support may vary according to location. Software upgrades to fix non-conformances or safety problems will be issued free of charge. Software upgrades to add additional functionality will attract a fee. The customer is solely responsible for selecting a Varian instrument to achieve their desired results or for particular applications. |

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Varian, Inc. is committed to a process of continuous improvement which demands that we understand and then meet or exceed the needs and expectations of our customers—both inside and outside the company—in everything we do.

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