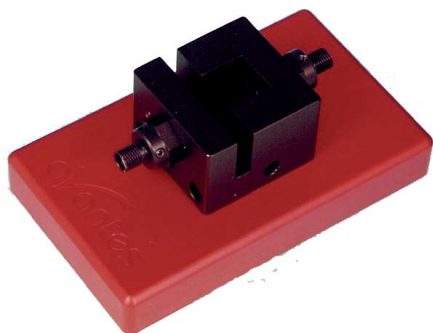# Cuvette Sample Holders

CUV- UV/VIS

The CUV-UV/VIS, CUV-FL-UV/VIS and CUV-ALL/UV/VIS are especially designed for absorption and fluorescence measurements and should be used with standard 10x10 mm cuvettes. For non-standard cuvettes, adjustable ball-detents ensure repeatable placement and measurements at the same location. All cuvette holders have a 5 mm wide slit to hold filters and a cover to prevent ambient light from entering the light path.

The CUV-UV/VIS features two COL-UV/VIS collimating lenses with adjustable focus to maximize light throughput.

CUV-ALL-UV/VIS

The CUV-FL-UV/VIS has the same specifications, but the collimating lenses are placed under an angle of 90 degrees for fluorescence measurements (to isolate excitation from emission wavelengths).

The other two ports on the CUV-FL-UV/VIS have SiO_2 coated aluminum mirrors (CUV-FL-MIRROR) to enhance the excitation and fluorescence signals.

The CUV-ALL-UV/VIS features four collimating lenses, all COL-UV/VIS, in two optical paths.

For UV measurement Avantes offers quartz cuvettes. The CUV-10-2 has two optical windows for absorption measurements. The CUV-10-4 features four optical windows, ideal for fluorescence with the CUV-FL-UV/VIS or dual path measurements with the CUV-ALL-UV/VIS.

Technical Data

	CUV-UV/VIS	CUV-FL-UV/VIS	CUV-ALL-UV/VIS
Cuvette Dimensions	10 x 10 mm (lightpath)		
Fiber connection	2 x COL-UV/VIS, SMA	2 x COL-UV/VIS, SMA, 2 mirrors	4 x COL-UV/VIS, SMA
Filter slot	Max 5 mm wide		
Overall dimensions	100 x 60 x 40 mm	100 x 100 x 40 mm	
Cover	Black anodized aluminum with black PE insert, 45 x 45 x 80 mm		

Ordering Information

CUV-UV/VIS	• Cuvette Holder, 10 mm path, incl. 2 UV/VIS/NIR lenses and cover
CUV-FL-UV/VIS	• Fluorescence Cuvette Holder, 10 mm path, incl. 2 UV/VIS/NIR lenses under 90° , 2 x SiO_2 coated aluminum mirrors and cover
CUV-ALL-UV/VIS	• Cuvette Holder 10 mm path, 2 beams, 4 x UV/VIS/NIR lenses and cover
CUV-FL-MIRROR	• SiO_2 coated aluminum mirror
CUV-10-2	• Quartz Cuvette 10 mm, 2 windows, 3.5 ml
CUV-10-4	• Quartz Cuvette 10 mm, 4 windows, 3.8 ml

Accessories

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Temperature-Controlled Cuvette Holders

For extra stability during demanding measurements such as fluorescence, Avantes offers the CUV-UV/VIS-TC, a temperature-controlled cuvette holder. The temperature can be set anywhere between -30°C and +105°C with an accuracy of 0.05°C.

Other features include magnetic stirring, slit attenuation kit and fused-silica lens systems with SMA fiber-optic connectors. It can be combined with any AvaLight light source or AvaSpec spectrometer to create a powerful measurement system.

The CUV-UV/VIS-TC is available in fluorescence, absorption or combined fluorescence/absorption configurations. A special direct-attached fluorescence configuration is available for coupling the Avalight-XE pulsed Xenon source for maximized fluorescence excitation energy.

Application areas enabled by the CUV-UV/VIS-TC series include DNA melting and annealing, protein thermodynamics, fluorophore characterization, enzyme kinetics and online thermocycling of biological particles.

CUV-UV/VIS-TC

Technical Data

Cuvette Dimensions	10 x 10 mm (lightpath)
Fiber connection	2 x COL-UV/VIS, SMA, 2 mirrors
Temperature control (Peltier)	-30ºC to +105ºC
TE control accuracy	± 0.05 ºC
Stirring	Variable speed magnetic stirring
Overall dimensions	100 x 100 x 40 mm
Control unit	TE controller unit and circulation pump

Ordering Information

CUV-UV/VIS-TC-ABS	• Temperature controlled cuvette holder absorbance Kit, includes sample compartment, Temperature-Controller, two QIL-UV imaging lenses, BATH 100 submersible pump, QSLITS optical slits, cover with access cap, tubing, cables and a stir bar
CUV-UV/VIS-TC-FL	• Temperature controlled cuvette holder fluorescence Kit, same as CUV-UV/VIS-TC-ABS but with two QIL-UV imaging lens assemblies and two QMP mirror plugs
CUV-UV/VIS-TC-ABS/FL	• Temperature controlled cuvette holder fluorescence & absorbance kit, same as CUV-UV/VIS-TC-ABS, but with two QIL-UV imaging lens assemblies, two QCL-UV collimating lens assemblies, and two QMP mirror plugs
CUV-UV/VIS-TC-AVXE	• Base plate and support with AR-coated fused silica lens pair for excitation using the Avalight-XE pulsed Xe light sources

Accessories

CUV-TC-QCL-UV	• Extra AR-coated UV/VIS collimating lens for CUV-UV/VIS-TC
CUV-TC-QIL-UV	• Extra AR-coated UV/VIS imaging lens for CUV-UV/VIS-TC
CUV-TC-QMP	• Spherical mirror plate with steering plate for CUV-UV/VIS-TC
CUV-TC-QFH	• Filter holder for CUV-UV/VIS-TC
CUV-10-4	• Quartz Cuvette 10 mm, 4 windows, 3.8 ml

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Direct-Attach Accessories

CUV-DA

CUV-ATT-DA

Avantes offers a wide range of high quality direct-attach accessories, such as cuvette holders, filter holders and attenuators for the AvaLight series of light sources. In the table below an overview of direct-attach accessories for each light source can be found. For more information, please take a look at the following pages.

The last column is a combination of the attenuator, the cuvette holder and the filter holder in one easy to attach device.

Ordering Information

Coupling to	Mounting	Round ½" Filter Holder	Cuvette Holder	Attenuator	Cuvette/ Filter Holder/ Attenuator
AvaLight-HAL-Mini	UNS thread	FH-DA-HAL-Mini	CUV-DA-HAL-Mini	ATT-DA-HAL-Mini	CUV-ATT-DA-HAL-Mini
AvaLight-DHS	Front plate	n/a	CUV-DA-DHS	n/a	n/a
AvaLight-DHc	SMA thread	FH-DA	CUV-DA	ATT-DA	CUV-ATT-DA
AvaLight-XE					
AvaLight-LED					
Fiber-optic	fiber	FH-INLINE	CUV-UV/VIS	ATT-INL-EXT	n/a

Accessories

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Direct-Attach Variable In-line Filter Holder

As part of the wide range of direct-attach accessories, Avantes offers the FH-DA series of filter holders. They can hold 0.5 inch filters of 1-8 mm thick.

