

# Технические характеристики

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## Agilent 8453/8454 UV-Vis and Cary UV-Vis-NIR Supplies

Agilent 8453/8454 UV-Vis and Cary UV-Vis and UV-Vis-NIR spectrophotometers are synonymous with excellence and high performance. Our range of consumables for these products includes high quality cuvettes and flow cells, fiber optic probes, lamps, and detectors.



The genuine Agilent cells, tubing, fittings, and supplies in this section have been tested with the Agilent 8453/8454 and Cary range for reliable and repeatable results. Agilent UV-Vis cells and supplies are manufactured in an EN ISO 9001:2000/EN ISO 14001:2004 certified environment. Additionally, Agilent UV-Vis cells are individually checked and certified to be within specifications, so you can be confident that it will conform to stringent protocols such as NIST, GLP, GMP, and NAMAS.

This section will help you identify the cells that fit your unique applications. You will also learn how to enhance your lab's productivity by choosing the correct spectrophotometer equipment, tubing, fittings, and dissolution testing supplies.

## UV-Vis and UV-Vis-NIR Flow Cells and Cuvettes

### Cell Materials

Cells are available in four materials. Select the cell material depending on the wavelength range of your measurements.

For applications with a wavelength range of interest in the visible range, either use our economical single use cuvettes or our lower priced Agilent optical quality glass cells, made from exceptionally pure raw materials. Alternatively, if your application requires measurement in the UV range, select our quartz cuvettes, which give transmission values of > 80 % between 200 nm and 2,500 nm for an empty cell. Optical glass gives transmission values of > 80 % between 330 nm and 2,500 nm for an empty cell. To extend the measurement range into the NIR range, select the Infrasil quartz cells (made from Suprasil 300 material).

Material	Wavelength (nm)
Quartz	170 to 2,700
Infrasil quartz (NIR)	220 to 3,800
Optical glass	334 to 2,500
Polystyrene (disposable)	340 to 800

## Cell Shapes

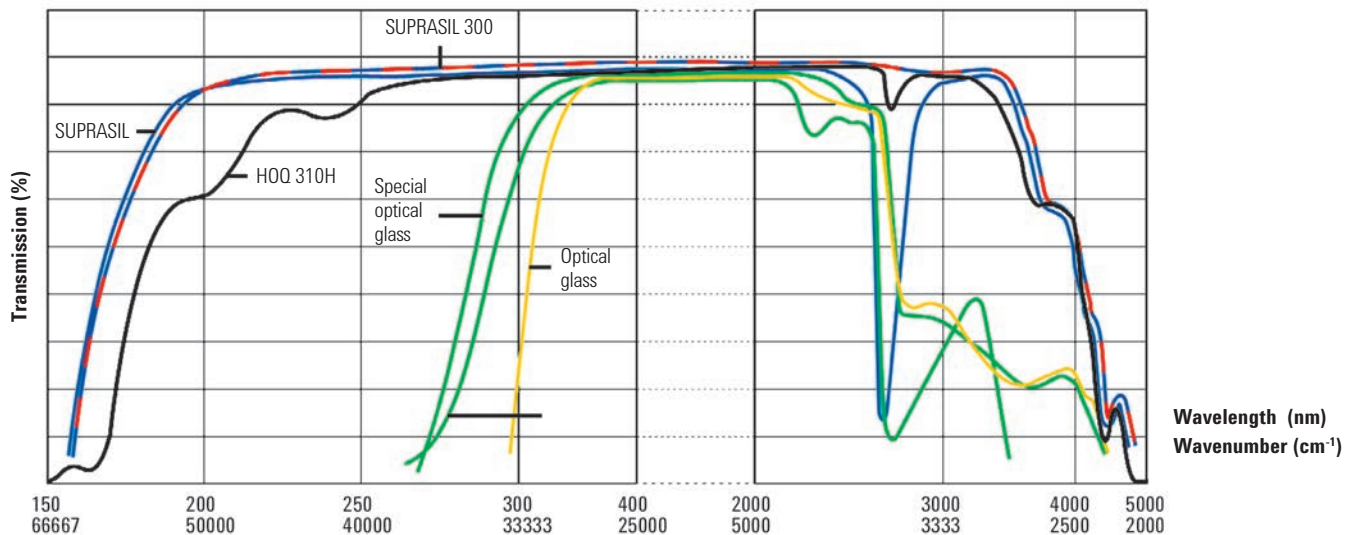
### Rectangular Cells

Rectangular cells are the most commonly used cell type and vary in shape from square to longer rectangles, depending on the cell pathlength. We offer standard cells, semi-microcells with about 40 % of the volume of a standard cell of the same pathlength, microcells with about 20 % of the volume of a standard cell, sub, and ultra-microcells that have microliter volumes, and disposable cells. Semi-microcells can be used with all Cary 50/60/100/300/4000/5000/6000i/7000 multicell holders and with all standard single cell holders. In addition, they can be used with the Temperature Probe Accessory for cell temperature monitoring.

Cells sold as matched pairs are used for most UV-Vis and UV-Vis-NIR routine analyses. Matched pairs ensure these cells will give a similar absorbance or transmission reading when empty or filled with water.

Long pathlength cells are ideal for use when extra sensitivity is needed for low concentration samples. These cells must be used with the long pathlength rectangular cell holder.

### Transmission of empty cells made of different materials





Cell tray, 5063-6577

## Cell Volumes

### Macrocells

The macrocell, which is defined by DIN 58963 as a rectangular cell with an inner width greater than 5 mm, has emerged as the standard for spectrophotometry. The most widely used macrocell is a rectangular cell with typical outer dimensions of 45 x 12.5 mm (height x width). The length of the cell is dependent on the desired pathlength. Macro or standard cells have about the same wall thickness on all sides, and are used for most liquid UV-Vis and UV-Vis-NIR measurements. They require the largest sample size for a given pathlength.

### Semi-microcells

Semi-microcells have an inner width of 4 mm to 2 mm. The thickness of the base is typically 9 mm. Semi-microcells also have thicker side walls to reduce the volume to about 40 % of the volume of a standard cell of the same pathlength. These cells are useful when only small sample volumes are available for testing. Cells that are black self-masking are listed with their aperture size. The aperture is located at the correct Z-height for both Agilent 8453/8454 and the Cary UV-Vis and UV-Vis spectrophotometers – but note that the 8453/8454 uses a different Z-height, so check compatibility. Semi-microcells can be used with Cary 100/300 and 4000/5000/6000/7000 multicell holders and with all standard single cell holders. They can also be used with the Temperature Probe Accessory for cell temperature monitoring. The semi-microcell, with a stirring well for a magnetic stirring bar, is suitable for all Cary 100/300 and 4000/5000/6000/7000 series Peltier thermostatted multicell and single cell holders.

### **Microcells**

Microcells have thicker sidewalls to reduce the volume to about 20 % of the volume of a standard cell of the same pathlength. These cells are useful when limited sample volumes are available for testing.

### **Ultra-microcells**

Ultra-microcells are specifically designed for use in the  $\mu\text{L}$  range (with typical volumes in the 5 to 135  $\mu\text{L}$  range). They fit into any standard cell holder and have the advantage of requiring much smaller sample volumes – so they're ideal for highly concentrated samples, highly absorbing solvents, or when sample volumes are very limited. These quartz cells offer low volume, short pathlength, and excellent heat transfer. They are ideal for temperature-controlled work, and all except the 1 mm pathlength cell can be used with the Temperature Probe. Cells that are black self-masking are listed with their aperture size. The cells are constructed so that filling and emptying can be easily accomplished with commonly available pipette tips. Ultra-microcells with Eppendorf pipette filling/emptying are designed to handle extremely small volumes. When only a minimum amount of sample is available, these cells provide a filling volume only slightly larger than the measuring chamber volume

## Macrocells



Macrocell with PTFE lid



Macrocell with PTFE lid, 6610000800

### Macrocells with PTFE Lid

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Int. Dimensions (H x W (mm))	Volume (µL)	Part No. Glass	Part No. Quartz
<b>Use with 8453/8454 UV-Vis</b>					
1	45 x 12.5 x 3.5	43.5 x 9.5	350	5063-6546**	5061-3384**
2	45 x 12.5 x 4.5	43.5 x 9.5	700	5063-6547**	5061-3385**
5	45 x 12.5 x 7.5	43.5 x 9.5	1750	5063-6548**	5061-3386**
10	45 x 12.5 x 12.5	43.5 x 9.5	3500	5063-6549	5061-3387
10	45 x 12.5 x 12.5	43.5 x 9.5	3500	5063-6550*	1000-0544*
20	45 x 12.5 x 22.5	43.5 x 9.5	7000	5063-6551	5063-6553
50	45 x 12.5 x 52.5	43.5 x 9.5	17500	5063-6552	5063-6554
<b>Use with Cary 50/60/100/300/4000/5000/6000i/7000</b>					
10	45 x 12.5 x 12.5	43.5 x 9.5	3500	6610008800*	6610000800* 6618000100 (Infrasil quartz)
20	45 x 12.5 x 22.5	43.5 x 10 7000			6610016200
50	45 x 12.5 x 52.5	43.5 x 9.5	17500	6610016400	6610016100
100	45 x 12.5 x 102.5	43.5 x 9.5	35000	6610016300	6610016000

\*\*Spacers are required for cells with an outer thickness of less than 12.5 mm to hold them securely in the cell holder.

\*Matched pair

**Macrocells with PTFE Stopper**

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Int. Dimensions (H x W (mm))	Volume (µL)	Part No. Glass	Part No. Quartz
<b>Use with 8453/8454 UV-Vis</b>					
5	46 x 12.5 x 7.5	44.5 x 9.5	1750		5063-6557**
10	46 x 12.5 x 12.5	44.5 x 9.5	3500	5063-6556	5062-2477
<b>Use with Cary 50/60/100/300/4000/5000/6000i</b>					
10	46 x 12.5 x 12.5	44.5 x 9.5	3500		6610001100*

\*\*Spacers are required for cells with an outer thickness of less than 12.5 mm to hold them securely in the cell holder.

\*Matched pair



Macrocell with PTFE stopper

Agilent high-precision cells are individually tested to meet the highest optical standards. Every Agilent cell is certified to confirm that the following areas have been tested and are within specifications:

- Homogeneity of the raw material
- Dimensional and angle tolerances of the component parts
- Flatness and finish of the optical surfaces
- Transmission of the cells

Test equipment is calibrated regularly using standards certified by PTB (Physikalisch Technische Bundesanstalt) and/or National Institute of Standards and Technology.





Spacer for 2 mm pathlength cell, 5061-3389

## Quartz Block Inserts

Description	Part No.
1.0 or 5.0 mm insert	190029200
1.0 or 2.0 mm insert	190029201
1.0 or 0.5 mm insert	190029202
1.0 or 0.05 mm insert	190029203

Inserts are used with standard rectangular 10 mm pathlength cells when a reduced pathlength is required. This avoids the need for a specialized cell. Each insert provides two different pathlengths as indicated, by rotating through 90 degrees.

## Spacers\*

Description	Part No.
Spacer for 1 mm pathlength cell	5061-3388
Spacer for 2 mm pathlength cell	5061-3389
Spacer for 5 mm pathlength cell	5061-3390

\*Spacers are required to hold cells with an outer thickness of less than 12.5 mm in the cell holder, where there is no pathlength adjustment facility on the cell holder.

## TIPS AND TOOLS

The number on the top of the spacer indicates the pathlength of the cuvette it should be used with. For example, a #1 spacer is to be used with a 1 mm pathlength cuvette; a #2 spacer is to be used with a 2 mm pathlength cuvette.

To ensure the correct orientation of the spacer, the engraved number located on top of the spacer should be readable to the operator.

The spacer can be located before or after the cuvette in the light path because the light is collimated.





## Disposable Polystyrene Cells

Disposable polystyrene cells are useable from 340 to 800 nm, are economical, can be used with magnetic stirrers, but cannot be used at elevated temperatures.

### Disposable Cells

Description	Cell Type	Cell Material	Volume (mL)	Path Length (mm)	Sample Chamber Width (mm)	Unit	Part No.
Standard cell	Rectangular	Polystyrene	3.5	10	10	500/pk	6610018800
Microcell	Rectangular	Polystyrene	1.5	10	4	500/pk	6610018700



Microcell, polystyrene, 6610018700



Standard cell, disposable, 6610018800

### TIPS AND TOOLS

The best way to clean quartz or glass cuvettes is to soak in a dilute 2 % solution of cell cleaning solution (p/n 5190-0530).

This is suitable for use with glass, quartz, sapphire, porcelain, ceramics, plastics, and ferrous metals.

