



Agilent Cary 4000/5000/6000i Series UV-Vis-NIR

Guaranteed specifications



Design overview

Double beam, ratio recording, double out-of-plane Littrow monochromator UV-Vis-NIR spectrophotometer (Agilent Cary 4000 is UV-Vis only). 2 x 400 mm focal length, dual double sided gratings (Agilent Cary 4000 single sided only), centrally controlled by a PC. Features Optical Isolation System for low noise performance and minimized impact from surrounding environment. High speed non-measurement-phase-stepping wavelength drive. UV-Vis detector: high performance R928 photomultiplier tube, NIR detector: electrothermally controlled lead sulfide photocell (Agilent Cary 5000) incorporating PbSmart technology for better noise and linearity performance than standard photocells, or electrothermally controlled Indium Gallium-Arsenide PIN photodiode (Agilent Cary 6000i) for the ultimate in low noise, linearity and resolution in the NIR. Tungsten halogen visible source with quartz window, deuterium arc UV source. Supplied as standard is a mercury lamp module for automatic wavelength accuracy validation. Features Plug-and-Go lamp management. Lamps are pre-aligned and easily replaced, requiring no adjustment. Plug-and-Go supports a wide range of lamp designs. Precision Lock Down mechanism for quick and reproducible accessory change overs. The Agilent Cary Lock Down system eliminates tools and time consuming alignment. Choice of software interfaces.

Agilent Cary 4000/5000/6000i Series UV-Vis-NIR spectrophotometers are manufactured according to a quality management system certified to ISO 9001. These guaranteed specifications are based on the ± 4 sigma statistical confidence level of the final acceptance tests performed at the factory. Typical specifications are not reported in this document.

Operators can routinely repeat performance tests using Agilent's dedicated instrument performance test software suite — Validate. Some tests, where indicated, require equipment or certified material, which can be obtained through Agilent or international standard organizations.

Performance specifications

	Agilent Cary 4000	Agilent Cary 5000	Agilent Cary 6000i
Monochromator	Double out-of-plane Littrow monochromator		
Grating	70 x 45 mm	70 x 45 mm	70 x 45 mm
UV-Vis	1200 lines/mm blazed at 250 nm	1200 lines/mm blazed at 250 nm	1200 lines/mm blazed at 250 nm
NIR		300 lines/mm blazed at 1192 nm	600 lines/mm blazed at 1000 nm
Beam splitting system	Rotating beam splitter, which measures a sample, dark and reference signal per cycle with a speed of 30 Hz		
Detectors			
UV-Vis	R928 PMT	R928 PMT	R928 PMT
NIR		Cooled PbS	Cooled InGaAs
Limiting resolution (nm)			
UV-Vis	<0.048 nm	<0.048 nm	<0.048 nm
NIR		<0.2 nm	
Stray light (%T)			
At 220 nm (10 g/L NaI ASTM method)	<0.00007%	<0.00007%	<0.00007%
At 370 nm (50 mg/L NaNO ₂)	<0.00007%	<0.00007%	<0.00007%
At 1420 nm (H ₂ O, 1 cm pathlength)		<0.0002%	<0.0001%
At 2365 nm (CHCl ₃ , 1 cm pathlength)		<0.00045%	
Wavelength range (nm) (N ₂ purge required below 185 nm)	175–900 nm	175–3300 nm	175–1800 nm
Wavelength accuracy (nm) Deuterium lamp lines			
UV-Vis: 190–900 nm	± 0.08 nm	± 0.08 nm	± 0.08 nm
NIR: 760–3000 nm (Cary 5000) NIR: 760–1700 nm (Cary 6000i)		± 0.4 nm	± 0.4 nm
Wavelength reproducibility (nm)			
Peak separation of repetitive scanning of a UV-Vis line source	<0.025 nm	<0.025 nm	<0.025 nm
Peak separation of repetitive scanning of a NIR line source		<0.1 nm	<0.05 nm
Standard deviation of 10 measurements, UV-Vis	<0.005 nm	<0.005 nm	<0.005 nm
Standard deviation of 10 measurements, NIR		<0.02 nm	<0.02 nm
Photometric accuracy (Abs)			
Using double aperture method at 0.3 Abs UV-Vis	<0.00025 Abs	<0.00025 Abs	<0.00025 Abs
Photometric linearity (Abs) All tests performed by addition of filters technique UV-Vis (465 nm, 10 s SAT, 2 nm SBW), NIR (1200 nm, 10 s SAT, energy 3)			
UV-Vis, at 1 Abs	<0.0007 Abs	<0.0007 Abs	<0.0007 Abs
UV-Vis, at 2 Abs	<0.0014 Abs	<0.0014 Abs	<0.0014 Abs
UV-Vis, at 3 Abs	<0.005 Abs	<0.005 Abs	<0.005 Abs
NIR, at 1 Abs		<0.0015 Abs	<0.0005 Abs
NIR, at 2 Abs		<0.007 Abs	<0.0018 Abs
Photometric range (Abs) with RBA	8 Abs	8 Abs	8 Abs