The filter holders are equipped with a quartz collimating lens for the UV/VIS/NIR range. Avantes offers a wide range of round 12 mm filters.

The FH-DA is available in two versions: the FH-DA for the Avalight-XE, AvaLight-DHc and AvaLight-LED. The FH-DA-HAL is designed to work seamlessly with the AvaLight-HAL.

FH-DA

Technical Data

	FH-DA	FH-DA-HAL-Mini
Wavelength range	200-2500 nm	
Filter Dimensions	Round, 13 mm diameter, 1-8 mm thick	
Fiber connection	SMA-905 connector	
Light source	AvaLight-DHc/XE/LED	AvaLight-HAL-Mini
Light source mounting	SMA-905 thread	UNS thread (remove COL-UV/VIS)
Material	Black anodized aluminum	

Separate Round Filters

GL-WG305-12	Separate 12 x 3 mm long-pass filter > 305 nm
GL-KG3-12	Separate 12 x 3 mm band-pass filter, transparent > 325 nm and < 700 nm
GL-BG28-12	Separate 12 x 3 mm band-pass filter, transparent > 360 nm and < 500 nm
GL-GG395-12	Separate 12 x 3 mm long-pass filter > 395 nm
GL-GG475-12	Separate 12 x 3 mm long-pass filter > 475 nm
GL-OG515-12	Separate 12 x 3 mm long-pass filter > 515 nm
GL-OG550-12	Separate 12 x 3 mm long-pass filter > 550 nm
GL-NG9-1-12	Separate 12 x 1 mm Neutral Density filter, (transmission 10%, 400-1100 nm)
GL-NG9-2-12	Separate 12 x 2 mm Neutral Density filter, (transmission 1%, 400-1100 nm)
GL-NG9-3-12	Separate 12 x 3 mm Neutral Density filter, (transmission 0.1%, 400-1100 nm)

Ordering Information

FH-DA	• Direct-attach Filter Holder for 12 mm diameter filters, 1-8 mm thick, incl. one UV/VIS collimating lens.
FH-DA-HAL-Mini	• As FH-DA, meant for the AvaLight-HAL-Mini light source.

Direct-Attach Cuvette Holders

CUV-DA

To mount a cuvette holder directly to your light source, Avantes offers a range of direct-attached cuvette holders. The CUV-DA connects to the AvaLight-DHc, -XE and -(HP) LED light sources, the CUV-DA-DHS to the AvaLight-DHS and AvaLight-DHS-BAL and the CUV-DA-HAL to the AvaLight-HAL. These devices can be used for either absorbance or fluorescence measurements.

All CUV-DA cuvette holders feature two 90-degree and one 180-degree threads that allow the COL-UV/VIS collimating lens to be connected for absorbance or fluorescence setups. Each of CUV-DA series cuvette holders includes two SiO_2 aluminum mirrors to further enhance fluorescence signals. These are mounted at 90 degrees to the excitation source and emission output. The CUV-DA has a 5 mm wide filter slot.

For the AvaLight-HAL and the AvaLight-DHS the direct-attached cuvette holders can be mounted directly on the front panel of the light source by removing the standard filter holder.

Technical Data

	CUV-DA			CUV-DA-DHS	CUV-DA-HAL-Mini
Lightsource	AvaLight-DHc	AvaLight-(HP)LED	AvaLight-XE	AvaLight-DH-S	AvaLight-HAL-Mini
Wavelength range	200-2500 nm				
Cuvette Dimensions	10 x 10 mm (lightpath)				
Light source connection	SMA thread incl col. lens			Mounting plate	UNS-thread (remove COL-UV/VIS)
Fiber connection	1 x COL-UV/VIS, SMA-905 connectors				
Fluorescence mirrors	2 x SiO_2 coated aluminum mirrors				
Filter slit	Max. 5 mm wide				n.a.

Ordering Information

CUV-DA	• Direct-attach 10 mm cuvette holder for AvaLight-DHc/XE/LED, incl. COL-UV/VIS lens and 2 mirrors
CUV-DA-DHS	• Direct-attach 10 mm cuvette holder for AvaLight-D(H)-S, incl. COL-UV/VIS lens and 2 mirrors
CUV-DA-HAL-Mini	• Direct-attach 10 mm cuvette holder for AvaLight-HAL(S)-Mini, incl. COL-UV/VIS lens and 2 mirrors
CUV-FL-MIRROR	• SiO_2 coated aluminum mirror
CUV-10-4	• Quartz Cuvette 10 mm, 4 windows, 3.8 ml
CUV-COVER-DA	• Cover for CUV-DA and CUV-DA-HAL-Mini

Accessories

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Direct-Attach Fiber-Optic Attenuators

When light intensity has to be reduced, the direct-attached attenuator is a great choice with your AvaLight series light sources. The attenuator helps in situations where detector saturation is an issue. It is attached to the light source and has a SMA connector to couple to other measurement devices and your spectrometer.

The attenuation can be set from 0-100%, which can be fixed with a set screws. It is supplied with a UV/VIS/NIR collimating lens. The ATT-DA series attenuators come in two

versions: the ATT-DA is meant to be used with the AvaLight-DHc, the AvaLight-XE and AvaLight-LED. The ATT-DA-HAL is meant to be used with an AvaLight-HAL light source.

ATT-DA

Technical Data

	ATT-DA	ATT-DA-HAL-Mini
Wavelength range	200-2500 nm	
Attenuation	0-100%	
Iris aperture	0.0 – 12.0 mm	
Iris construction	2 x 5 leaves	
Fiber connection	SMA-905 connector	
Light source	AvaLight-DHc/XE/LED	AvaLight-HAL-Mini
Light source mounting	SMA-905 thread	UNS-thread (remove COL-UV/VIS)
Material	Black anodized aluminum	
Dimensions	27 mm round x 49 mm	37 x 41 x 57 mm

Ordering Information

ATT-DA	• Direct-attach Fiber-optic Attenuator, 0-100%, SMA connector
ATT-DA-HAL-Mini	• As ATT-DA, for AvaLight-HAL-Mini

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Cuvette Holders with Attenuator and Filter Holder

CUV-ATT-DA

Have the most flexible setup with the combined cuvette holder, attenuator and filter holder. You can control the light throughput from 0-100%, which can be fixed with a set screw. Use the cuvette holder for any cuvette up to 10x10 mm and add half inch diameter (12-13 mm) filters of 1-8 mm thick.

The combined direct-attached accessory is available in two versions: the CUV-ATT-DA is used with the AvaLight-DHc (Deuterium and Halogen), AvaLight-XE (Xenon) and AvaLight-LED. The CUV-ATT-DA-HAL is meant for the AvaLight-HAL (Halogen) light source.