The use of demineralized water improves the cleaning characteristics



Semi-microcell with PTFE lid



Semi-microcell with PTFE stopper



Cary 50/60 semi-microcell, 6610021100

## Semi-microcells

### Semi-microcells with PTFE Lid

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Int. Dimensions (H x W (mm))	Volume (µL)	Part No. Glass	Part No. Quartz
<b>Use with 8453/8454 UV-Vis</b>					
10	45 x 12.5 x 12.5	41.8 x 2	700	5063-6558	5061-3391
		36 x 4	1000		5063-6559

### Semi-microcells with PTFE Stopper

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Int. Dimensions (H x W (mm))	Volume (µL)	Part No. Glass	Part No. Quartz
<b>Use with 8453/8454 UV-Vis</b>					
10	46 x 12.5 x 12.5	37 x 4	1000	5063-6560	5063-6561

### Use with Cary 50/60/100/300/4000/5000/6000i/7000 Self masking black walls

5	48 x 12.5 x 12.5	39 x 4	450		6610019800 *
2	48 x 12.5 x 12.5	39 x 4	180		6610019700 *
1	48 x 12.5 x 12.5	39 x 4	90		6610019600 *
10	45 x 12.5 x 12.5	42.5 x 4	1400		6610001800
	48 x 12.5 x 12.5	45.5 x 4	1300		6610015400 **
	48 x 12.5 x 12.5	39 x 4	900		6610012700 *

### Use with Cary 50/60 only Top section features two black walls and two translucent side walls

10	45 x 12.5 x 12.5	2 x 7	135		6610021100
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\*Matched pair

\*\*Designed for use with a magnetic stir bar. Includes a circular recess in the base for the stir bar. Use with magnetic stirrer bars (p/n 6610018900)

## Sub-microcells

### Sub-microcells

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Int. Dimensions (H x W (mm))	Volume (µL)	Part No.
<b>Use with Cary 50/60/100/300/4000/5000/6000i/7000</b>				
5	45 x 12.5 x 12.5	4 x 2	40	6610024000***
	45 x 12.5 x 12.5	4 x 2	80	6610024100***
10	45 x 12.5 x 12.5	2.5 x 2	50	6610010400***
	45 x 12.5 x 12.5	4 x 2	80	6610014900*
<b>Use with Cary 50/60 only</b>				
<b>Top section features two black walls and two translucent side walls</b>				
10	45 x 12.5 x 12.5	2 x 2	40	6610019500

\*\*\*Low head space design for thermal melt applications

\*Matched pair



Sub-microcell, black wall, 6610021100

## Ultra-microcells

### Ultra-microcells with Eppendorf Pipette Filling/Emptying

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Aperture	Center Height (mm)	Volume (µL)	Filling Volume (µL)	Part No.
<b>Use with 8453/8454</b>						
0.1	40 x 12.5 x 12.5	5 x 1	15	0.5	5	5063-6562
1	40 x 12.5 x 12.5	5 x 1	15	5.0	10	5063-6563
5	40 x 12.5 x 12.5	0.8 round	15	2.5	5	5063-6564
10	40 x 12.5 x 12.5	0.8 round	15	5.0	10	5063-6565



Ultra-microcell with Eppendorf filling



Ultra-microcell with PTFE stopper

**Ultra-microcells with PTFE Stopper**

<b>Path Length (mm)</b>	<b>Ext. Dimensions (H x W x T (mm))</b>	<b>Aperture</b>	<b>Center Height (mm)</b>	<b>Filling Volume (L)</b>	<b>Unit</b>	<b>Part No.</b>
<b>Use with 8453/8454</b>						
2	45 x 12.5 x 12.5	2.5 x 2	15	10	1/ea	5062-2497
10	45 x 12.5 x 12.5	2.5 x 2	15	50	1/ea	5062-2496
<b>Use with Cary 50/60/100/300/4000/5000/6000</b>						
1	45 x 12.5 x 12.5	4 x 2	20	8	1/ea	6610023900 ***
10	48 x 12.5 x 12.5	1 x 1	20	10	1/ea	6610013800

\*\*\*Low head space design for thermal melt applications

## TrayCell

The micro-volume TrayCell is a fiber-optic ultra-microcell designed for the UV-Vis analysis of DNA/ RNA and proteins. The dimensions of the TrayCell are equivalent to a standard cuvette, ensuring compatibility with most spectrophotometers. The TrayCell allows simple, rapid absorbance and transmission measurements in ultralow volumes using the Cary 50/60 UV-Vis spectrophotometer.

The TrayCell consists of a measuring cell and a cap with an integrated mirror. The sample drop is pipetted onto the measuring window, then the cap is applied. The distance between the window and the mirror in the cap ensures a defined light path. The internal optics in the TrayCell, which incorporate an internal prism and optical fiber, ensure that the light is transmitted through the sample and to the detector.



Micro-volume TrayCell, G6871A

### TrayCell

Description	Part No.
Micro-volume TrayCell with 1.0 mm lid for volumes less than 5 $\mu$ L	G6871A
Add 0.2 mm pathlength lid for volumes 4 $\mu$ L or less	G6871A#100
Add 2.0 mm pathlength lid	G6871A#200
Add 0.1 mm pathlength lid for highly concentrated samples	G6871A#300

### Specifications

Volume capacity	0.5-10 $\mu$ L
Pathlength	0.2-2.0 mm
Maximum temperature	50° C
Wavelength range	190-1100 nm

Single cell holder with optimum tilt and height adjustment

## Cylindrical Cells

A cylindrical cell is a cell with plane-parallel optical surfaces whose inner volume is cylindrical in shape, and has a longitudinal axis parallel to the direction of the radiation beam. They are recommended when sample volume is not a limitation and when very short to long pathlengths are needed. All cylindrical cells can be used with the cylindrical cell holder or the thermostatted cylindrical cell holder. Cylindrical cells are available as standard cells, long pathlength cells for extra sensitivity when measuring low concentrations, and microcells, suitable for concentrated samples, or to overcome solvent absorbance, for example, water in the NIR or low UV regions.



Cylindrical cell with PTFE stoppers,  
6610002300

### Cylindrical Cells with 2 PTFE Stoppers

Path Length (mm)	Ext. Dimensions (L x od (mm))	Int. Dimensions (id mm)	Volume (mL)	Part No. Glass	Part No. Quartz
<b>Use with 8453/8454 UV-Vis</b>					
100	102.5 x 22	19	28	5063-6566	5061-3392
<b>Use with Cary 50/60/100/300/4000/5000/6000i</b>					
10	12.5 x 22	19	2.8		6618000600*
50	52.5 x 22	19	14		6610002200
100	102.5 x 22	19	28		6610002300

\*Has only a single PTFE stopper

## Flow-through Cells

Flow cells allow the sample to pass through the cell and are connected to the sample source via tubing. Flow cells require the use of a pump to ensure sample is pumped into the cell for measurement and out again afterwards. This can improve productivity - but care needs to be taken to ensure there is no carryover from one sample to another and to ensure there are no bubbles in the cell during measurement. Long pathlength flow cells are useful for low concentration samples and require the long pathlength rectangular cell holder. They can be used with a Cary 100/300 Series Routine Sampler Accessory or a Cary 50/60 Series Sipper. Sub-micro flow cells are suitable for use with the Cary 100/300 Series Routine Sampler Accessory.

Until recently, flow-through cells had measuring chambers that were either rectangular or circular in shape. These shapes were dictated by limitations in the manufacturing process and did not offer the best geometry for clean flushing and reduction of contamination. Agilent has developed oval aperture cells that combine low volume with excellent flow characteristics. These oval flow cells are strongly recommended for automated analyses such as dissolution testing. Black quartz is used in the vicinity of the aperture to ensure that no light passes through the side walls of the cell.



### Flow-through Cells with Oval Aperture and Screw Fitting Connection

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Aperture (H x W (mm))	Center Height (mm)	Volume (µL)	Part No. Quartz
<b>Use with 8453/8454</b>					
10	35 x 12.5 x 12.5	2	15	30	0100-1224
	35 x 12.5 x 12.5	3	15	70	0100-1225
<b>Use with Cary 50/60/100/300/4000/5000/6000</b>					
10	40 x 12.5 x 12.5	3	20	70	6610008900*

\* Supplied with inlet and outlet PTFE tubing (1.6 mm od) fitted with M6 threaded connectors.

#### NOTES:

Flow-through cells do not include tubing/fittings (unless indicated otherwise).

**Flow-through Cells with Rectangular Aperture and Screw Fitting Connection**

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Aperture (H x W (mm))	Center Height (mm)	Volume (µL)	Part No. Quartz
<b>Use with 8453/8454</b>					
0.1	35 x 12.5 x 12.5	17.5 x 3.5	15	6.2	5188-8003
0.2	35 x 12.5 x 12.5	17.5 x 3.5	15	12.4	5188-8004
0.5	35 x 12.5 x 12.5	17.5 x 3.5	15	31	5188-8005
1	35 x 12.5 x 12.5	17.5 x 3.5	15	62	5061-3396
2	35 x 12.5 x 12.5	17.5 x 3.5	15	124	5061-3397
5	35 x 12.5 x 12.5	10 x 2.5	15	230	5065-9918
10	35 x 12.5 x 12.5	11 x 3.5	15	390	5061-3398
10	35 x 12.5 x 12.5	8 x 2	15	160	5062-2476
<b>Use with Cary 50/60/100/300/4000/5000/6000</b>					
10	35 x 12.5 x 12.5	11 x 4	20	450	6610012600
50	35 x 12.5 x 12.5	6 x 3	20	1000	6610010000
100	45 x 12.5 x 12.5	6 x 3	20	2100	6610010100
<b>Use with Cary 50/60</b>					
1	40 x 12.5 x 12.5	11 x 6.5	20	113	6610019900
2	40 x 12.5 x 12.5	11 x 6.5	20	227	6610020000
5	40 x 12.5 x 12.5	11 x 6.5	20	568	6610020100
10	40 x 12.5 x 12.5	11 x 6.5	20	715	6610020200
<b>Use with Cary 100</b>					
1	40 x 12.5 x 12.5	11 x 6.5	20	72	6610014100
2	40 x 12.5 x 12.5	11 x 6.5	20	290	6610014200
10	40 x 12.5 x 12.5	11 x 6.5	20	420	6610015200

\*Supplied with inlet and outlet PTFE tubing (1.6 mm od) fitted with M6 threaded connectors.

**Flow-through Cells with Oval Aperture and Screw Fitting Connection**

Path Length (mm)	Ext. Dimensions (H x W x T (mm))	Aperture (H x W (mm))	Center Height (mm)	Volume (µL)	Part No.
1	39 x 12.5 x 12.5	10 x 2	15	40	5063-6570
1	39 x 12.5 x 12.5	8 x 3	15	40	5065-9907
2	39 x 12.5 x 12.5	10 x 2	15	80	5063-6571
5	39 x 12.5 x 12.5	10 x 2	15	200	5063-6572
10	39 x 12.5 x 12.5	10 x 2	15	430	5063-6573



## Miscellaneous

Description	Comments	Unit	Part No.
UV convenience kit	Includes open top UV quartz cell, 10 mm, 3.0 mL volume, 2/pk; disposable polystyrene cells, 10 mm, 3.5 mL volume, 500/pk; tray for 16 cells, lens cleaning paper, lint free, and cell cleaning solution, 1 L		5067-4666
Magnetic stirring bar, 7 mm long x 4 mm diameter, PTFE coated*		2/pk	9301-1161
Magnetic stirrer bar, PTFE, star type, 7.9 mm diameter x 9.5 mm high			7418000400
Magnetic stirrer bars, 6 mm long x 3 mm diameter, PTFE coated	Suitable for use with spectrophotometer cells designed specifically to accommodate magnetic stir bars (includes p/n 6610015400)	10/pk	6610018900
Cell cleaning solution	An alkaline liquid concentrate which is mixed with water to a concentration of 2 % to yield an effective cleaning solution for all quartz and glass cells. Also suitable for cleaning other sensitive optical components made of glass, quartz, sapphire, and porcelain.	1 L	5190-0530
Lens cleaning paper, lint-free		50/pk	9300-0761
Tray, for 16 cells		10 mm	5063-6577

\*For use with Agilent 89054A cell-stirring multicell transport and Agilent 89090A Peltier temperature controller. Stirring bars are used with cells having internal dimensions of 10 x 10 mm (W x D) and cell holders with magnetic stirring capability.



Magnetic stirring bar, 9301-1161



Magnetic stirrer bars, 6610018900



Cell cleaning solution, 5190-0530



Lens cleaning paper, lint-free, 9300-0761



Cell tray, 5063-6577

## TIPS AND TOOLS

Never use an ultrasonic bath for cleaning cuvettes. This can permanently damage the cuvette, especially if the cuvette is placed on the bottom of the cleaning chamber.

## Cell Holders and Accessories



Standard cell holder, 08451-60104



Long pathlength cell holder, 89076C



Thermostatable cell holder, 89054A



Cell stirring module, 89055A



Cell base, 110648190



Cary 50/60 cell holder, spare, 110645090



Cell holder base, 110716190

### Cell Holders and Bases

Description	Comments	Use With	Part No.
Standard cell holder		8453/8454	08451-60104
Long pathlength cell holder	Holds cylindrical and rectangular cells with up to 10 cm pathlength. Includes stops at 1, 2, and 5 cm.	8453/8454	89076C
Thermostatable cell holder	A jacketed cell holder for standard 1 cm cuvettes with provisions for connecting a water bath (not supplied) to temperature regulate the cells during measurement.	8453/8454	89054A
Cell stirring module for thermostatable cell holder	Provides cell stirring capability with the thermostatable cell holder. Stirrer is driven by circulating water from water bath (not included).	8453/8454	89055A
Cell base		Cary 50/60	110648190
Cell holder, spare		Cary 50/60	110645090
Cell holder base		Cary 400 and 500	10048100
Cell holder base		Cary 4000/5000/6000	110716190
Standard cell holder, 10 mm	Includes cell lifter and cell height adjustment screw. Supplied as standard with Cary 100/300 and Cary 5000/6000i	All Cary	110260190

(Continued)

**Cell Holders and Bases**

Description	Comments	Use With	Part No.
Standard cell holder, 10 mm, with Z-height adjustment from 0-20 mm, lifter, and ball bearing cuvette stabilizer	Supplied as standard with Cary 4000	All Cary except Cary 50/60	110721900
Test tube holder	Allows use of 16 mm od test tubes in the sample compartment instead of conventional cuvettes	Cary 50/60	7910033500
Long pathlength rectangular cell holder	Holds 20, 50, and 100 mm rectangular cells and rectangular flowcells	All Cary	110059900
Variable pathlength cell holder	For use with rectangular cells of 5, 10, 20, 30, 40, and 50 mm pathlength and a solid sample holder. Must be fitted in slide-mount solid sample holder kit in Cary 50/60 (p/n 10072300) or Cary 100/300 (p/n 10046500).	All Cary	210125300
Variable pathlength cell holder	For use with rectangular cells up to 100 mm pathlength and a solid sample holder. Must be fitted in slide-mount solid sample holder kit in Cary 50/60 (p/n 10072300) or Cary 100/300 (p/n 10046500).	All Cary	6610014000
Dual rectangular thermostatable cell holder	Allows thermostating of standard 10 mm pathlength cuvettes with height 45 mm. Requires the extended sample compartment and an external water bath.	All Cary	10046800
Cylindrical single cell holder, ambient	Allows use of cylindrical cells with up to 100 mm pathlength	All Cary	110026900
Dual cylindrical thermostatable cell holder	Allows use of cylindrical cells with up to 100 mm pathlength. Requires extended sample compartment and an external water bath.	All Cary	10046700