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Photometric reproducibility (Abs)			
Using NIST 930D filters, at 546.1 nm, 2 s SAT, 2 nm SBW			
0.5 Abs, Standard deviation for 10 measurements	<0.00008	<0.00008	<0.00008
1.0 Abs, Standard deviation for 10 measurements	<0.00014	<0.00014	<0.00014
Photometric stability (Abs/hour)			
After 2 hr warm up, 500 nm, 1 s SAT, 2 nm SBW			
	<0.00018	<0.00018	<0.00018
Photometric noise (Abs/RMS)			
UV-Vis (190 nm, 1 s SAT, 2 nm SBW)			
At 0 Abs	<0.00009	<0.00009	<0.00009
At 1 Abs	<0.0002	<0.0002	<0.0002
UV-Vis (500 nm, 1 s SAT, 2 nm SBW)			
At 0 Abs	<0.00003	<0.00003	<0.00003
At 1 Abs	<0.00005	<0.00005	<0.00005
At 2 Abs	<0.0001	<0.0001	<0.0001
At 3 Abs with 1.5 Abs RBA	<0.0003	<0.0003	<0.0003
At 4 Abs with 1.5 Abs RBA	<0.0008	<0.0008	<0.0008
At 5 Abs with 1.5 Abs RBA	<0.002	<0.002	<0.002
At 6 Abs with 3.0 Abs RBA	<0.0045	<0.0045	<0.0045
NIR: Fixed SBW (1500 nm, 1 s SAT, 2 nm SBW (Cary 5000), 1500 nm, 1 s SAT, 0.4 nm SBW (Cary 6000i))			
At 0 Abs		<0.00003	<0.00002
At 1 Abs		<0.0001	<0.00004
At 2 Abs		<0.0005	<0.0002
At 3 Abs		<0.007	<0.001
At 4 Abs			<0.007
NIR: Variable SBW (1500 nm, 1 s SAT, Energy 1)			
At 0 Abs		<0.00004	<0.00002
At 2 Abs		<0.0005	
At 3 Abs with 1.5 Abs RBA		<0.0003	<0.00006
At 6 Abs with 3.0 Abs RBA			<0.0009
Baseline flatness (Abs)			
UV-Vis (0.1 s SAT, 4 nm SBW), NIR (0.2 s SAT, Energy 1), baseline corrected	± 0.0012 (200 to 850 nm)	± 0.0012 (200 to 3000 nm)	± 0.0012 (200 to 1700 nm)
UV-Vis (0.2 s SAT, 2 nm SBW), NIR (0.24 s SAT, Energy 1), no smoothing applied	± 0.0007 (200 to 850 nm)	± 0.0007 (200 to 3000 nm)	± 0.0007 (200 to 1700 nm)

Performance specifications

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Sample compartment beam separation (mm)	190.5 mm	190.5 mm	190.5 mm
Compartment size (width x depth x height) Extended sample compartment fitted	160 x 433 x 221 mm	160 x 433 x 221 mm	160 x 433 x 221 mm
Access	Top, front and base	Top, front and base	Top, front and base
Instrument dimensions (width x depth x height)	1020 x 710 x 380 mm	1020 x 710 x 380 mm	1020 x 710 x 380 mm
Purging			
Sample compartment	Yes	Yes	Yes
Optics	Yes	Yes	Yes
Instrument weight	91 kg	91 kg	91 kg

Operational

Spectral bandwidth (nm)			
UV-Vis	0.01–5.00 nm, 0.01 nm steps	0.01–5.00 nm, 0.01 nm steps	0.01–5.00 nm, 0.01 nm steps
NIR		0.04–20 nm	0.04–20 nm
Signal averaging (seconds)	0.033–999 s	0.033–999 s	0.033–999 s
Maximum scan rate (nm/min)			
UV-Vis	2000 nm/min	2000 nm/min	2000 nm/min
NIR		8000 nm/min	8000 nm/min
Slew rate (changing between wavelengths, nm/min)			
UV-Vis	16000 nm/min	16000 nm/min	16000 nm/min
NIR		64000 nm/min	32000 nm/min
Data interval (UV-Vis)			
(nm)	0.005–1.111 nm	0.005–1.111 nm	0.005–1.111 nm
cm ⁻¹ *	1.633–13.699 cm ⁻¹ *	1.627–17.335 cm ⁻¹ *	1.627–17.335 cm ⁻¹ *
Å	0.05–11.1 Å	0.05–11.1 Å	0.05–11.1 Å
Data interval (NIR)			
(nm)		0.02–4.444 nm	0.02–2.222 nm
cm ⁻¹ *		0.3145–4.0753 cm ⁻¹ *	0.3145–2.0377 cm ⁻¹ *
Å		0.2–44.44 Å	0.2–22.22 Å
* Interval range is dependent upon scan range			
Repetitive scanning			
Maximum number of cycles	999	999	999
Maximum cycle time (min)	9999	9999	9999

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Recommended environmental conditions

Agilent Cary 4000/5000/6000i	
Instrument storage	5–45 °C at 20–80% relative humidity, non-condensing, altitude < 2133 m.
Instrument operation	Below 853 m altitude: 10–35 °C, 50–80% relative humidity, non-condensing. Between 853 and 2133 m altitude: 10–25 °C, 50–80% relative humidity, non-condensing.
Instrument electrical requirements	Mains supply of 85–264 volts AC with 300 VA power consumption. Frequency 47-63 Hz.

Support policies

Type	Policy
Warranty	12 months, though this may vary according to location
Hardware support period	Seven (7) 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 add additional functionality will attract a fee.

Further details

More information

For further information please consult your Agilent office or supplier, or our Web site at www.agilent.com

www.agilent.com/chem

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