Technical Data

	CUV-ATT-DA	CUV-ATT-DA-HAL-Mini
Wavelength range	200-2500 nm	
Cuvette Dimensions	10 x 10 mm (lightpath)	
Attenuation	0-100%	
Filter slit	Max 5 mm wide	
Fiber connection	SMA-905 connector	
Fluorescence mirrors	2 x SiO_2 coated aluminum mirrors	
Light source	AvaLight-DHc/XE/LED	AvaLight-HAL-Mini
Light source mounting	SMA-905 thread	UNS-thread (remove COL-UV/VIS)
Material	Black anodized aluminum	

Ordering Information

CUV-ATT-DA	• Combined direct-attach Fiber-optic Attenuator, Filter Holder and Cuvette Holder, SMA connector
CUV-ATT-DA-HAL-Mini	• As CUV-ATT-DA, but for AvaLight-HAL-Mini light source
CUV-COVER-DA	• Cover for DA cuvette holders

Accessories

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Variable In-Line Filter Holders

When an in-line filter is needed, Avantes offers two types of in-line filter holders: the FH-INLINE-1" and the FH-INLINE. The FH-INLINE-1" is designed to hold one inch filters from 1-60 mm thick. The FH-INLINE is designed for 1/2" or 12-13 mm filters of 1-8 mm thick.

Both in-line filter holders come with two quartz collimating lenses for the UV/VIS/NIR range. Avantes offers a wide range of round 12 mm filters (for FH-INLINE). For more specifications please see the table below.

FH-INLINE-1"

FH-INLINE

Technical Data

	FH-INLINE	FH-INLINE-1"
Wavelength range	200-2500 nm	
Filter Dimensions	Round, 12-13 mm diameter, 1-8 mm thick	Round, max 1 inch (25.4 mm) diameter, 1-60 mm thick
Fiber connection	2 SMA-905 connectors	
Material	Black anodized aluminum	
Dimensions	round 20 x 50 mm	81 x 41 x 51 mm

Separate Round Filters

GL-WG305-12	Separate 12 x 3 mm long-pass filter > 305 nm
GL-KG3-12	Separate 12 x 3 mm band-pass filter, transparent > 325 nm and < 700 nm
GL-BG28-12	Separate 12 x 3 mm band-pass filter, transparent > 360 nm and < 500 nm
GL-GG395-12	Separate 12 x 3 mm long-pass filter > 395 nm
GL-GG475-12	Separate 12 x 3 mm long-pass filter > 475 nm
GL-OG515-12	Separate 12 x 3 mm long-pass filter > 515 nm
GL-OG550-12	Separate 12 x 3 mm long-pass filter > 550 nm
GL-NG9-1-12	Separate 12 x 1 mm Neutral Density filter, (transmission 10%, 400-1100 nm)
GL-NG9-2-12	Separate 12 x 2 mm Neutral Density filter, (transmission 1%, 400-1100 nm)
GL-NG9-3-12	Separate 12 x 3 mm Neutral Density filter, (transmission 0.1%, 400-1100 nm)

Ordering Information

FH-INLINE	• In-line filter holder for 12-13 mm diameter filters 1-8 mm thick, incl. UV/VIS collimating lenses and SMA connectors
FH-INLINE-1"	• In-line filter holder for 1" filters, max 60 mm optical path, incl. 2 collimating lenses and SMA connectors

In-Line Fiber-Optic Attenuators

ATT-INL-EXT

For all UV-VIS-NIR applications and ATT-INL-EXT setups where light intensity has to be reduced, Avantes offers the inline fiber-optic attenuator (ATT-INL-EXT) and the direct attached fiber-optic attenuator (ATTDA). This device is an iris attenuator which controls light throughput to avoid detector saturation. The ATT-INL-EXT is coupled between two SMA terminated fiber-optic cables, whereas the ATT-DA can be connected directly to the light source. Both devices consist of two UV/VIS/NIR collimating lenses mounted on either side of an adjustable iris. The attenuation can be set from 0-100% and can be fixed with a set screw.

Technical Data

Wavelength range	200-2500 nm
Attenuation	0-100%
Iris aperture	0.0 – 12.0 mm
Iris construction	2 x 5 leaves
Fiber connection	2 SMA-905 connectors, incl. 2 COL-UV/VIS collimating lenses
Material	Black anodized aluminum
Dimensions	60 x Ø 25 mm

Ordering Information

ATT-INL-EXT	• In-line Fiber-optic Attenuator, 0-100%, SMA connectors

Variable Pathlength Cuvette Holders

CUV-VAR-UV/VIS
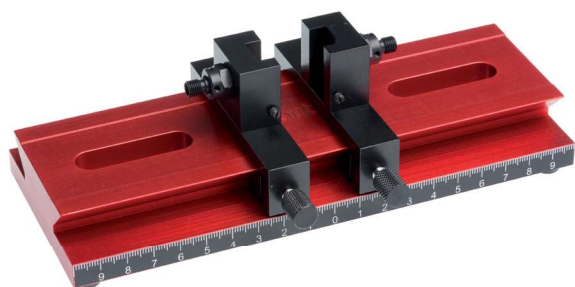
For low absorption measurements and flow cell cuvettes, the CUV-VAR-UV/VIS cuvette holder is the ideal solution.

It features a variable, adjustable path length, ranging from 10-160 mm, ensuring maximum flexibility. It can be used as a standard cuvette holder with a 10 mm path length, as a filter holder with 2 mm path length or any path length up to 160 mm.

This item is equipped with two COL-UV/VIS collimating lenses to support applications in the 200-2500 nm wavelength range.

Technical Data

Base Dimensions (L x W x H)	200 x 80 x 25 mm
Fiber connection	2 x COL-UV/VIS, SMA connectors
Optical path	10-160 mm
Cuvette holder insert	Minimal optical path 10 mm.
Focal height	15 mm from base plate
Overall dimensions (L x W x H)	200 x 96 x 62 mm

Ordering Information

CUV-VAR-UV/VIS	• Cuvette Holder with variable 10-160 mm path, incl. 2 COL-UV/VIS collimating lenses

Accessories

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Integrating Spheres

An integrating sphere works as a light collector. The light collected can be used as a diffuse illumination or measurement source. The basic principle is that light enters the sphere through the sample port, goes through multiple reflections on the highly reflective, Lambertian surface of the sphere and is scattered uniformly around the interior of the sphere. Behind a baffled port inside the sphere which is independent of the angular properties of the sample port, a fiber-optic cable collects a homogenized light signal and carries it to the spectrometer. The baffle is very significant as it prevents first reflections from entering the detection fiber.

The AvaSphere series integrating spheres are available with active diameters of 30, 50 and 80 mm and an SMA port at 90 degrees for collecting the irradiance and reflection signals. The reflection spheres feature an additional SMA-connector port at 8 degrees from normal (from sample port) for direct illumination. This port couples external light into the sphere through a fiber-optic cable connected to a COL-UV/VIS collimating lens. The sample port diameters are 6 mm for the AvaSphere-30, 10 mm for the AvaSphere-50 and 15 mm for the AvaSphere-80.