Standard cell holder, 110721900



Standard cell holder, 10 mm, 110260190



Variable pathlength cell holder, 210125300



Cylindrical single cell holder, ambient, 110026900



Cary 8454 UV-Visible Spectrophotometer



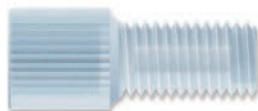
Union, 5022-2155



Cell fittings (black), 5022-2156



Conical adapter kit, 5022-2157



PTFE nuts, 5022-2158



PEEK fittings and ferrules, 5042-1337

# Agilent 8453/8454 UV-Vis Supplies

## 8453/8454 Tubings and Fittings

### 8453/8454 Tubings and Fittings

Description	Unit	Part No.
PTFE tubing, 1.6 mm od	10 m	5041-2191
Pump tubing, 2.06 mm id	15/pk	5041-2166
Pump tubing, 1.3 mm id	12/pk	5041-2184
Pump tubing, 2.8 mm id	12/pk	5041-2185
Tefzel ferrules and stainless steel lock rings, 1/16 inch	10/pk	5022-2154
Union, 1/4-28 thread, polypropylene	10/pk	5022-2155
Cell fittings, black (short, 4/pk and long, 4/pk) Replacement fittings used to connect the tubing to the flow cell used with the Sipper system for the 8453/8454 Includes headless PPS M6 nuts, 4/pk and short PEEK M6 nuts, 4/pk	8/pk	5022-2156
Conical adapter kit Replacement fittings for the flow cell-pump tubing used with the Sipper system for the 8453/8454 Includes conical PTFE adapters, 2/pk, PTFE female nuts, 2/pk, and PTFE ferrules, 2/pk	2/pk	5022-2157
PTFE nuts, for 1/16 inch od tubing	10/pk	5022-2158
Tubing, heat exchanger, FEP, 12 cm		5042-1336
Fittings and ferrules, 1/16 in, PEEK, for 8-port valve	10/pk	5042-1337
Mounting tool, for flangeless nut		0100-1710

## Instrument Parts and Supplies

### G1120A 8-Position Multicell Transport Supplies

Description	Part No.
Optical filter kit Set of three optical filters to prevent photosensitive samples from being irradiated by UV light (265 and 295 nm cut-off and UV roll-off filter)	G1120-68707
Stirring module kit Stirrer is driven by circulating water from water bath (not included)	G1120-60006
Magnetic stirring bar for use with 10 x 10 mm (W x D) cells, 2/pk	9301-1161
Multicell transport adjustment tool	89075-23800



Optical filter kit, G1120-68707

### 89090A Peltier Temperature Controller Supplies

Description	Part No.
Union, cell holder	5021-1870
Flow cell, 10 mm, 8 x 2 mm aperture, 160 µL	5062-2476
Quartz cuvette, 10 mm, with PTFE stopper	5062-2477
Tubing, heat exchanger, FEP	5042-1336
Magnetic stirring bar	9301-1161



Stirring module kit, G1120-60006



Tubing, heat exchanger, FEP, 5042-1336

### Spectrophotometer Lamps

Description	Part No.
Deuterium lamp assembly	2140-0605
Tungsten lamp assembly	G1103-60001



Deuterium lamp assembly, 2140-0605



Tungsten lamp assembly, G1103-60001



Needle, beveled edge for G1811A, G1811-23200



Autosampler tubing and fittings kit, 5042-1334



Sipper tubing kit, 5042-1333



Cassette, fixed pressure, 5041-2167



Cassette, variable pressure, 5042-1356

## Autosampler Supplies

Description	Part No.
Needle, beveled edge, for G1811A	G1811-23200
Test tubes, 12 x 100 mm, 250/pk	5022-6531
Autosampler tubing and fittings kit	5042-1334

## Sipper Supplies

Description	Part No.
Sipper tubing kit for 8452	
Includes inlet tubing (1.5 m), inlet to flow cell tubing (0.35 m), flow cell to pump tubing (0.35 m), flow cell to pump tubing (0.5 m), flow cell to waste tubing (1.5 m) with fittings and connectors.	5042-1333
Flow cell, 10 mm, 80 $\mu$ L	0100-1225
Cassette, fixed pressure	5041-2167
Cassette, variable pressure	5042-1356

## Dissolution Testing Supplies

### Dissolution Testing Supplies for 8453/8454

Description	Part No.
Multicell system tubing kit	5042-1330
Valve tubing kit for one bath	5042-1331
Dissolution probes kit, 0.9 mm id, tubes with fittings	5042-1332
Fittings and ferrules, 1/16 in, PEEK, for 8-port valve	5042-1337
8-port valve for dissolution system	5063-6575
Rotor seal, for 5063-6575 valve (UV-Vis) dissolution system	5067-1539
Dissolution filters, for 1/8 inch probe, 45 µm pore size	5181-1246



Multicell tubing kit, 5042-1330



Valve tubing kit, 5042-1331



Dissolution probes kit, 5042-1332



PEEK fittings and ferrules, 5042-1337



Dissolution filters for 1/8 inch probe, 5181-1246



8-port valve for dissolution system, 5063-6575



Cary 5000 UV-Vis-NIR Spectrophotometer

# Agilent Cary UV-Vis and UV-Vis-NIR Supplies

## Cary Fiber Optic Probes



Cary 60 UV-Vis Spectrophotometer



Fiber optic dip probe, Torlon, body only,  
7910032600

### Fiber Optic Probes

Use With	Description	Part No.
	Fiber optic dip probe, stainless steel, body only Requires stainless steel tip, see the section on Replaceable Tips for compatible tips	7910035700
	Fiber optic dip probe, stainless steel, fixed 10 mm path tip	7910036400
	Fiber optic dip probe, stainless steel, replaceable 10 mm path tip	7910036500
	Fiber optic dip probe, Torlon probe, 7.9 mm in diameter x 159 mm	7910029900
	Fiber optic dip probe, Torlon, body only Probe is 7.9 mm in diameter by 144 mm (excluding tip). Not recommended for use with solutions that attack epoxy, requires Torlon tip, see the section on Replaceable Tips for compatible tips	7910032600
Cary 50/60 Wavelength range 200-1100 nm	Fiber optic dip probe, 7.9 mm in diameter x 159 mm, Torlon, replaceable 10 mm path tip (tip can be exchanged for other pathlengths)	7910035100
	Fiber optic dip probe, 12.7 mm in diameter x 70 mm, quartz construction, for use with corrosive samples, fixed 10 mm pathlength	7910030300
	Fiber optic stainless steel micro probe, 3.05 mm in diameter x 140 mm, fixed 10 mm pathlength. Not recommended for use with strong acids.	7910035600
	Hand-held fiber optic remote read probe, 6.35 mm in diameter x 104 mm, stainless steel, replaceable 10 mm path tip	7910030200

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**Fiber Optic Probes**

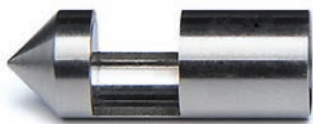
Use With	Description	Part No.
Cary 100/300	Hand-held fiber optic probe, quartz, long body 265 mm, 10 mm pathlength. Suitable for use up to 150 °C and with corrosive acids.	7910032100
	UV-Vis reflectance probe and probe holder for measuring total reflectance from a sample surface. Illumination area is 1 mm.	7910036200
	Absorbance dip probe with switch, stainless steel, 10 mm pathlength	9910085000
	UV-Vis reflectance probe	7910035500
Cary 50/60/100/300	Hand-held stainless steel fiber optic probe, 6.35 mm diameter x 104 mm, 10 mm pathlength, 3 m fiber. Includes light shield	9910076600
	Hand-held fiber optic probe, quartz, corrosion resistant, 12.7 mm diameter, 10 mm pathlength	9910080800
	Versi remote read fiber optics probe with replaceable quartz tips. Can be hand held or mounted on the Cary Fiber Optic Dip Probe Coupler. Ideally suited for samples that are corrosive, toxic, radioactive or cross contamination.	190055700
Cary 4000/5000/6000i	UV-Vis absorption probe, stainless steel, 2.5 m, 10 mm pathlength	9910069400



Hand-held fiber optic probe with replaceable tip,  
9910076600



Replaceable tip, Torlon, 20 mm pathlength,  
7910034600



Replaceable tip, stainless steel, 10 mm pathlength,  
7910035800

## Replaceable Tips and Miscellaneous Supplies

The stainless steel probe tips are suitable for use with the two stainless steel dip probes – either the stainless steel probe body (p/n 7910035700) or the stainless steel probe with the replaceable tip (p/n 7910036500).

The Torlon probe tips are suitable for use with the Torlon probe body (p/n 7910032600) or the Torlon fiber optic dip probe with the replaceable tip (p/n 7910035100). They feature a single arm design to reduce bubble formation. The tip is 7.9 mm in diameter and is suitable for operation in temperatures up to 85 °C.

### Replaceable Tips and Miscellaneous Supplies

Use With	Description	Part No.
Cary 50/60	Replaceable tip, stainless steel, 2 mm pathlength	7910036000*
	Replaceable tip, stainless steel, 5 mm pathlength	7910035900*
	Replaceable tip, stainless steel, 10 mm pathlength	7910035800*
	Replaceable tip, stainless steel, 40 mm pathlength	7910036100*
	Replaceable tip, Torlon, 2 mm pathlength	7910032800**
	Replaceable tip, Torlon, 5 mm pathlength	7910032900**
	Replaceable tip, Torlon, 10 mm pathlength	7910033000**
	Replaceable tip, Torlon, 20 mm pathlength	7910034600**
	Replaceable tip, Torlon, 40 mm pathlength	7910034500**
	All Cary	10 mm pathlength tips to suit the Versi remote fiber optics probe, p/n 190055700
Fiber optic alignment loop		7910027200
Fiber optic probe light shield. Provides light immunity for fiber optic probes used with Cary 100/300		7910028900
UV-Vis reflectance probe holder, spare		9910068500

## Kits and Supplies for UV-Vis and UV-Vis-NIR Accessories

### Accessory Supplies

Description	Comments	Part No.
<b>Temperature Probe Accessory Supplies</b>		
Probe holder	Includes square end probes, 2/pk, for use in rectangular cuvettes with internal dimensions of 10 x 10 mm and regular end probe, 2/pk, for use in rectangular cuvettes with internal dimensions of 10 x 9.5 mm	9910066800
Probe holder, tapered end	Includes tapered end probes, 4/pk, suitable for use in microcells	9910066900
Extension lead, short, for probe holder	Required for mounting the probe inside the sample compartment	110381100
Extension lead, long, for probe holder	Required for mounting the probe outside the sample compartment	110380500
<b>Cary 50/60 Solid Sample Holder Accessory Supplies</b>		
End holder	Side mounting support for the solid sample holder for Cary 50/60 Used to position the polarizer/depolarizer or other accessories	810137000
Solid sample holder spares kit #2	Includes V plate, 3 x 45 mm, 2/pk; V plate, 6 x 45 mm, 2/pk; assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910056200
<b>Cary 100/300 Solid Sample Holder Accessory Supplies</b>		
Film holder spares kit #1	Includes magnetic strips, 4/pk; V plates, 20/pk; gel-boat holders, resting plates, 2/pk; masks, 8/pk; clamps, 4/pk	9910064600
Solid sample holder spares kit #1	Includes aperture sample slide holder, 10 mm; aperture sample slide holder, 5 mm; aperture sample slide holder, 1 mm; V plate, 3 x 45 mm, 2/pk; V plate, 6 x 45 mm, 2/pk; assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910059400
Solid sample holder spares kit #2	Includes V plate, 3 x 45 mm, 2/pk; V plate, 6 x 45 mm, 2/pk; assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910056200
<b>Cary 7000 UMA Solids Autosampler Sample Holders</b>		
Sample holder, 1 inch round	Two configurations provided. Mount up to 32 x 1 in diameter, samples up to 10 mm thick with maximum angle of incidence 45°; or mount up to 24 x 1 in diameter samples up to 10 mm thick with maximum angle of incidence 65°	G6876-60003
Sample holder, 8 inch round	Wafer holder: Mount single 8 in diameter samples up to 3 mm thick. Maximum angle of incidence 65°	G6876-60002
Sample holder, universal	Permits mounting of irregular shaped samples of up to 10 mm thickness. The universal sample holder has 24 x 1 inch holes, evenly spaced around the 200 mm (8 inch) diameter ring. %R or %T measurement can be made through any of these 24 holes	G6876-60004

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Cary temperature probe accessory