All sample ports are knife-edge, ensuring a near 180 degree field of view of the sample port. The irradiance version of the integrating sphere can be used for measurements of light sources, such as lasers, LEDs and incandescent sources.

For irradiance measurements of 5 mm cylindrical LEDs, a special adapter is available for the AvaSphere-50/80-IRRAD. This adapter ensures correct and reproducible positioning of the LEDs inside the sphere.

The AvaSphere reflection version is used for the measurement of total integrated reflectance of a surface, as well as for color measurements and fluorescence spectroscopy on solids/powders. The principle of measurement is based on direct illumination and indirect reflection.
The AvaSphere-50-LS-HAL with internal light source can be a used as a uniform source and is available with an intensity calibration file.

The inside of the integrating spheres is made of a highly reflective diffuse PTFE material. This provides over 96% reflectance over a wide wavelength range of 250-2500 nm. For the AvaSphere-50-REFL a special black gloss-trap is available to exclude specular reflection in the measurement. Please order this option when ordering the sphere. In case specular reflection needs to be included, a white reflective part, which is standard on all AvaSphere-50-REFL, can be mounted in the position of the gloss-trap.

AvaSphere-30-REFL
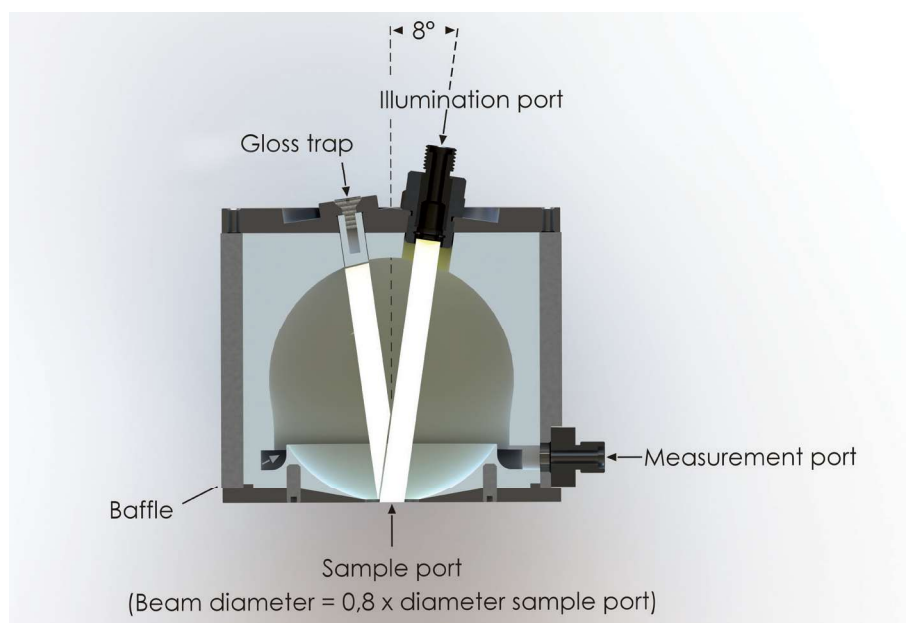
Reflection Integrating Sphere Drawing for AvaSphere-50-REFL

Reflectance Factor ODM
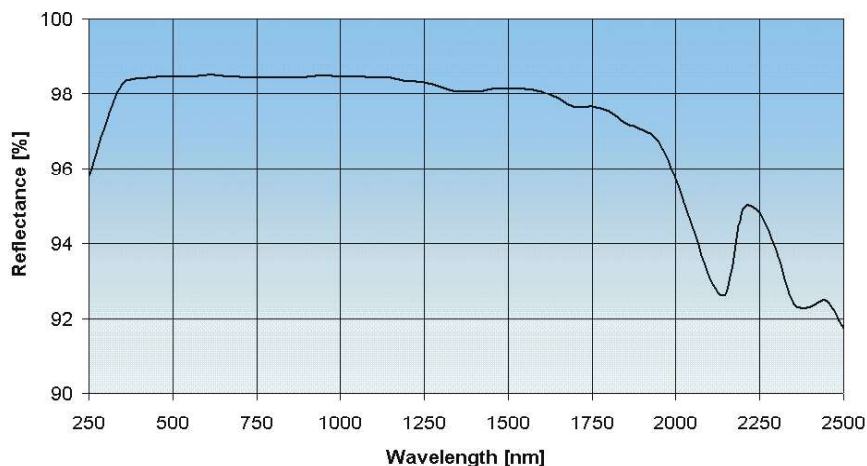
Reflection Curve AvaSphere

Technical Data

	AvaSphere-30	AvaSphere-50	AvaSphere-80
Internal diameter (mm)	30	50	80
Sample port diameter (mm)	6	10	15
External Dimensions	59.5 mm diameter 40 mm height	69.5 mm diameter 60 mm height	109 mm diameter 95 mm height

Ordering Information

AvaSphere-30-IRRAD	• Integrating Sphere 30 mm for light measurements (250-2500 nm), Sample-port 6 mm
AvaSphere-50-IRRAD	• Integrating Sphere 50 mm, Sample-port 10 mm
AvaSphere-80-IRRAD	• Integrating Sphere 80 mm, Sample-port 15 mm
AvaSphere-30-REFL	• Integrating Sphere 30 mm for reflection (250-2500 nm), Sample-port 6 mm, 2 SMA port
AvaSphere-50-REFL	• Integrating Sphere 50 mm for reflection, Sample-port 10 mm
AvaSphere-80-REFL	• Integrating Sphere 80 mm for reflection, Sample-port 15 mm
AvaSphere-50-LS-HAL-12V	• Integrating Sphere 50 mm for reflection, built-in halogen light source, sample-port 10 mm
AvaSphere-LED-ADR	• Cylindrical Adapter to hold 3, 5, 8 mm LED's inside the AvaSphere-50-IRRAD
AvaSphere-LED-ADR-80	• As AvaSphere-LED-ADR, but for AvaSphere-80-IRRAD
AvaSphere-GT50	• Optional Gloss-trap for AvaSphere-50-REFL, coated with black absorbing material. Only in combination with AvaSphere-50-REFL.
AvaSphere-GT50-W	• Gloss-trap coated with white material to include specular reflection. Standard included in AvaSphere-50-REFL.
AvaSphere-50-HOLD	• WS-2 (-GEM) Tile holder for AvaSphere-50-REFL/LS-HAL-12V
AvaSphere-COL-PLUG-W	• Optional replacement for collimating lens on top of AvaSphere-50-REFL to realise IRRAD functionality.

Accessories

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Integrating Spheres with Internal Halogen Light Source

Providing up to 160 times more light on your sample for a reflection measurement relative to our standard reflectance integrating sphere, the AvaSphere-50-LS-HAL-12V is a valuable instrument for reflection applications. It is a combination of an integrating sphere and a halogen light source. The sphere provides diffused halogen light on your sample without the losses associated with fiber-optic coupling. It has a direct collimated SMA-port for collection of the reflection signal with any of our AvaSpec spectrometers.

It's mostly useful for dark or low reflecting materials and NIR spectral measurements

where signal strength can be limited. It is also very useful for measuring gem stones. In the application section of this catalog a complete gemology setup can be found.

The AvaSphere-50-LS-HAL-12V has an internal diameter of 50 mm, a sample port of 10 mm and an SMA terminated reference port. The 5W halogen lamp is stabilized and cooled with forced airflow. A 12V power supply is included.

The switch line makes it possible to remotely switch the lighsource on/off with a TTL signal.

AvaSphere-50-LS-HAL-12V

Technical Data

Wavelength range	360-2500 nm
Internal diameter	50 mm
Sample port diameter	10 mm
Color temperature	2850 K
Stability/Drift	< 0.1% / h
Bulb life	4.000 hrs
Power requirement	12VDC, 1A

Ordering Information

AvaSphere-50-LS-HAL-12V	• Integrating sphere 50 mm for reflection (360-2500 nm), including 5W halogen lightsource, sample port 10 mm diam., 2 SMA ports (reflection and reference) and 12V power supply.
AvaLight-HAL-B-5W	• Replacement 5W halogen bulb for AvaSphere-50-LS-HAL-12V
IC-DB26-AvaSphere-0,5	• Interface cable to control switchline with AvaSpec
AvaSphere-50-HOLD	• WS-2(-GEM) tile holder for AvaSphere-50-LS-HAL-12V for gemology applications

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Large Integrating Spheres

For measurement of high powered LEDs and sources, Avantes offers the AvaSphere-100, -150 and -200. The number corresponds with the internal diameter of the spheres in millimeters.

The 100, 150 and 200 models come with three ports: at 0, 90 degrees and NP. The port of your choice is fitted with a baffled SMA-905 connector, please specify when ordering. Either of the other two ports can be used for illumination or sampling. The default sample port sizes are typically 25% of the sphere's diameter. Port plugs or reducers are available on request.

All spheres can be attached to spectrometers via fiber-optic cables and the entire system can be irradiance calibrated to measure total flux of a lamp under test.

Technical Data

	AvaSphere-100	AvaSphere-150	AvaSphere-200
Wavelength range	400-1100 nm	400-1100 nm	400-1100 nm
Internal diameter	102 mm	152 mm	203 mm
Port diameters	25.4 mm	38.1 mm	50.8 mm
Port Reducers	10 mm	10 mm	10 mm
External Dimensions	118 mm	168 mm	218 mm

Ordering Information

AvaSphere-100	• Integrating Sphere, 100 mm, 3 ports (0,90,NP), 1baffled SMA port, incl. Postmount
AvaSphere-100-SMA	• Additional SMA port for the AvaSphere-100
AvaSphere-100-PR10	• Port reducer for the AvaSphere-100 to 10 mm
AvaSphere-100-PP	• Port plug for unused ports for the AvaSphere-100
AvaSphere-150	• Integrating Sphere, 150 mm, 3 ports (0,90,NP), 1baffled SMA port, incl. Postmount
AvaSphere-150-SMA	• Additional SMA port for the AvaSphere-150
AvaSphere-150-PR10	• Port reducer for the AvaSphere-150 to 10 mm
AvaSphere-150-PP	• Port plug for unused ports for the AvaSphere-150
AvaSphere-200	• Integrating Sphere, 200 mm, 3 ports (0,90,NP), 1baffled SMA port, incl. Postmount
AvaSphere-200-SMA	• Additional SMA port for the AvaSphere-200
AvaSphere-200-PR10	• Port reducer for the AvaSphere-200 to 10 mm
AvaSphere-200-PP	• Port plug for unused ports for the AvaSphere-200

Accessories

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Variable Collimating Lens Holders

For transmission measurements of samples of various sizes and thicknesses, the variable collimating lens holder is the perfect tool. The vertical bars can be adjusted to samples up to 160 mm thick. The base is made of anodized aluminum and features adjustable mount bars. Each bar has four 3/8"-24 threaded holes for COL-UV/VIS collimating

lenses. Adjusting the bars is easy, simply loosen the screws and slide.

Two COL-UV/VIS collimating lenses are included with the variable collimating lens holder.

CLH-VAR-UV/VIS
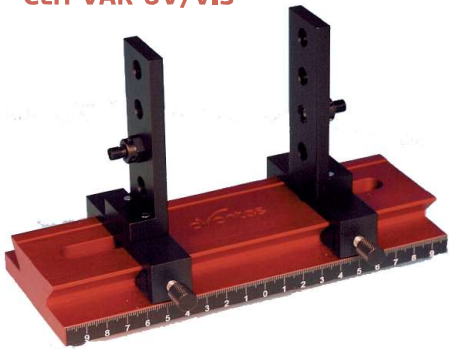
Technical Data

	Base	Mounting bars
Dimensions	200 x 80 x 25 mm, total height 120 mm	35 x 7 mm thick
Threads	n.a.	4 holes 3/8"-24, 20 mm apart
Collimating Lenses	n.a.	2 COL-UV/VIS

Ordering Information

CLH-VAR-UV/VIS	• Variable Collimating Lens Holder, including 2 COL-UV/VIS lenses

For the latest product information and other updates, go to www.avantes.com.

AvaTripod

AvaTripod

The AvaTripod is a flexible and versatile accessory, which is useable in various applications.

The top of the tripod has an attachment head which features two holes; one measuring 6.8 mm in diameter to hold the barrel of a cosine corrector (CC-UV/VIS) or a reflection probe and a setscrew to hold the probe or cosine corrector in place.

The second hole is a 3/8"-24 threaded hole for a COL-UV/VIS collimating lens.

The head can be fixed at any position, at any angle with an adjustable height of 200-300 mm.

Technical Data

Dimensions	250 x 250 x 300 mm Max 75 x 75 x 200 mm (folded)
Threads	1 hole $^3/_8$"-24 for COL-UV/VIS collimating lens 1 hole 6.8 mm diameter with setscrew for FCR probes and cosine correctors
Height adjustment	200-300 mm

Ordering Information

AvaTripod	• Tripod with COL-UV/VIS thread and 6.8 mm hole for FCR and CC-UV/VIS

AvaTrigger External Trigger Box

AvaTrigger

We made it smaller and more sensitive… Introducing the new AvaTrigger. Designed for use with any AvaSpec-USB2 spectrometer, it enables two different external triggering methods: optical and manual.

The optical trigger is useful for measuring pulsed light sources, such as solar simulations. Your Avantes spectrometer can start integrating within 1.5 microseconds after receiving the signal from the AvaTrigger. Alternatively, you can specify a delay time if you are interested in measuring spectral output against time (temporal stability). The AvaTrigger has an SMA-905 connector

to easily couple with any accessory or light source from Avantes' extensive line-up.

The sensitivity of the optotrigger can be adjusted by a potentiometer at the front. A green indicator LED on the front panel of the AvaTrigger shows a short pulse when a TTL pulse is sent to your spectrometer.

The IC-DB26-2 interface cable required to connect the AvaTrigger with your Avantes spectrometer is included in the box.