Cary 100/300 diffuse reflectance accessory

**Accessory Supplies**

Description	Comments	Part No.
<b>Cary 7000 UMA Sample Holders</b>		
Standard sample holder	Supplied as standard with all UMA and UMS systems.	G6874A#100
Cube beam splitter holder	For use with cube beam splitters from 1 cm <sup>3</sup> to 5 cm <sup>3</sup>	G6874A#200
Edge mount sample holder	Fully adjustable for use with samples 1 inch (25.4 mm) to 6 inch (150 mm) in diameter and 5 mm thick	G6874A#300
Round sample holder	3 fixed diameter sample holders. Designed for %R or %T measurement of round samples of 1 inch, 1.5 inch, or 2 inch diameters. Each holder has a 2 mm selvage perimeter which will contact the sample. Horizontal cut outs ensure large angles of incidence can be achieved.	G6874A#400
<b>Cary 4000/5000/6000 Solid Sample Holder Accessory Supplies</b>		
Film holder spares kit #1	Includes magnetic strips, 4/pk; V plates, 20/pk; gel-boat holders, resting plates, 2/pk; masks, 8/pk; clamps, 4/pk	9910064600
Solid sample end support	Solid sample mount for the attachment of polarizers, depolarizers or apertures to the standard solid sample mounting accessory for the Cary 4000/5000/6000	5810008100
Solid sample masking aperture, 1 mm	Replacement aperture plate with 1 mm hole	410204100
Solid sample masking aperture, 5 mm	Replacement aperture plate with 5 mm hole	410204300
Solid sample masking aperture, 10 mm	Replacement aperture plate with 10 mm hole	410203900
Solid sample mounting plate	Provides attachment points for solid sample supports	410204500
Solid sample holder spares kit #1	Includes aperture sample slide holder, 10 mm; aperture sample slide holder, 5 mm; aperture sample slide holder, 1 mm; V plate, 3 x 45 mm, 2/pk; V plate, 6 x 45 mm, 2/pk; assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910059400
Solid sample holder spares kit #2	Includes V plate, 3 x 45 mm, 2/pk; V plate, 6 x 45 mm, 2/pk; assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910056200
<b>Diffuse Reflectance Accessory (DRA) Supplies</b>		
<b>Cary 100/300 Internal DRA Supplies</b>		
Powder cell holder kit	Includes a prepacked PTFE powder cell for use as a reflectance standard and powder cell holder. Quartz window covers sample so holder can be positioned at port of sphere.	7910036600
10 mm pathlength cuvette holder, for DRA-CA-30I	Suitable for positioning 10 mm pathlength cells in the transmittance port	7910028200
Fabric sample holder, for DRA-CA-30I	Includes UG11 filter	7910027900
Light trap (for performing 0 % T baseline correction)		7910028100
Transmittance sample holder, for DRA-CA-30I		7910028000
Calibrated 1.25 inch diameter 99 % Spectralon reflectance standard for DRA-CA-30I		7910036900
<b>Cary 4000/5000/6000 Internal DRA Supplies</b>		
Small reference disk	PTFE packed diffuse reflectance disk, 30 mm diameter	410198890
Large reference disk	PTFE packed diffuse reflectance disk, 45 mm diameter	410143990
Cuvette holder	Suitable for both transmission and reflectance measurements using 10 mm pathlength cells	210187900
Powder cell kit	Includes a prepacked PTFE powder cell for use as a reflectance standard, powder cell holder, funnel, and small sample holder	9910111400

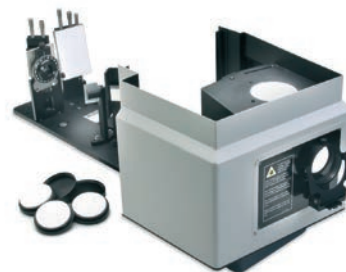
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**Accessory Supplies**

Description	Comments	Part No.
<b>Cary 4000/5000/6000 External DRA Supplies</b>		
Spectralon 99 % reflectance standard	Calibrated, for diffuse reflectance, 2 inch diameter, in durable Delrin holder with protective cover. Includes diffuse reflectance data from 250 to 2500, every 50 nm	7910037700
Center mount cuvette holder	Suitable for mounting a standard 10 mm pathlength cuvette inside the sphere normal to the incident beam. Ideal for measuring turbid samples such as proteins and other biological solutions.	7910038700
External mount cuvette holder	Suitable for measuring the transmission or absorbance of liquid samples using standard 10 mm pathlength cuvettes. Mounts on the transmission holder and can be positioned in either the sample or reference beams.	7910038300
Center mount holder, clip type	Allows samples to be positioned at the center of the DRA for measurement. The clip style holder is suitable for mounting thin and flexible samples. Incorporates a rotating dial so the user can quickly set the desired incidence angle to the nearest degree.	7910047600
Center mount holder, jaw type	Allows samples to be positioned at the center of the DRA for measurement. The jaw style holder is suitable for mounting rigid, opaque samples such as mirrors and painted samples. Incorporates a rotating dial so the user can quickly set the desired incidence angle to the nearest degree.	7910047500
Powder cell holder	Allows reflectance measurements of powdered samples and samples. Mounts on the standard sample holder against the reflectance port. Includes a prepacked PTFE powder cell for use as a reflectance standard and an empty powder cell holder for sample. Sample is retained by a plunger.	7910047700
Small spot kit	Consists of an iris, mirror assembly, and three lens options to focus the beam to a smaller diameter spot at the selected measurement location. The beam size is ~ 3 mm diameter at the transmission position and 3.5 mm tall by 1.5 mm wide at the reflectance position.	7910047200
Variable angle transmittance holder	Allows transmittance measurements of solid samples at various incident angles. The sample can be positioned through 360 degrees to the incident beam and is selectable to 1 degree. Suitable for rigid samples such as mirrors and glasses.	7910047400
<b>Miscellaneous Accessory Supplies</b>		
Aperture mask kit, for the variable angle specular reflectance accessory	Contains 1 inch disk holder, 2/pk, and two each of the 2, 10, and 20 mm sample holder	9910064700
Attenuation filter kit with neutral density screens and blue filter, for use with the variable angle specular reflectance accessory	Used for high levels of attenuation from 0.5 Abs to 3.1 Abs	9910047700



Cary 4000/5000/6000 solid sample holder


 Cary 4000/5000/6000  
diffuse reflectance accessory



Deuterium lamp, for Cary 100/300 UV,  
G9820-80000



Visible source lamp, for Cary 100/300 UV,  
5610021700



Xenon lamp module, 110639690



Visible QI lamp, for Cary 4000 to 7000,  
5610013900



Deuterium lamp, for Cary 4000 to 7000,  
110713990

## Cary Source Lamps

Agilent offers high quality lamps that produce top level performance for your Cary spectrophotometer.

### Cary Source Lamps

Description		Part No.
Deuterium UV lamp	Cary 100/300	G9820-80000
Visible source lamp	Cary 100/300	5610021700
Xenon lamp module	Cary 50/60	110639690
UV source lamp, less than 190 nm	Cary 400	5610135500
Deuterium UV lamp	Cary 4000 to 7000	110713990
Visible QI lamp	Cary 4000 to 7000	5610013900
Mercury lamp Used for UV-Vis wavelength validation	Cary 4000 to 7000	5610136300

## Cary Tubing

### Tubing

Description	Comments	Part No.
Silicon pump tubing, 3/16 inch id, 5/16 inch od, per m	Tubing only, no connectors	2410023800
Peristaltic pump tubing replacement kit for Routine Sampler Accessory	Includes silicon pump tubing and fittings	9910052900
PTFE tubing (to sample) for Routine Sampler Accessory, per m		3710030800
Silicon tubing, 1 mm id, 3 mm od		3710026400
Silicon tubing, used to connect Routine Sampler Accessory to flow cells, per m		910146400
Dissolution tubing spares kit, Cary 50/60		6610020500
Dissolution tubing spares kit, Cary 100/300		6610020600

# UV Filters, Standards, and Reagents

## Optical Filters

Description	Comments	Part No.
Attenuator filter kit with neutral density screens and blue filter, for use with Cary 100/300/4000/5000/6000i.	Used for high levels of attenuation from 0.5 Abs to 3.1 Abs. Filters mount in filter holders supplied. Filter holders mount onto liquid sample holder base. Two filter holders (V-Holders) are supplied with three neutral density mesh filters (0.5 Abs, 1.1 Abs and 1.5 Abs). Also supplied are three blue glass filters for attenuation at visible wavelengths or for demonstration of system photometric range.	9910047700
Holmium oxide filter		118020790
Holmium oxide/didymium glass filter kit	Includes holmium oxide and didymium glass filters in a 10 mm rectangular cell holder	10030200
Certified holmium glass filter	Holmium glass filter mounted in a 10 mm rectangular holder, with certificate	2010094300
Certified didymium glass filter	Didymium glass filter mounted in a 10 mm rectangular holder, with certificate	2010094400
Photometric linearity neutral density filter kit	Contains tandem cell holder and two each neutral density filters of 0.3, 0.5, 1.0, and 1.5 Abs	9910056100



Photometric linearity neutral density filter kit,  
9910056100



OO/PV chemical standards kit I,  
5063-6503



OO/PV chemical standards kit II,  
5063-6521



OO/PV hardware kit,  
5063-6523



Tubing kit for UV-Vis OO/PV test,  
5063-6522



Caffeine OO/PV sample for dissolution test,  
5042-6476

## Standards and Reagents

Our chemical standards and accessory kits provide an inexpensive and time-saving solution for operational qualification and performance verification (OO/PV) of UV-Vis spectrophotometers. The kits are designed for analysts who need to conform closely to both quality and regulatory requirements when performing UV-Vis measurements.

The chemical kits can be used with any UV-Vis spectrophotometer and consist of prepared solutions in sealed ampoules. The solutions are traceable to NIST standards and specified by the European Pharmacopeia (EP) and include holmium oxide for wavelength accuracy measurement; potassium dichromate for photometric accuracy measurement; sodium nitrite, sodium iodide, and potassium chloride for stray light measurements at 340, 220, and 198 nm; and toluene in hexane for resolution measurement.

Each standard includes a Certificate of Analysis for traceability.

### 8453/8454 Certified Calibration Standards and Accessory Kits

Description	Kit Contents	Part No.
OO/PV chemical standards kit I, for photometric accuracy, stray light, and resolution measurements	Contains ampoules, 10 mL each, 12/pkg, including 4 potassium dichromate in sulfuric acid (2 each of 60 and 600 mg/L), 2 sulfuric acid (blank), sodium nitrite, sodium iodide, potassium chloride, toluene in hexane, and 2 hexane	5063-6503
OO/PV chemical standards kit II, for wavelength accuracy	Contains ampoules, 10 mL each, 2/pkg, including perchloric acid (blank) and holmium oxide in perchloric acid	5063-6521
OO/PV hardware kit	Contains flow cells, 2/pkg; cell passivating fluid; tubing kit; MCT adjustment tool; temperature sensor support; syringes; and OO/PV manual	5063-6523
Tubing kit, for UV-Vis OO/PV test	Contains tubings, fittings, and adapter to flush flow cell	5063-6522
Caffeine OO/PV sample, for dissolution test, 150 mg/L caffeine in water, 500 mL		5042-6476

### 8453/8454 Checkout Samples

Description	Part No.
Test sample for UV-Vis (caffeine solution, 10 µg/mL in water)	5063-6524



## Cary Standards

Description	Comments	Part No.
Calibrated solution standards kit	Solution validation test kit of 12 sealed cells for testing performance of a UV spectrophotometer (wavelength accuracy, photometric accuracy, stray light, etc). Includes potassium dichromate 40 mg/L, 60 mg/L, 120 mg/L, 600 mg/L plus perchloric acid blank for photometric accuracy tests, holmium perchlorate 4 % in 10 % perchloric acid for wavelength accuracy tests, potassium chloride solution 12 g/L, sodium nitrite solution 50 g/L, sodium iodide - 1 % solution plus water blank for stray light tests, 0.02 % toluene in hexane plus a hexane blank for resolution tests. Each solution is sealed in a quartz cuvette. A certificate of traceability and performance is included for each solution.	9910085200
Holmium perchlorate 4 % in perchloric acid, sealed in a quartz cuvette	Includes certificate of traceability and performance.	6610022100
Toluene in hexane resolution test kit	Includes 10 mL ampoules of 0.02 % toluene in n-hexane, 2/pk and 10 mL ampoules of n-hexane, 6/pk	9910101000
Certified standard, for specular reflectance at 7 degree angle of incidence	Features Al coating on 40 mm diameter Pyrex substrate. Covers range 250–2500 nm with >80 % reflectance >250 nm and >85 % reflectance >800 nm. Includes NIST traceable certification at 10 nm intervals (250–1100 nm) and 25 nm intervals (1100–2500 nm).	G6874-80000
Spectralon 99 % reflectance standard, calibrated, for diffuse reflectance, 2 inch diameter	PTFE diffuse reflectance standard which has typical reflectance value of 99 % and is spectrally flat over the UV-VIS-NIR spectrum in the range from 250–2500 nm. Reflective area 2 inch diameter. Supplied with complete diffuse reflectance data from 250–2500 nm. Housed in a durable Delrin holder with a protective cover. For use with the Cary 7000/UMA when performing scattering measurements that need to be referenced (ratioed) to a scattering material.	7910037700
Calibrated color standard, 1.25 inch od, 4/pk	Includes four colored standards (red, green, blue, yellow) with values traceable to NIST. Includes tristimulus values, chromaticity coordinates, UCS coordinates, and CIELAB and CIELUV values. Certified values are in 10 nanometer increments from 380–830 nm.	9910084300
Certified diffuse reflectance wavelength and wave number standard	PTFE diffuse reflectance standard which has typical reflectance value of 99 % and is spectrally flat over the UV-VIS-NIR spectrum in the range from 250-2500 nm. Reflective area 2 inch diameter. Supplied with complete diffuse reflectance data in both wavelength and wavenumbers, directly traceable to NIST. Housed in a durable Delrin holder with a protective cover.	9910081100
Certified diffuse reflectance wavenumber standard	PTFE diffuse reflectance standard which has typical reflectance value of 99 % and is spectrally flat over the UV-VIS-NIR spectrum in the range from 250–2500 nm. Reflective area 2 inch diameter. Supplied with complete diffuse reflectance data in wavenumbers, directly traceable to NIST. Housed in a durable Delrin holder with a protective cover.	9910081000
Certified reference standard for certification of UV instruments to USP requirements	Includes 0.006 % potassium dichromate plus perchloric acid blank and neutral density filters of 0.5, 0.7, and 1.0 Abs. for photometric accuracy tests. Also includes 4 % holmium perchlorate in 10 % perchloric acid for wavelength accuracy tests. Each solution is sealed in a quartz cuvette. A certificate of calibration with NIST traceability is included for each solution/filter.	190034200
Certified Neutral Density standards, set of three	Set of three neutral density glass filters of 0.5, 0.7, and 1.0 Abs. required for the determination of photometric accuracy. Traceable to NIST.	190032100

# Cary 60 Fiber Optic Couplers

The Cary 60 Fiber Optic Coupler and the Cary 60 Dip Probe Coupler are optional accessories for the Cary 60 UV-Vis spectrophotometer. Both accessories convert the Cary 60 UV-Vis into a remote fiber optic measurement system. Remote fiber optics are useful when sterile conditions need to be maintained, high temperatures or pressures are present, radiation or hazardous material prevent direct handling of samples, measurements need to be performed inside a glove box, or when monitoring a reaction in a process bath.