Technical Data

	Opto	Pushbutton
Trigger Input	Opto	Pushbutton
Internal Delay time to TTL output	Ca. 300 ns*	20 µsec
Minimal pulse duration Trigger in	10 µsec	
Power consumption	5 mA @ 5VDC (internal)	
IO connector to AvaSpec	Pin 3 (5VDC), Pin 4 (hardware trigger to AvaSpec), pin 8 (enable trigger), pin 10 GND	
Dimensions	75 x 78 x 37 mm	
Weight	260 g	

*depending on the slew rate of the light source

Ordering Information

AvaTrigger-USB2	• External trigger source for all AvaSpec-USB2/EVO spectrometers, incl. IC-DB26-2

Accessories

Fiber-Optic Switch (FOS-2-INL)

Avantes' fiber-optic switch (FOS) is the ideal accessory to correct light source drift.

This FOS is operated electronically via TTL signals from an external source or one of our AvaSpec spectrometers. TTL signals can be provided either by an external device or by an AvaSpec spectrometer connected via an interface cable (IC-DB-xxx, see ordering information below).

The FOS is coupled in the optical paths between SMA-terminated fibers and features four COL-UV/VIS collimating lenses (UV/VIS/NIR).

Both light paths can be controlled independently via the two TTL signals.

The industrial-graded shutter motors inside support heavy usage of the instrument. With its 5 million cycles, 24/7 operation is supported in most cases.

To operate the FOS, a PS-12V/2.08A power supply and interface cable are required (ordered separately).

FOS-2-INL

Technical Data

Wavelength range	200 - 2500 nm
Fiber connection	4 SMA-905 connectors, incl. 4 COL-UV/VIS collimating lenses
Shutter frequency	Max. 5 Hz
Shutter delay	15 ms
Shutter attenuation	-1.0 dB*
Material	Black anodized aluminum
Dimensions	34 x 58 x 45 mm
Lifetime shutter	5,000,000 cycles (typical)
Power	12V DC/500 mA

*Attenuation is measured using 600 µm core fibers.

Ordering Information

FOS-2-INL	• In-line fiber-optic switch, 2 independently controlled optical paths. Includes 4 COL-UV/VIS collimating lenses. Needs 12V powersupply and interface cable (not included)
IC-DB26-FOS-SHUTTER-0.6	• Interface cable from AvaSpec-EVO platform to FOS, 0.6 m
IC-DB26-FOS-SHUTTER-2.0	• Interface cable from AvaSpec-EVO platform to FOS, 2 m
PS-12V/2.08A	• Power supply 12V DC, 2.08A, necessary to operate FOS

We offer three years limited warranty on all Avantes spectrometers, light sources (excl. bulbs) and accessories.

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Direct-Attach Shutter

DA-Shutter

For accurate results during a transmission, absorption, reflection, irradiance or color measurement at different integration times, a good dark measurement is necessary. Taking this dark measurement often leads to having to undertake manual actions, like covering the sensor or switching off the light. This might prove to be problematic with certain applications because of the time and place or operator restraints.

Our solution: a remote-controlled shutter, positioned between the spectrometer entrance and the input fiber.

Avantes' direct-attach shutter is the ideal accessory to facilitate automatic shuttering of a spectrometer. This shutter is operated via TTL pulses from either an external source or an AvaSpec spectrometer through a cable

(IC-DB26-AS-SHUTTER-0.6, to be ordered separately).

The DA-Shutter switch unit is directly attached to the spectrometer's SMA input connector. The fiber that is normally connected to the spectrometer is then connected to the DA-Shutter. This switch unit, as well as the power source and TTL control signal, is connected to the control box.

The industrial-graded shutter motor used inside will support heavy usage of the instrument. With its 5,000,000 cycles, 24/7 operation is supported in most cases.

To operate the DA-Shutter, a PS-12V/2.08A 12 volt DC power adapter is required (to be ordered separately).

Technical Data

Wavelength range	200-2500 nm
Fiber connection	SMA-905 connector
Spectrometer connection	SMA-905 connector (female)
Shutter frequency	Max. 5 Hz
Shutter delay	15 ms
Attenuation/amplification DA-Shutter	+0.6 dB (AvaSpec HSC/HERO), -1.5 dB (AvaSpec HSC/NIR)*, +0.6 dB (AvaSpec-ULS/Mini)
Material	Black anodized aluminum
Dimensions switch unit (DxH)	30 x 38 mm
Dimensions control box (HxLxW)	28 x 58 x 45 mm
Power	12V DC/500 mA
Lifetime shutter	5,000,000 cycles (typical)

*Attennuation is measured using 600 μm core fibers

Ordering Information

DA-Shutter	• Direct-attach shutter, one optical path, including control box. Needs 12V power supply and interface cable (not included)
IC-DB26-DA-AS-SHUTTER-0.6	• Interface cable for AvaSpec-EVO platform to DA-Shutter, 0.6 m
IC-DB26-DA-AS-SHUTTER-2	• Interface cable for AvaSpec-EVO platform to DA-Shutter, 2 m
PS-12V/2.08A	• Power supply 12 VDC, 2.08 A, necessary for DA-Shutter

Accessories

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Fiber-Optic Multiplexer (FOM)

To configure systems which enable a single light source and spectrometer to make multi-point serial measurements, Avantes offers the FOM fiber-optic multiplexer. The device is available in three different configurations: 1 input to 16 outputs, 2 inputs to 8 outputs or 4 inputs to 4 outputs. The FOM consists of a precisely controlled stepper motor and a rotary block. The optical path is coupled through multiple COL-UV/VIS collimating lenses.

The fiber-optic multiplexer is controlled via a USB-connection to a PC. The FOM software enables full control over the switching order, switching time and delay time and operates as a stand-alone unit. To integrate the FOM with AvaSpec spectrometers and your own devices the FOM-DLL software development kit is available and should be ordered separately.

Applications for the FOM include process control, where multiple locations need to be measured with multiple probes, all with one spectrometer and/or light source.

FOM-UVIR400-2x8

Technical Data

	FOM-UVIR400-1x16	FOM-UVIR400-2x8	FOM-UVIR400-4x4
Multiplex Channels	1 x 16	2 x 8	4 x 4
Optical Throughput	> 60 % (based on 400 µm fibers)		
Wavelength Range	200-2500 nm (UV/VIS/NIR)		
Fibers	Standard max. 400 µm, different dimensions available on request		
Connectors	All SMA-905		
Optical Repeatability	> 99%		
Switching Time	< 60 ms between adjacent positions		
Interface	USB 2.0		
Power Requirement	100-230 VAC, 60VA		
Dimensions	244 x 144 x 354 mm		

Ordering Information

FOM-UVIR400-1x16	• Fiber-optic Multiplexer, 1 x 16 channels, 400 µm fibers
FOM-UVIR400-2x8	• Fiber-optic Multiplexer, 2 x 8 channels, 400 µm fibers
FOM-UVIR400-4x4	• Fiber-optic Multiplexer, 4 x 4 channels, 400 µm fibers

Options

FOM-DLL	• Interface DLL package for Fiber-optic Multiplexer (FOM-UVIR400-1x16 and FOM-UVIR400-2x8, and FOM-UVIR400-4x4) for Windows

Direct-attach Beam Splitter/Combiner

The Beam Splitter gives you a flexible option for using dual light sources or spectrometers. The small size of the beam splitter allows it to directly mount to the front of any AvaSpec spectrometer or AvaLight lightsource, eliminating the fiber interface. Another advantage is that your existing systems can be easily upgraded to a two channel system. Being highly adaptable, the Beam Splitter enables easy measurement of two different applications at the same time (for example a fluorescence and a absorption measurement).