The Cary 60 UV-Vis is the ideal instrument for remote measurements using fiber optics. A highly focused beam enables efficient coupling of the UV-Vis light into the optical fibers, and room light immunity means measurements can be performed outside the sample compartment, without the need to shield the sample.



The Cary 60 UV-Vis Spectrophotometer with fiber optic accessory

## | Features

- The Cary 60 Fiber Optic Coupler is ideal for fiber optic probes and accessories used away from the Cary 60 UV-Vis.
- The Cary 60 Dip Probe Coupler features a mounting arm that holds the fiber optic probe in position making repetitive analysis even more convenient.
- Reducing the risk of instrument downtime: The simple design of the Cary 60 Fiber Optic Coupler and the Cary 60 Dip Probe Coupler is inherently reliable, with no moving parts and few optical components.
- Enjoy full flexibility: Fiber optic probes quickly and easily plug into the SMA connectors on the coupler. Numerous fiber optic probes are available for use with the Cary 60 UV-Vis when sampling liquids and solids, in a wide range of materials including stainless steel, Torlon, and quartz.
- Measure what was not measurable before: Large or stationary samples that are impossible to mount in normal instruments can be accurately measured outside of the sample compartment using fiber optic technology.
- Eliminate the need for cuvettes: The use of fiber optic probes increases productivity by minimizing sample handling and maximizing sample throughput, with no compromise in accuracy or reproducibility.
- The Remote Diffuse Reflection Accessory (DRA) allows the easy and convenient remote measurement of solids and powders outside the Cary 60 UV-Vis sample compartment. The Remote DRA features an inbuilt camera to help visualize sample and test area.

# Cary Eclipse Temperature Probes

The Agilent Cary temperature probe accessory accurately measures temperature with Agilent Cary spectrophotometers. It can be attached for remote monitoring outside of the sample compartment or used to monitor liquid sample temperatures inside cuvettes.



## | Features

- Measure the temperature of the sample or temperature in the sample compartment
- Probe range:  $-10\text{ }^{\circ}\text{C}$  to  $+100\text{ }^{\circ}\text{C}$
- Probe size: 1.5 mm diameter, 15 mm long (approx.)

## Cary Sipper Specifications



### Pump and measure multiple samples simultaneously

The Agilent Cary Sipper is a three-channel, single speed sample pump, compatible with the Cary 3500 UV-Vis spectrophotometer. It combines the simultaneous measurement capability of the Cary 3500 with the ability to pump from three samples at once. Combining these capabilities allows up to three samples to be pumped and measured at the same time.

The tightly controlled beam geometry of the Cary 3500 measures less than 1.5 mm at the sample measurement point. The small beam size allows many different flow cells to be used with the Cary Sipper, including those with low volumes.

The Cary Sipper is software controlled, with functionality such as rinsing and optimization of filling times. The accessory includes tubing bracket guides for pump tube management, tubing with appropriate connectors, and a single flow cell.

## Performance specifications

Parameter	Specification
Number of pumping channels	3
Speed (rpm)	80
Software control	Yes
Rinse functionality	Yes
Optimization of fill times functionality	Yes
Save Sipper parameters in UV-Vis methods	Yes
Pump activation on Sipper module	Yes

## Compatibilities

Parameter	Specification
Instrument compatibility	Cary 3500 UV-Vis (all Cary 3500 modules)
Flow cells	Flow cells compatible with a 15 mm z height and maximum 10 mm pathlength.*
Software version	Cary UV Workstation 1.2 or later

## Installation requirements

### System installation

For details of installation requirements, see the Agilent Cary Sipper Site Preparation Guide, document number D0002330.

### Weight and dimensions

	Weight		Height		Depth		Width	
	kg	lb	cm	in	cm	in	cm	in
Agilent Cary Sipper	4.1	9	25	10	21.5	8.5	25	10

## Recommended environmental conditions

Parameter	Specification
Instrument conditions	15 to 35 °C at 15 to 80% relative humidity, noncondensing, altitude 0 to 3100 m
Electrical requirements	Mains supply of 100 to 240 volts AC and frequency 47 to 63 Hz. Maximum power consumption 3 W

## Quality

Agilent Cary spectrophotometers and accessories are manufactured using a quality system that is certified to ISO-9001.

# Cary UV-Vis Sunglasses Holder accessory

The sunglasses holder accessory aids in testing the penetration of solar ultraviolet radiation (UVR) through sunglasses and sun glare filters in the range of 280 to 400 nm. The accessory can be used for testing sunglass UV transmission as well as sunglass lens uniformity.



## | Features

- Used in testing the penetration of solar ultraviolet radiation (UVR) for sunglasses and lenses
- Used in the 280 to 400 nm spectral wavelength region
- Mounts in the Cary 60, 100, and 300 spectrophotometers

## Rapid Mix accessory RX2000

The RX2000 rapid mix accessory from Applied Photophysics rapidly mixes reagents for stopped flow kinetics experiments with Cary UV-Vis, UV-Vis-NIR, and Cary fluorescence instruments. The dead time is only 6 ms, making it possible to measure first-order reaction rates over 200 s<sup>-1</sup>.

The syringes, mounted on a rigid drive platform, stop the flow precisely and instantaneously. Reagents travel in this inert sample circuit through an umbilical cord to the flow cell containing a high-efficiency T-format mixer.



### | Features

- The RX2000 cell attaches in seconds without tools to any spectrometer that can accommodate a standard 1-cm rectangular cell.
- The volume per shot is 100  $\mu\text{L}$  and prime volume is 260  $\mu\text{L}$ , with a 60 cm umbilical length so minimal sample is required. Other umbilical lengths are available.
- The entire flow circuit, including drive syringes, can be thermostatted between 0 to 60  $^{\circ}\text{C}$ , providing reliable temperature equilibration and helping to exclude oxygen from the sample during anaerobic work.
- Change the drive syringes to deliver mixing ratios from 1:1 to 1:25.
- Adjust the position of the stopping block/trigger mechanism to change the drive volume –important for large ratio asymmetric mixing experiments and purging air bubbles.

## Rapid Mix Accessory SFA-20

The Hi-Tech Scientific SFA-20 is a stopped-flow accessory used to mix reagents for short-lived reactions. The SFA-20 has an empirical dead time of less than 8 ms, and when used with Agilent Cary spectrophotometers monitors reaction rates up to  $100 \text{ s}^{-1}$ .

The SFA-20 is available in three additional versions that enable microvolume mixing or mixing of more than two reagents. Optional extras include a pneumatic drive attachment, anaerobic kit, and a range of different size syringes.



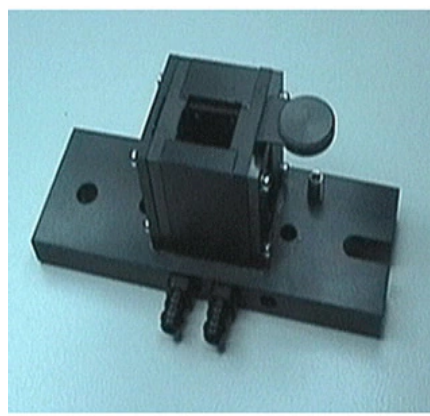
### | Features

- High precision, gas-tight syringes mounted on a rigid drive platform outside the thermostatically controlled sample circuit stop the flow precisely and instantaneously.
- Easy set-up for variable ratio mixing applications: syringes are mounted outside the sample circuit, providing easy and rapid replacement.
- The platform, syringe mounting blocks, and thermostatted sample circuit are constructed from chemical-resistant materials to protect the instrument from spills and chemical attack.
- The flow circuit has no seals, so a wide temperature range of  $0-80 \text{ }^\circ\text{C}$  can be achieved using an external thermostatted circulator/cooler.
- Inert sample circuit reagents travel in the inert sample circuit through an umbilical cord to the flow cell containing a high-efficiency T-format mixer.
- The SFA-20 can be driven by hand. A pneumatic drive can be added as an optional extra for better reproducibility. It is highly recommended for multimixing (mx) versions.



# Thermostatted Accessories Kit Cary 4000/5000/6000i/7000

The thermostatted accessories kit includes a special baseplate to provide light-proof seals through which plumbing and ribbon cables can pass. This kit should be used with the Cary 4000, 5000, 6000i, and 7000 extended sample compartment and either the Peltier 1x1 single cell holder or the dual rectangular water thermostatted cell holder.



## | Features

- Kit to retrofit Cary accessories for temperature control
- Provides light-proof seals through which plumbing and ribbon cables can pass

# Thermostatted Multicell Holder Accessory

The thermostatted multicell holders for Cary UV-Vis and Cary UV-Vis spectrophotometers provide temperature control for multiple samples. The multicell holders can be used at ambient temperature with water thermostating, or be Peltier controlled, as with the 6x6 multicell holder for the Cary UV-Vis-NIR spectrophotometers.

The thermostatted multicell holders are automatically controlled by the UV-Vis spectrophotometer software and can be used together with the Cary temperature probe to monitor sample temperature.



Cary 60 UV-Vis spectrophotometer 18-cell multicell changer

## | Features

- 18-cell water thermostatted multiple available with the Cary 60 UV-Vis spectrophotometer for stable, static temperature control.
- Water- or Peltier-thermostatted multicell holder available for the Cary UV-Vis-NIR spectrophotometers.
- Multicell holders come with built-in stirring functionality.



# Diffuse Reflectance Accessories (DRAs)

for the Cary 4000, 5000, 6000i, or 7000 UV-Vis-NIR spectrophotometers



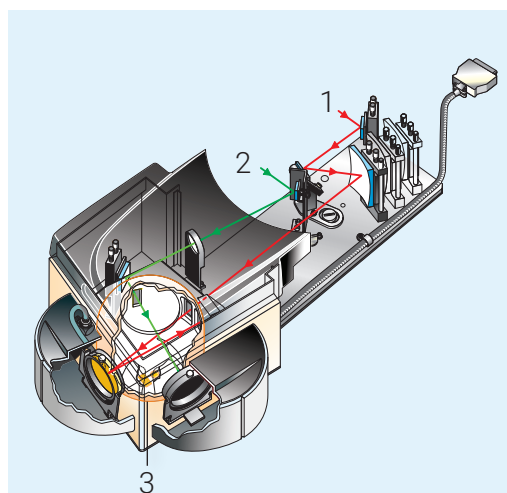
## Measure reflectance, transmittance or absorbance

Integrating spheres are versatile accessories that accommodate a wide variety of sample types, and allow for various measurement modes. The integrating sphere is hollow and its internal surface is a non-selective diffuse reflector. The geometry of the integrating sphere is designed to collect the majority of reflected or transmitted radiation (without directional preference), presenting an integrated signal to the detector.

Agilent has a range of external and internal DRAs for the Cary 4000, 5000, 6000i, or 7000 instruments. The three external and three internal DRAs are designed to perform reflectance, transmittance, or absorbance measurements of diffuse, specular, or mixed samples.

## Features

- **Variety:** The internal and external DRAs can be used with all Agilent high end UV-Vis and UV-Vis-NIR instruments, so you can choose the DRA option that best suits your needs.
- **Flexibility:** Reflectance and transmittance mounting options are provided as standard. Other options are available for powders and small samples, including variable angle center mount attachments for solids and solutions.
- **Ease of use:** A thoughtfully designed lock down lever saves time, with no tools required to install accessories.



**Optical diagram of the Cary DRA accessories**

1. Sample beam
2. Reference beam
3. Integrating sphere

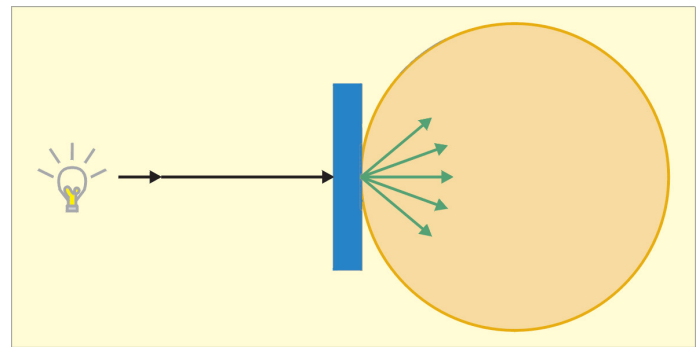
Reflection consists of two components: specular and diffuse. Specular reflectance is the mirror-like reflection off a sample surface. Diffuse reflectance occurs when the surface reflects light in many different directions, giving the surface a matte finish.

Traditionally, the accessory used to measure diffuse reflectance is the integrating sphere. Applications include characterizing solar materials, color measurement and characterization, and obtaining reflectance spectra of a painted surface. Samples which distort the beam of the instrument, such as a lens, can also be studied with the DRA.

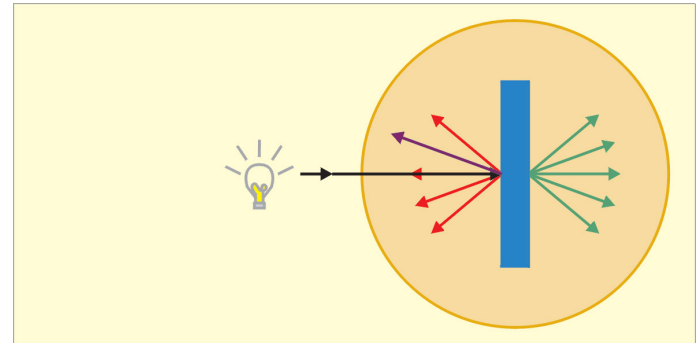
Integrating spheres are ideal for measuring the transmission of turbid, translucent or almost opaque materials where many standard techniques prove inadequate due to loss of light and sample scattering effects.