Technical Data

Wavelength range	250-2000nm
Throughput	Ca. 25%
Temperature range	0-40 C
Switching time open	15 ms
Switching time close	30 ms
Maximum frequency	10 Hz
Power supply	5VDC, 0.3A (max power 1.5W)
Fiber connection	SMA-905 connector
Material mechanical	Black anodized aluminum
Material optical	UV Fused silica
Dimensions (LxWxH)	44 x 34 x 63 mm *
Weight	184 grams

* Exclusive COL-UV/VIS and I/O connector

Ordering Information

BSC-DA	• Direct-Attach Beam Splitter / Combiner, includes IC-DB26-BEAM-0.6 (0.6 m interface cable), needs extra PS-5V / 1.1 A power supply
IC-DB26-BEAM-2	• Interface cable (2 meters long)

Accessories

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In-Line Flow Cells

For in-line absorbance or fluorescence measurements, Avantes offers the in-line flow cells. They are available for tubing diameters of 1/4, 1/2 and 1 inch. The flow cells consist of Swagelok union cross tube fittings and two UV/VIS/NIR collimating lenses.

The optical path depends on the size of the flow cell: the 1/4" version has an optical path of 5 mm, the 1/2" of 10 mm and the 1" version 20 mm. They feature SMA-905 connectors for easy coupling to any of our wide range of fiber-optic cables or bundles

All flow cells come with variable focusing to optimize light throughput over the spectral range.

All flow cells are also available in high temperature configurations (up to 200°C). Special flow cells for gasses and liquids are also available and are designed to withstand pressures up to 100 bar.

Technical Data

	¼" flow cell	½" flow cell	1" flow cell
Optical path	5 mm	10 mm	20 mm
Sample volume	62 µl	124 µl	248 µl
Wavelength range	200-2500 nm		
Fiber connection	2 x SMA-905 connectors		
Collimating optics	Plano Convex, focal length 8.7 mm		
Max. Temperature	80°C (HT version till 200°C available on request)		
Max. Pressure	10 bar (Special Gasflowcell up to 100 bar)		
Material	Stainless steel for the fitting, black anodized aluminum for the SMA-905 connectors		
Overall dimensions	55 x 45 x 15 mm	72 x 50 x 22 mm	98 x 60 x 38 mm

## Ordering Information

Flowcell-1/4"	• Flow cell ¼" with variable SMA adapter, 5 mm path length, incl. 2 UV/VIS/NIR lenses
Flowcell-1/2"	• Flow cell ½" with variable SMA adapter, 10 mm path length, incl. 2 UV/VIS/NIR lenses
Flowcell-1"	• Flow cell 1" with variable SMA adapter, 20 mm path length, incl. 2 UV/VIS/NIR lenses
Flowcell-1/4"-FL	• Fluorescence Flow cell ¼" with 2 SMA adapters, incl. 1 UV/VIS/NIR lens
Flowcell-1/4"-5-HPHT	• Flow cell for gasses and liquids, ¼", 5 mm optical path length with SMA adapter, including 2 UV/VIS/NIR lenses, high pressure 100 bar, high temp 200°C.
Flowcell-1/4"-50-HPHT	• Flow cell for gasses and liquids, ¼", 50 mm optical path length with SMA adapter, including 2 UV/VIS/NIR lenses, high pressure 100 bar, high temp 200°C.

Option

-HT	• High temperatures up to 200°C

Micro Flow Cells

Micro flow Z-cell
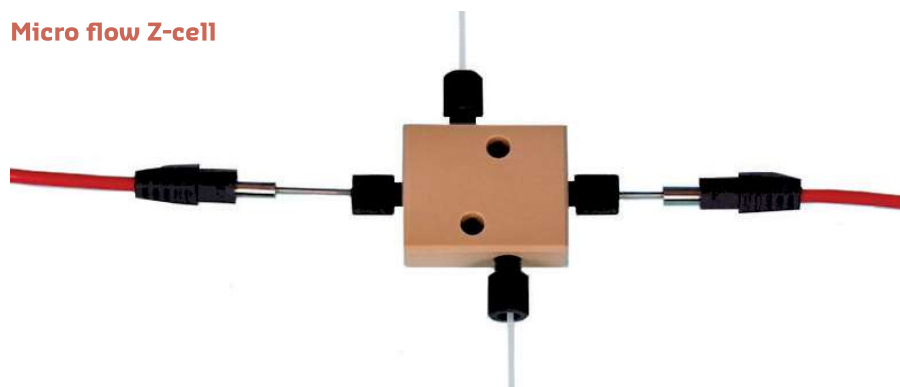
For in-line measurements of low liquid volumes, Avantes offers our micro flow cells. The micro flow cells feature a Z-design and can easily be coupled to 1.5 mm PTFE tubing with 0.5 mm inner diameter. Typically these are used for absorption measurements and HPLC applications. Two special fiber-optic cables (FC part number terminating in FIA)are required for coupling with these micro flow cells. The special fiber-optic cable is the window for these flow cells.

Technical Data

Flow Cell Type	Micro flow Z-cell -10	Micro flow cell -1.5
Wavelength Range	200-2500 nm	
Optical path length	10 mm	1.5 mm
Sample volume	18 µl	3 µl
Tubing OD connection	1.5 mm (1/16")	
Pressure rating	10 bar	
Fiber-optic coupling	1.6 mm ferrule	
Dimensions / material	32 x 38 x 13 mm / PEEK	

Ordering Information

FLOWCELL-Z-10	• Flow Z cell with 10 mm optical path
FLOWCELL-1.5	• Flow Z cell with 1.5 mm optical path
FC-UVIR400-1-FIA-SR	• Fiber cable 400 µm, UV/VIS, sol. Resistant for Flow Z cell 10/1.5

Accessories

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Reference Tiles

For diffuse reflection measurements, Avantes offers the WS-2 reference tile. For specular reflection measurements, the RS-2 is available.

The WS-2 reference tile is made out of a white diffuse PTFE based material, which is considered the highest grade reference material for diffuse reflectance. It is mostly used in colorimetric application where a reference signal has to be obtained during a reflection measurement.

The PTFE material is high purity and processed using exacting standards to an amorphous structure, so the tile reflects light from 350-1800 nm at circa 98% and from 250-2500 nm at more than 92%. The material offers long term stability, even in UV applications. The plastic is hydrophobic and chemically inert. so it is cleanable.