Reflectance measurements are made by mounting a sample on the sphere wall, ensuring efficient collection of a high proportion of diffusely reflected radiation. Although commonly referred to as a diffuse reflectance accessory (DRA), options are available to exclude or include the specular component of the reflected radiation, providing the choice of either diffuse only or total reflectance modes.

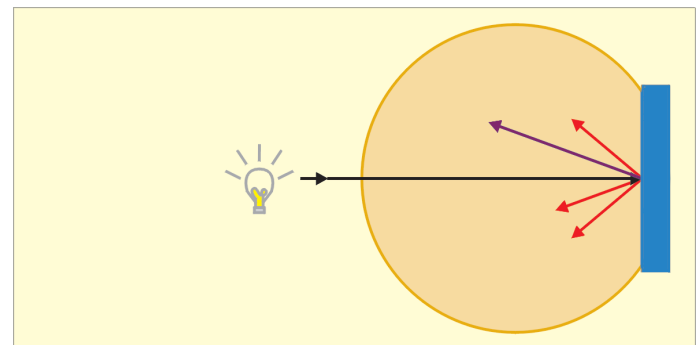
The functionality of a DRA is not limited to reflectance measurements. Integrating spheres can also be used to measure transmittance by mounting the sample at the entrance port or the center of the sphere. The center mount, augmented by rotational control over the sample axis, complements the straight diffuse measurement mode.



Transmission



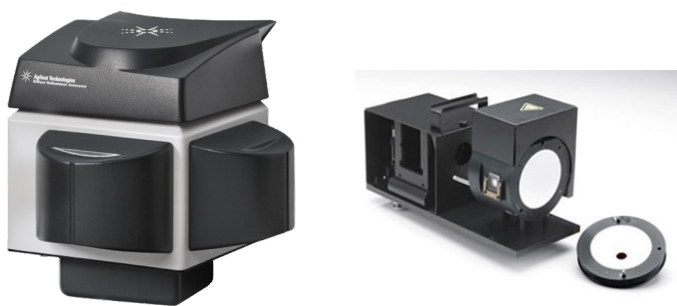
Center



Reflection

Figure 1. Schematics showing transmitted and reflected light. Diffuse reflection (red), specular reflection (purple) and diffuse transmission (green). Incident light is shown in black and the sample is shown in blue.

## Choosing an external or internal DRA



The DRAs are available in either an external or an internal version. The external version (shown on the left, above) mounts in the instrument sample compartment, but extends beyond the instrument footprint. The internal version (shown on the right, above) fits completely inside the instrument sample compartment.

External DRA	Internal DRA
Unlimited sample size in reflectance mode	Max sample size limited to sample compartment dimensions
Center mounting options available as clip, jaw or cuvette	Small efficient size resulting in high signal to noise and greater dynamic range
Variable angle measurements for center and transmission positions	
Access to reference beam for cuvette holder	
150 mm sphere	110 mm sphere
Port to sphere area ratio: <5%	Port to sphere area ratio: <3%

### Measurement capabilities

The external DRA can perform more measurement types than the internal version, with the use of optional accessories. The table below conveys the different measurement types each DRA can be used for.

	Internal DRA	External DRA
Total %R (Specular + Diffuse)	✓	✓
Diffuse %R (Specular excluded)	✓	✓
Transmission %T	✓	✓
Cuvette Holder (optional)	✓	✓
Solid Sample Holder	✓	✓
Powder Cell Holder (optional)	✓	✓
Mount for Polarizer/Depolarizer (optional)	✓*	✓
Transmission (Variable Angle) (optional)	☒	✓
Transflectance (Center Mount) (optional)	☒	✓
Small Spot Kit (SSK) (optional)	☒	✓
Aperture Kit (optional)	☒	✓

\*Standard

## DRA detectors

As well as selecting an internal or external DRA, three different detectors are available.

1. DRA-900 (PMT version): With exceptionally low photometric noise, wide photometric range and good linearity the DRA-900 is ideal for research and reference work
2. DRA-2500 (PMT/PbS version): The PbS NIR detector is peltier cooled and optimized in real time. This provides the highest photometric linear range of any commercial PbS instrument.
3. DRA-1800 (PMT/InGaAs version): This PMT/InGaAs DRA uses a high performance narrow band InGaAs detector for improved NIR resolution and sensitivity.

## Applications

Consider the following application requirements when deciding between an internal and external DRA.

### Powders

Routine QA/QC analysis of powders is more efficient with the internal DRA using disposable cuvettes and the cell holder mounted in the reflection position (shown in Figure 1). The internal DRA also better accommodates low volumes of powders. If the samples are large and/or highly granular, the increased volume of the external DRA powder cell makes it the preferred choice.

### Absorbance

Center mounting (shown in Figure 1) is only offered with the external DRA. This permits simultaneous measurement of reflectance and transmittance, a requirement of solar and life science applications.

### Small samples

The external DRA has an optional Small Spot kit which reduces the beam size using a condensing lens and permits the measurement of samples down to approximately 5 mm. By focusing the beam down, minimal light is lost providing better signal to noise for small sample sizes.

### Large samples

The maximum internal DRA sample size (%T or %R) is limited by the physical space inside the sample compartment and extended sample compartment. The maximum sample size for the external DRA %R port is unlimited.

### Kinetics

Highly scattering kinetic studies which incorporate buffers that change with time require access to the reference beam to correct for this effect. The external DRA has a cuvette mount for the reference beam, making it suitable for this type of study.

## Specifications

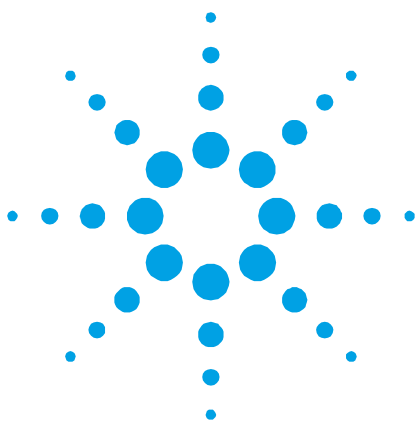
Wavelength range (nm)			
	DRA-900	DRA-2500	DRA-1800
Cary 4000	200-900	200-900*	200-900*
Cary 5000	200-900	200-2500	200-1800
Cary 6000i	200-900	200-1800*	200-1800
Detectors			
UV-Vis	PMT	PMT	PMT
NIR	n/a	Peltier cooled PbSmart	Peltier cooled InGaAs

\*Grey shaded cells indicate full wavelength capability of the DRA is limited by the spectrophotometer itself. On this basis the configuration is not recommended however the configuration is still supported.

Measurement geometry	Internal DRA	External DRAs
Specular included	3° 20' deg/d	8 deg/d
Specular excluded	0 deg/d	8 deg/d
Transmittance	0 deg/d	0 deg/d

## Additional Accessories

<b>Required</b>	Extended sample compartment (internal DRA only)
<b>Optional</b>	Sample holders, polarizer/depolarizer, small spot kit, double aperture, aperture kit, variable angle %T holder, Edwards attachment, powder mounts



# Linear dynamic range of the Cary 4000, 5000, 6000i: internal diffuse reflectance accessories

## Data Sheet

### Introduction/Theory

The photometric accuracy and linearity of a spectrophotometer defines its ability to measure an absorbance that can be directly related to a compound of known absorptivity or concentration. Of similar importance is the dynamic range over which the spectrophotometer remains linear. A wide linear dynamic range permits the analysis of highly turbid solutions and a wide range of sample concentrations (optical densities), as well as reducing sample preparation (dilution) requirements.

Diffuse reflectance accessories (DRAs) employ an integrating sphere design. This design greatly improves the efficiency with which light can be collected when analyzing highly scattering samples in either transmission or reflectance modes. For this reason, and because DRAs have their own light detectors, most system performance attributes must be characterized with the DRA installed. This data sheet uses potassium permanganate solution to demonstrate the excellent linear dynamic range of the Agilent Internal DRAs.



Cary 4000, 5000 and 6000i instruments provide a wide linear dynamic range

## Materials

- Cary 4000, 5000 or 6000i spectrophotometer with an Internal DRA
- 2 ► Attenuator, 1.5 Abs, part number 0110677500
- Quartz cuvettes (10 mm pathlength), part number 6610000800
- Accessory Final Cell Holder, part number 0210187900
- Standard potassium permanganate solutions (0.1, 0.5, 1, 10, 100, 200, 250, 300, 350 and 400 mg/L; freshly prepared from AR Grade  $\text{KMnO}_4$ )

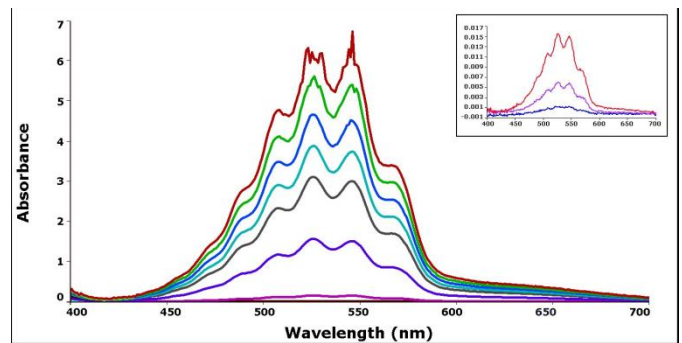
## Method

1. Install and align the Internal DRA.
2. Warm up the Cary spectrophotometer for at least 1h prior to use.
3. Recalibrate the DRA by running the Auto-calibrate feature in the Validate application.
4. Install and check the alignment of the cell holder at the transmission port of the DRA beam.
5. Set up the instrument as follows:
  - Wavelength range: 750–400 nm
  - Scan rate: 60.0 nm/min with a data interval of 1.0 nm, signal averaging time 1.0 s
  - SBW: 1.5 nm
  - Zero/Baseline correction: ON
  - Slit height: Reduced
  - All other parameters: default
6. Perform a Zero/Baseline correction on a cuvette filled with water, without reference beam attenuation. Measure the 0.1, 0.5, 1, 10 and 100 mg/L  $\text{KMnO}_4$  solutions sequentially using the same quartz cuvette.
7. Place a 1.5 Abs attenuation in the reference beam and perform another Zero/Baseline correction. Using the same quartz cuvette as above, measure the 200, 250 and 300 mg/L  $\text{KMnO}_4$  solution.

**Note:** Rinse the cuvette with each new solution before measurement, ensuring that the optical faces are dry and free from fingerprints. Use lint-free tissues if required. You should also ensure that the cuvette is in the same orientation when you replace it for each measurement.

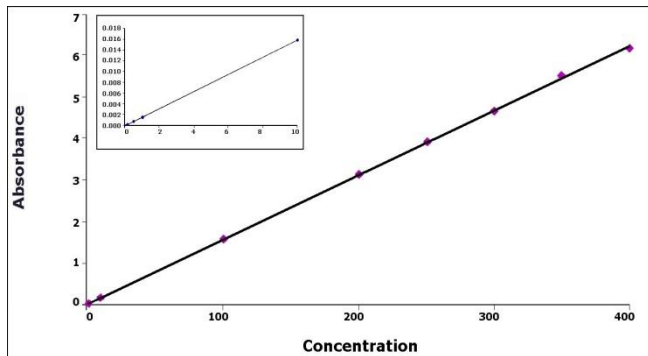
8. Repeat Step 7, this time using 3.0 Abs attenuation in the reference beam (i.e. 1.5 + 1.5 absorbance), and scan the 350 and 400 mg/L  $\text{KMnO}_4$  solution. Ensure that the two 1.5 Abs attenuators in the reference port are aligned to give approximately 3 Abs attenuation.
9. Construct a calibration curve by plotting the absorbance versus concentration.
10. To confirm the linear dynamic range of your Cary spectrophotometer, perform a linear regression on your data and calculate the coefficient of determination ( $r^2$ ). This gives an indication of the 'goodness of fit' of your data to a straight line, and hence the dynamic range and linearity of the instrument.

## Results

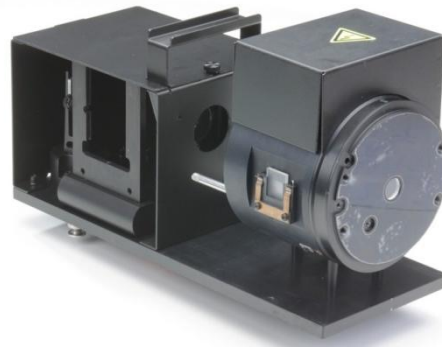


The spectra of standard permanganate solutions can be seen above. The insert shows the spectrum obtained for the lowest concentration standards (0.1 mg/L, 0.5 and 1.0 mg/L), and depicts a spectral profile identical to that of the more concentrated standards.





The plot of absorbance vs concentration (mg/L) above highlights the wide dynamic range and inherent linearity ( $r^2 = 0.99988$ ) of the Cary spectrophotometers, and confirms that quantitative analysis of permanganate from 0.1 to 400 mg/L is quite feasible at the peak absorption wavelength of 525 nm up to 6 Abs.



The Internal Diffuse Reflectance Accessory

## Conclusion

The quantitative analysis of aqueous potassium permanganate demonstrates the excellent photometric accuracy and wide linear dynamic range of the Agilent DRA systems - an important DRA performance attribute regardless of the application at hand.

# UV-Vis-NIR Fixed Angle Specular Reflectance accessories (slide mounted)

An external specular reflectance accessory (SRA) allows specular reflectance measurements to be made at fixed angles of 30°, 45°, or 60° depending on the accessory. These accessories are useful for studies of film thickness on metallic substrates and measurements of epitaxial film thickness.

The baseline is set by placing a reference material on top of the accessory and collecting the baseline. The reference material is then replaced with the sample lying face-down on top of the accessory to complete the measurement. These accessories have been designed for Cary 60, 4000, 5000, 6000i and 7000 instruments.