For gemology applications, the WS-2 is used in combination with a reflection integrating sphere. The gemstone is put on the middle of the tile with the integrating sphere over it.

The special WS-2-GEM is designed to facilitate holding and cooling a gemstone with liquid nitrogen, as it features a cavity and hole in the middle of the tile.

The WS-2-CAL is a NIST traceable calibrated white reference tile which includes an electronic calibration file covering 250-2500 nm.

The RS-2 is a mirror tile which can be used as a reference standard for specular reflection measurements.

The RS-2-CAL is a calibrated mirror tile which includes a NIST traceable calibration file, which is created using an 8° absolute specular reflectance measurement over the wavelength range from 250-2500 nm.

We also have black and grey reference tiles available. These tiles are perfect for reflectance measurements. For more information on these tiles, please look at the ordering information on the next page.

As with most Avantes products, these accessories can be delivered in a custom design. Contact us for more information.

WS-2 and WS-2-GEM

RS-2

Technical Data

	WS-2	RS-2
Material	Diffuse PTFE material	BK7 with Al+MgF$_2$ coating
Max. temperature	280ºC	80ºC
Dimensions tile	32 mm diameter / 10 mm thick	32 mm diameter / 1 mm thick
Housing	38 mm diameter, black PVC, cover red anodized	

For the latest product information and other updates, go to www.avantes.com.

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Reflectance Curves Reference Tiles
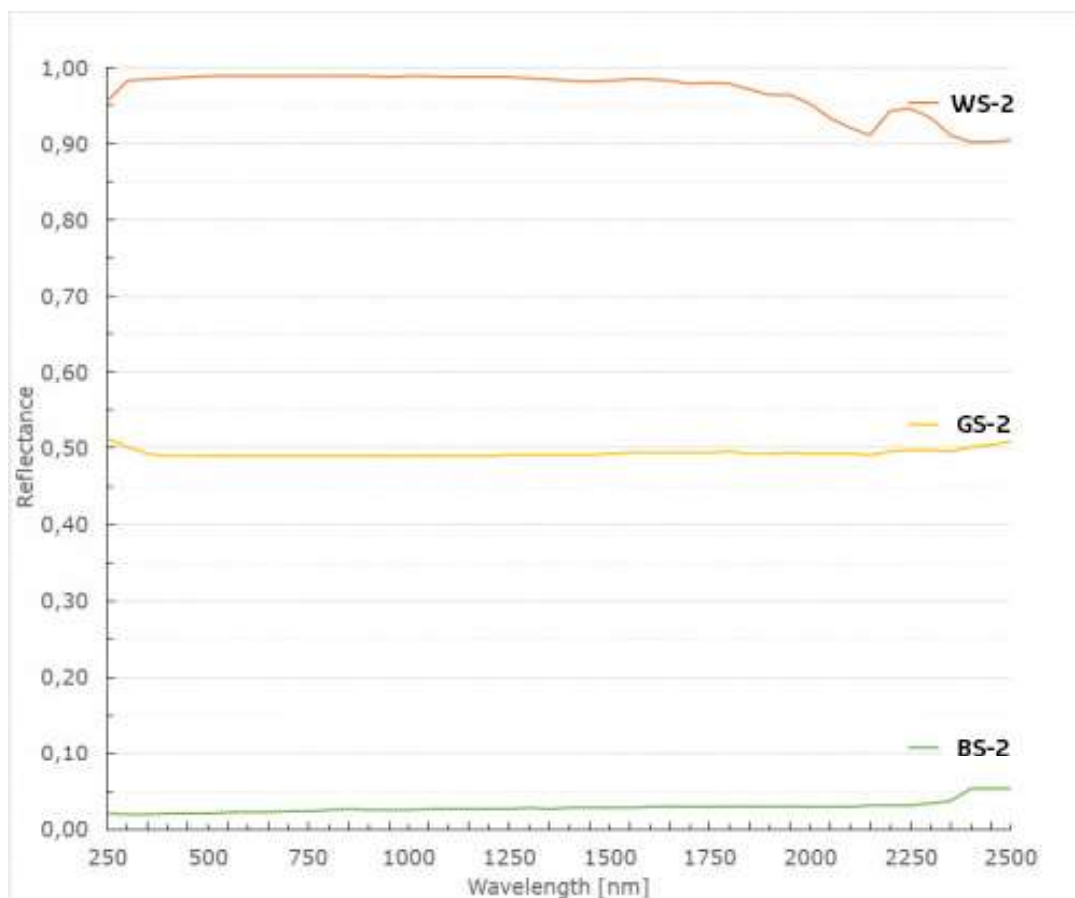
Ordering Information

WS-2	• White reference tile
WS-2-GEM	• White reference tile with cone, specially for Gemstone measurement
WS-2-CAL	• NIST traceable calibrated white reference tile with 8° hemispherical calibration, 250-2500nm
RS-2	• Specular Reflectance standard with Al+MgF$_2$, 250-2500 nm
RS-2-CAL	• NIST traceable calibrated Specular Reflectance standard with Al+MgF$_2$, 250-2500 nm
BS-2	• Black reference tile for reflectance measurements. Diffuse, 2%
GS-2	• Grey reference tile for reflectrance measurements. Diffuse 50%

12 and 24 Volts Power Adapters
for Spectrometer and Light Sources

Most AvaSpec spectrometers are USB powered, but some users prefer to externally power their instrument. Avantes PS-12V and PS-24V can be used to connect your AvaSpec spectrometer and AvaLight light sources to any 100-240V power connection.

The PS-12V has a maximum output of 1.0A and is used with all AvaSpec spectrometers and most light sources and accessories. The PS-24V is to be used with the AvaLight-HAL halogen light source and the FOS-inline

fiber-optic switch.

All power supplies are equipped with automatic thermal and overload cut-off circuitry. Please specify on the order which plug should be delivered based upon your geography: Euro, UK, USA or Australian plugs are available.

PS-12V Power adapter

Technical Data

	PS-12V/1.0A	PS-24V/1.25A
Power Input	100-240 VAC ± 10%/ 47-63 Hz	
Power consumption	400 mA	700 mA
Power Output	12 VDC ± 5%, depending on load	24 VDC ± 5%, depending on load
Output current (max.)	1.0 A	1.25 A
DC –Connector	5.5 mm OD, 2.1 mm ID, 11.5 mm long	3.5 mm OD, 1.3 mm ID, 10 mm long
Dimensions	92 mm x 40 mm x 28 mm	105 mm x 68 mm x 39 mm
Operating Temperature	0 - 45ºC	
Cable length	2.0 m	

Ordering Information

PS-12V/1.0A	• Power supply 100-240VAC/12VDC, 1.0A
PS-24V/1.25A	• Power supply 100-240VAC/24VDC, 1.25A for FOS
PS-12V/1.1mm	• Power supply 100-240VAC/12VDC, 1.0A for AvaSpec-Mini
PS-12V/2.08A	• Power supply 100-240VAC/12VDC, for AvaLight-HAL-Mini

Euro plug standard, special power plug specify

-UK	• UK plug
-US	• USA plug