## | Features

- Horizontal sampling surface
- Simple alignment using alignment mirror (included)
- High throughput for maximum performance
- Interchangeable masks in 3, 6, and 13 mm diameters for examining small samples or small areas of large samples—three masks are supplied as standard

# UV-Vis-NIR Fixed Angle Specular Reflectance Accessory (floor mounted)

The floor-mounted external fixed angle specular reflectance accessories allow specular reflectance measurements at fixed angles of 12.5°, 30°, 45°, and 60°. The accessories are particularly useful for studies of film thickness on metallic substrates and measurements of epitaxial film thickness.

Designed for the Cary 60, 4000, 5000, 6000i, and 7000 instruments, these accessories do not require a solid sample holder to be installed.



## Features

- Horizontal sampling surface
- Fixed angles—12.5°, 30°, 45°, or 60°
- Accurate and repeatable alignment—alignment mirror included
- High throughput
- Interchangeable masks—used for examining small samples or small areas of large samples (3, 6, and 13 diameters included)

# UV-Vis-NIR Liquid Cell Holders

The Cary UV-Vis liquid cell holders are designed for measuring liquid samples on the Cary UV-Vis and UV-Vis-NIR spectrophotometers. The selection of Agilent spectrophotometer liquid sample holders can be used for all types of sample measurements.

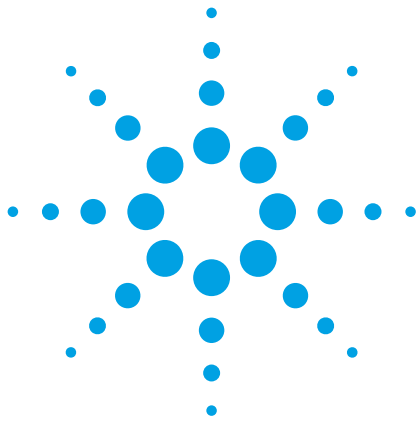
Water-thermostatted and Peltier cell holders make temperature-controlled measurements possible. Microcell holders are available for the Cary 60 for sample volumes down to 4  $\mu\text{L}$ . A range of long-pathlength cell holders for pathlengths up to 10 cm are available.



## | Features

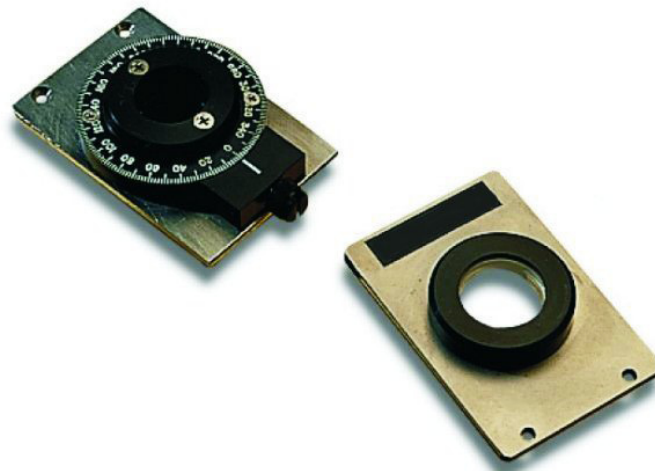
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- Standard rectangular cell holders
  - Ambient cylindrical cell holders
  - Long-pathlength rectangular cell holder
  - Variable pathlength cell holders
  - Dual cylindrical and rectangular thermostattable cell holders
  - Single cylindrical and rectangular water thermostatted cell holders
  - Microcell holders (Cary 60)
-



## **Polarizer and Depolarizer for the Agilent Cary Series UV-Vis-NIR**

### Data Sheet

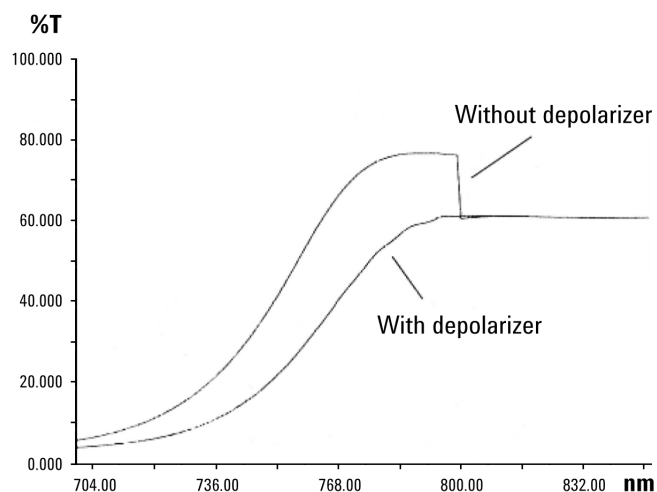


The randomly polarized light emitted by the lamp of the spectrophotometer will be partially polarized by the time it reaches the sample. The optical components within the instrument, such as the grating and each of the mirrors, introduce some plane polarization of the light. The alignment, age, selected spectral bandwidth and the detector used will all affect the polarizing characteristics of a spectrophotometer. For these reasons, it is very difficult to quantitate the degree of plane polarization of the light in the sample compartment.

The polarization state of the instrument often does not require special consideration for the vast majority of sample analyses. The baseline measurement performed prior to the sample measurement normalizes all system dependancies including light intensity and polarization characteristics.

When interaction with the sample changes the polarization state of the light, some additional user intervention is required. Polarizers and depolarizers are the tools used to control the polarization state prior to, and after the sample. The transmission results are measured in terms of horizontal or vertically polarized light or, in the case of reflection 's' or 'p' polarized light.

Without adequate control of polarization, ordinate 'steps' can appear in scans at grating or detector change points, due to the different polarization attributes of these components (Figure 1).



**Figure 1.** Ordinate steps, induced by sample polarization at the detector/ grating change, can be reduced by placing a depolarizer after the sample

Controlling the plane polarization of the light beam in a spectrophotometer is necessary for particular measurements. For example, polarizers and/or depolarizers may be used in these situations:

- If the sample being measured is sensitive to the plane polarized light, for example liquid crystals, the transmission of the sample will change as the plane of polarization changes. It is thus important to control the plane of polarization of the incident beam.
- If the sample itself polarizes the incident light, the results will be affected as the detectors in the Cary spectrophotometer are sensitive to plane polarized light. A depolarizer should be placed after the sample so that the polarization will not affect the measurement.

- When performing reflectance measurements at angles greater than  $10^\circ$ , a polarizer should be placed before the sample to define s and p measurements and a depolarizer after the sample.
- When measuring the transmission at an angle other than normal to the surface of any electrically conductive material (such as a thin film), plane polarization will be introduced. A depolarizer should be placed after the sample.
- When performing polarimetry measurements to determine the concentration of optically active compounds, a polarizer should be used to control the polarization of the incident beam.
- When measuring anisotropic materials such as single crystals or liquid crystals, a polarizer should be used to control the polarization of the incident beam.

## The polarizing principle

A polarizer will transmit only one polarized component of an incident light beam, which can be characterized as having two oppositely polarized components. One Cary polarizer option is a Glan-Taylor polarizing prism, mounted in a stainless steel slide (5 x 7.5 cm) with vernier and dial.

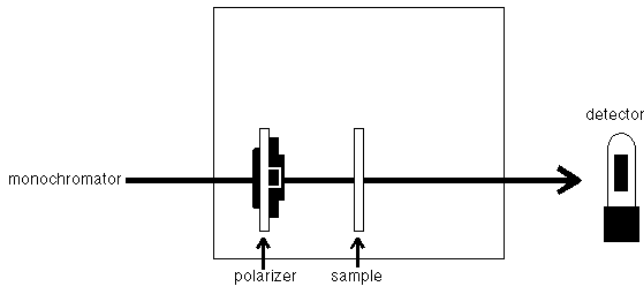
A depolarizer will transmit the polarized component of an incident light beam with minimum degree of plane polarization, converting any plane polarization to a mixture of polarizations.

The Cary depolarizer consists of two crystalline quartz wedges, one twice the thickness of the other. They are put together so that the crystal axes are at  $45^\circ$ . The depolarizer is neither wavelength sensitive, nor does it demonstrate a fast axis of deflect light. The depolarizer changes the plane polarization of the incident light into a polarization 'mixture' — the light passing through the depolarizer changes from parallel, through circular to perpendicular polarization many times over the area of the depolarizer. The light hitting the detector is thus a relatively non-uniform mixture of polarizations.

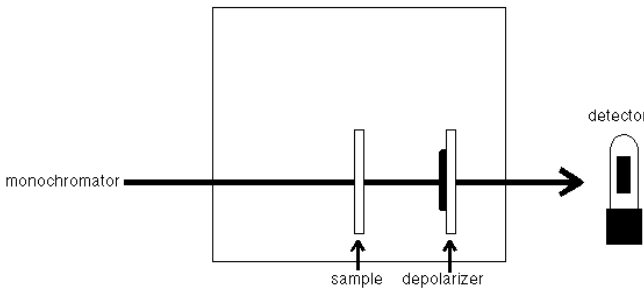
## Use of polarizers and depolarizers

Both the Glan-Taylor polarizer and the depolarizer can be placed anywhere in the light beam. Like the sample compartment windows, the effects on the beam imaging are small.

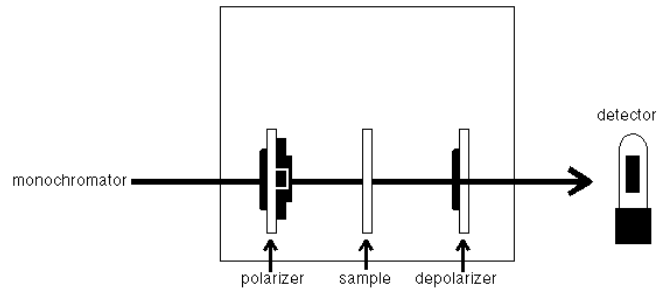
To control the plane of polarization of the incident light, the Glan-Taylor polarizer should be placed between the monochromator and the sample.



To remove any polarization caused by the sample before the light reaches the detector, a depolarizer should be placed between the sample and the detector.



The Glan-Taylor polarizer may be placed before the sample and the depolarizer after the sample. This will allow you to control the polarization of the beam incident on the sample while removing any polarization before the beam reaches the detector. Transmission measurements using an integrating sphere detector do not require the use of a depolarizer after the sample, as the integrating sphere removes polarization before the beam reaches the detector.



When using the depolarizer and/or the polarizer, a baseline should always be collected before measuring the sample.

## Specifications

### Glan-Taylor polarizer

Length to aperture ratio: 0.85–1.0

Wavelength range: 250–3000 nm

Angular polarized field\*: 8.5°

\* Symmetrical with respect to the prism axis at 360 nm

## UV-Vis-NIR Powder Cell Kit

Powder cell kits are used for diffuse reflectance spectroscopy (DRS). The powder cell is used to hold powder samples, or pastes, against the reflectance port of the internal or external DRA. The kit contains a prepacked PTFE cell, for use as a reflectance standard, and an empty powder cell holder for sample measurements. Each cell has a quartz window and for measurements across the 250–2500 nm wavelength range.

The powder cell holders accommodate a range of sample volumes. The large powder cell for the external DRA holds powder volumes from approximately 2 to 20 mL, while the small powder cell for the internal DRA can hold volumes from 0.2 to 2 mL dependent on the particle size and opacity.



### Features

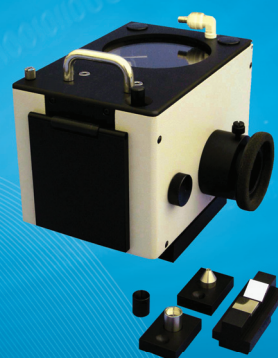
- Wavelength range: 250–2500 nm
- Minimum practical volume: 0.2 mL internal DRA, 2 mL external DRA
- Maximum volume: 2 mL internal DRA, 20 mL external DRA





# AGILENT PRAYING MANTIS ACCESSORY FOR THE CARY 4000/5000/6000i UV-VIS-NIR SPECTROPHOTOMETERS

The Measure of Confidence

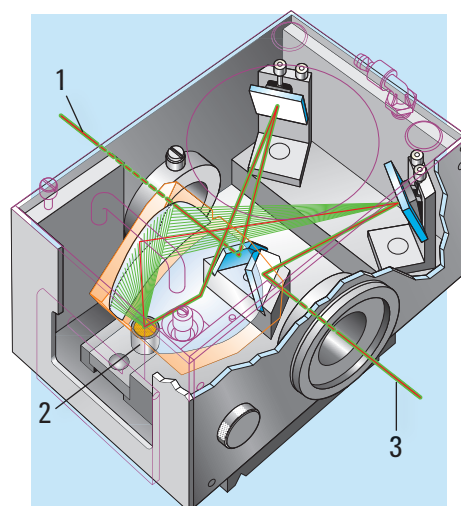


Easily measure diffuse reflectance over an extended wavelength range

The Praying Mantis is designed to measure diffuse reflectance of powder samples. Light is projected onto the horizontally positioned sample, and the two large elliptical mirrors positioned above the sample collect diffusely reflected light. The reflected light is then directed toward the instrument detector.

The Praying Mantis has several advantages over traditional integrating spheres:

- It is ideal for very small samples, as the image at the sample position is only 3 mm in diameter
- It can be used for samples that must be kept horizontal, such as powders, liquids or pastes
- The all-reflective optics of the Praying Mantis permit measurement over an extended wavelength range (dependent upon the type of instrument being used)
- The Praying Mantis can be used to perform experiments requiring controlled atmosphere, pressure and temperature environments



**Optical diagram of the Cary Praying Mantis accessory**

1. Incoming light
2. Sample cup
3. Outgoing light

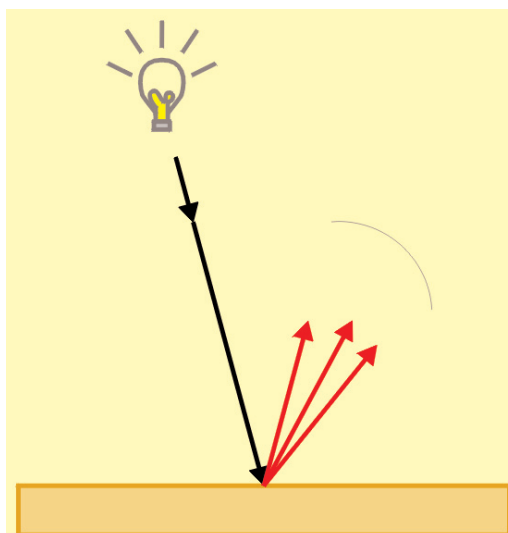
## Applications

The design of the Praying Mantis means that samples are presented horizontally, and there is a small image at the sample position. It is therefore ideal for use with small samples, as well as those that must be mounted horizontally.

Sample	Example measurement
Powders	Ore (mineral) composition, drug identification
Pastes, viscous liquids	Adhesives, foods, pharmaceuticals, tars
Solid surfaces	Polymer/composite coatings, paints, dyes and inks
Fabrics	Color, UV absorbance/reflectance properties
Forensic samples	Paint chips, drug residues, fabric sample

## Specifications

Instrument	Cary 4000/5000/6000i
Wavelength range	Equal to host instrument
Sample sizes (max)	
Diffuse microsampling cup	0.03 mL
Diffuse sampling cup	0.25 mL



Accessory schematic. Incident light (black) and diffuse reflection (red)

## Additional Accessories

Required	Extended sample compartment
Optional	Low Temperature, Reaction Chamber for pressure and temperature operation down to -150 °C (under vacuum) High Temperature, Reaction Chamber for pressure and temperature operation up to 910 °C Vacuum chamber for both accessories: 133 mPa (10 <sup>-6</sup> torr) to 133 kPa (1 ktorr)

# UV-Vis-NIR Rear Beam Attenuator (RBA)

The rear beam attenuator (RBA) provides continuous attenuation of the UV-Vis-NIR spectrophotometer's reference beam to extend its dynamic range and reduce noise at higher absorption levels. The motorized accessory mounts on the sample compartment wall and is driven from the Cary WinUV software.



## | Features

- Attenuates the rear beam from 0 to about 1.7 absorbance units for reduced noise and improved dynamic range
- Control of the stepper-motor-driven accessory via Cary WinUV software
- Accessory can be set for a nominated level of attenuation, a nominated photometric value, or a nominated angle (.1 step equals 1.8 degrees or about 0.01 absorbance units)

# UV-Vis-NIR Sample Transport Accessory

The sample transport accessory is a movable platform that positions samples in the sample compartment. Intended for the Cary 4000, 5000, 6000i, and 7000 instruments, the accessory is used to make photometric measurements at different positions along a sample, or for wavelength and time scans at selected sample positions.

The Cary WinUV software allows measurements at nominated positions along the sample transport, but not measurements as a function of distance.



## | Features

- 
- 0–160 mm distance range for the Cary 4000/5000/6000i/7000
  - Scanning rate 0–600 mm/min
  - ñ 0.2 mm positional accuracy for the Cary 4/5/400/500/500i/4000/5000/6000i
-

# Solid Sample Holder

for the Cary 4000, 5000, 6000i, or 7000  
UV-Vis-NIR spectrophotometers



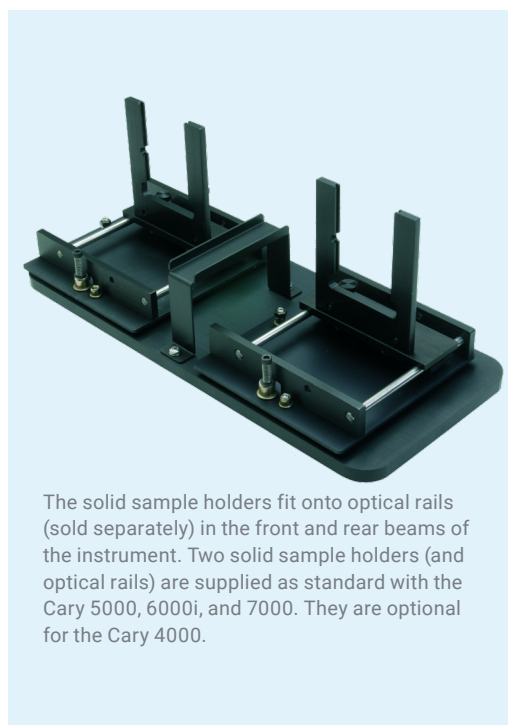
## Adapt your spectrophotometer for solid sample analysis

Agilent Cary UV-Vis-NIR solid sample holders are used for fixed position transmittance measurements of solid samples. They are ideal for measurements such as characterizing optical filters or detecting impurities in glass.

Several aperture masks are supplied with the holders to allow beam collimation and measurement of small samples. The holders suit many measurement configurations, catering for a wide variety of sample types and sizes.

The solid sample holder fits onto optical rails. The solid sample holder can slide along the rails (towards the sides of the sample compartment), allowing a range of sample thicknesses to be measured. Samples can be positioned anywhere along the beam. The sample holders can even be mounted in series along the optical rails.

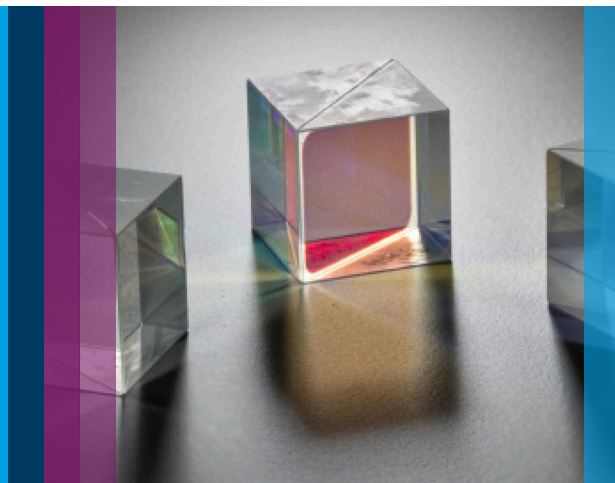
Optional polarizers, neutral density filters and additional apertures are available. Polarizers can be mounted against the sample compartment entrance windows and depolarizers can be mounted against the exit windows. The sample is then mounted in the centre of the sample compartment, using a solid sampler holder. A reference can be mounted on a second solid sample holder in the reference beam, or it can be left empty.



The solid sample holders fit onto optical rails (sold separately) in the front and rear beams of the instrument. Two solid sample holders (and optical rails) are supplied as standard with the Cary 5000, 6000i, and 7000. They are optional for the Cary 4000.

# Variable Angle Specular Reflectance Accessory (VASRA)

for the Cary 4000, 5000, 6000i, or 7000 UV-Vis-NIR spectrophotometers



## Automated variable angle specular reflectance measurements

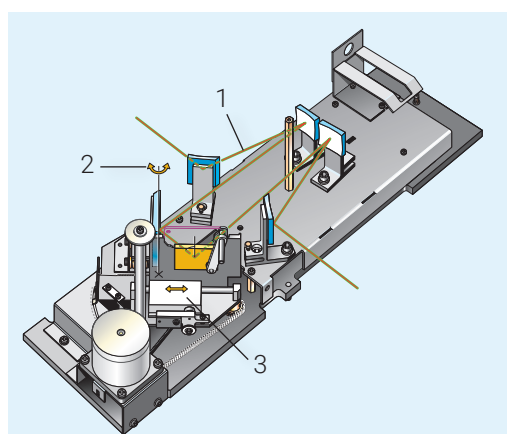
The Cary VASRA accessory can automatically measure the relative specular reflectance of a sample surface at angles of incidence between 20 to 70 degrees. It is easily installed in the sample compartment of a Cary 4000, 5000, 6000i, or 7000 instrument.

The accessory features:

- A translation stage that moves the sample as the angle changes, ensuring that the center of the light beam remains in the same position, regardless of the angle of incidence
- Sample mounting at the slit image position, so the width of the image can be changed to suit different samples, simply by selecting the appropriate spectral bandwidth (SBW) in the instrument software
- Several aperture masks (2, 10, and 20 mm, including a circular sample holder). This allows the size of the light spot or the masking size to be changed to suit the sample
- Automation, using the instrument software. You can program the measurements to be done at each angle

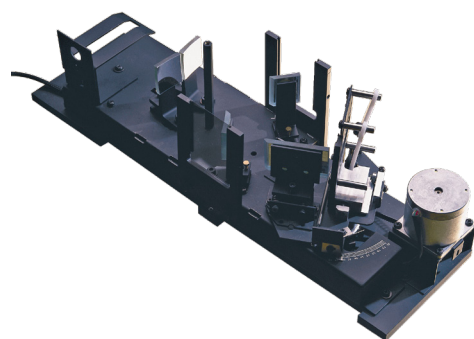
The Cary VASRA accurately measures the refractive index (RI) of lens coatings, anti-reflective coatings on glass, coated filters, and mirrors.

The accessory is supplied with a polymer film polarizer. The extended sample compartment accessory is required (sold separately). Optional accessories include a rear beam attenuator and a crystal Glan Taylor polarizer/depolarizer.



**Optical diagram of the Cary VASRA accessory**

1. Incoming light
2. Rotational sample stage
3. Translation stage



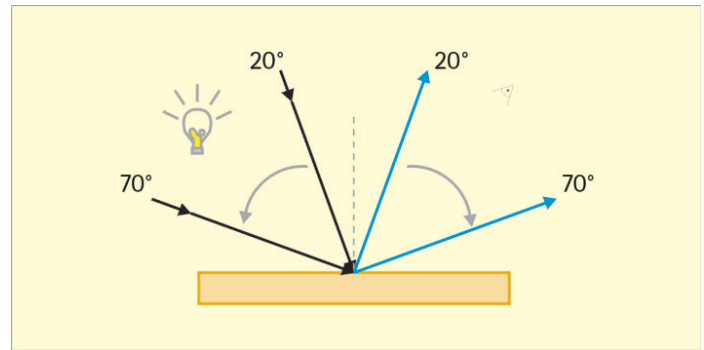
## Applications

The VASRA is ideal for measuring the reflectance of materials at various angles and wavelengths. Characterization of mirrors and determining the refractive index and thickness of thin films are common applications. The characterization of thin films for optical components is important in semiconductor, micro-machining, defense, materials, and other high technology applications.

Sample	Example Measurement
Anti-reflection Coatings	Refractive index and other optical constant determination
Glass	Defect analysis
Architectural Glass	Reflectance of light at varying angles
Paints/Coatings	Color at different viewing angles

## Specifications

<b>Polymer Film Polarizer</b>	400 nm to 700 nm range		
<b>Glan Taylor Polarizer</b>	350 nm to 2300 nm range		
<b>Sample Sizes (max)</b>			
<b>Angle</b>	<b>Length</b>	<b>Height</b>	<b>Thickness</b>
20	150	140	65 mm
45	235	140	53 mm
70	243	140	35 mm
<b>Maximum vertical ray divergence</b>	±2.2° (Maximum horizontal beam divergence: ±2.5°)		
<b>Angle of incidence</b>	20-70°		



The VASRA can measure the light reflected (blue) at angles of incidence between 20 to 70°. Incident light is shown in black.

# VW Absolute Specular Reflectance Accessory

for the Cary 4000, 5000, 6000i, or 7000 UV-Vis-NIR spectrophotometers



## High precision absolute specular reflectance measurements

The VW SRA is designed to measure the absolute specular reflectance of light from smooth solid materials at near normal incidence ( $7^\circ$ ).

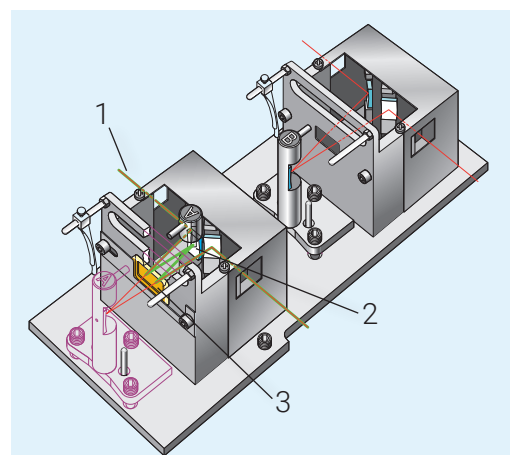
The minimum sample size is 25 mm diameter for two reflections and 12 mm diameter for a single reflection. The maximum sample size is 100 mm diameter.

"VW" describes the light path through the accessory in the reference and measurement positions. The design features a kinematically mounted spherical mirror, which is used for both calibration and sample measurement. With the exception of the sample, the same optical elements are always in the light path, providing a truly absolute reflectance measurement. Absolute measurements remove any need to correct results against standard reference materials.

The VW SRA optical design provides the functionality for:

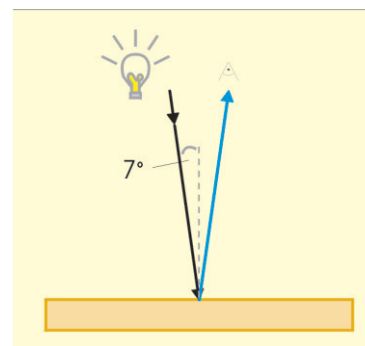
- Real time comparison of coated and uncoated substrates
- Reflectance, transmittance, and absorptance measurements of non-scattering transparent materials, without touching the sample
- Transmittance measurements of highly transparent films, using a double pass through the sample when in the "V" measurement position
- Single bounce reflectance measurement configuration for extreme antireflection coatings ( $< 0.1\%R$ )

The extended sample compartment (sold separately) is required for use with the VW SRA. An automated rear beam attenuator is optional (when measuring samples of very low reflectance).



**Optical diagram of the VW SRA accessory:**

1. Incident light
2. Movable spherical mirror
3. Sample



The accessory measures light reflected from a sample surface at a near-normal ( $7^\circ$ ) angle of incidence.



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