Avantes Deuterium light sources are known for their stable output and are used for UV absorption or reflection measurements. These can also be used as irradiance calibration sources due to their high-stability. The standard AvaLight-DH-S mixes the Halogen light with the Deuterium light, thus producing a wide spectral range light source. The output spectrum of Deuterium light sources exhibits several peaks, with a prominent peak at 656 nm. The AvaLight-DH-S-BAL incorporates a dichroic beam splitter installed to minimize these peaks, providing a smooth spectrum from 200-2500 nm.

Our pulsed Xenon light source is used in applications where a long lifetime and high output power is needed, such as in fluorescence measurements. This is an affordable UV source, but the spectral output is not as smooth and continuous as the AvaLight Halogen and Deuterium light sources. LED light sources provide high power at a precise wavelength. A typical application for AvaLight-LED sources is fluorescence. They provide long lifetime, short warm-up time and high-stability.

For wavelength calibration Avantes offers a variety of sources including Argon, Mercury-Argon, Neon, Zinc and Cadmium. All Avantes spectrometers are factory wavelength calibrated and do not require recalibration as they have fixed slits and optics. For those customers who wish to do their own calibrations, the AvaLight-CAL light sources can be used for recalibration purposes. For auto-calibration AvaSoft-Full provides a calibration procedure to make this easy.

New to the Avalight illumination sources family is the AvaLight-LDXE, a very high brightness light source. It has an extremely long lamp life, a spectral range from 200 nm to 1100 nm and a high-stability.

Table 8 Overview light sources

|	Wavelength Range	Type	Principle	Product
Color / VIS / NIR	360-2500 nm	Tungsten Halogen	Continuous	AvaLight-HAL(-S)-MINI
DUV	190-400 nm	Deuterium	Continuous	AvaLight-D-S-DUV
UV	215-400 nm	Deuterium	Continuous	AvaLight-D-S
UV/VIS/NIR refl./abs	215-2500 nm	Deuterium/Halogen	Continuous	AvaLight-DH-S-(BAL)
UV/VIS/NIR absorption	200-2500 nm	Deuterium/Halogen	Continuous	AvaLight-DHc
UV/VIS	200-1000 nm	Xenon	Pulsed	AvaLight-XE
Fluorescence	Multiple possible	LED	Continuous	AvaLight-LED
Wavelength Calibration	253-1704 nm	Mercury-Argon Neon / Argon	Continuous	AvaLight-CAL
	200-700 nm	Zinc/Cadmium	Continuous	AvaLight-CAL-CAD/Zinc
Irradiance Calibration	360-2500 nm	Tungsten Halogen	Continuous	AvaLight-HAL-CAL-MINI
	200-1100 nm	Deuterium/Halogen	Continuous	AvaLight-DH-(BAL)-CAL
Radiance Calibration	360-2500 nm	Tungsten Halogen	Continuous	AvaSphere-50-LS-HAL-CAL
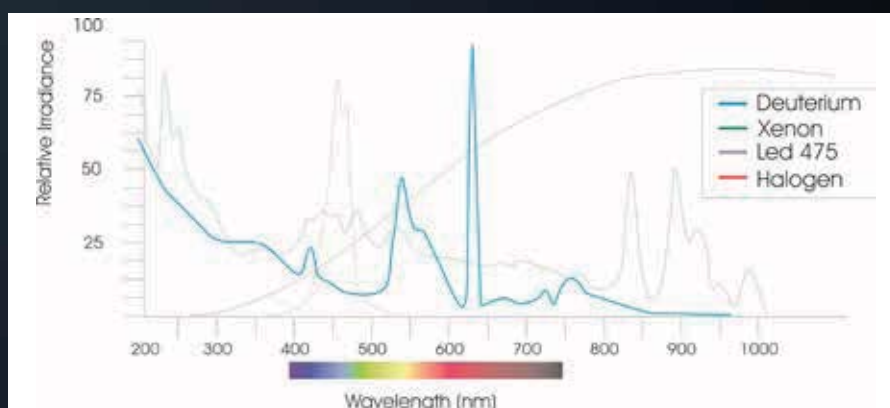
Figure 7 spectral distribution of different Light Sources

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AvaLight-DHc
Full-range Compact Light Source

AvaLight-DHc

Get the best out of two worlds with the AvaLight-DHc. It has both a deuterium light source and a halogen light source, providing you with adequate light between 200 and 2500 nm for nearly all absorbance chemistry applications. Deuterium emits light between 200 and 550 nm, where the halogen takes over up to 2500 nm. Coupling this lightsource to the rest of your spectroscopy system is easy with the SMA connector.

This light source is recommended in settings with large fiber cables or direct-attachment to a cuvette holder such as the CUV-DA, due to its relatively low output energy. The integrated TTL-shutter makes saving a dark measurement very simple in combination with AvaSoft (extra IC-DB26-2 needed).

Optionally the AvaLight-DHc is available in a rack-mountable version, to be used in the 19" rack or the 9.5" desktop system.

* Combined Deuterium-Halogen
* Low cost
* Integrated TTL-shutter

A direct-attach cuvette holder CUV-DA (see section accessories) is available for fluorescence or absorbance measurements.
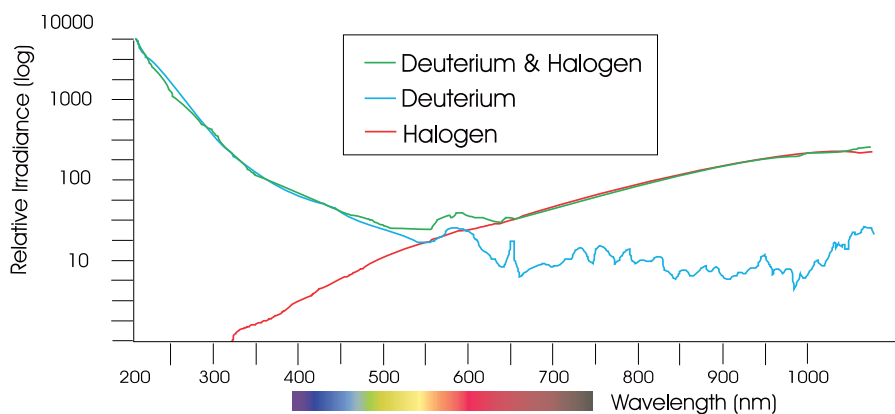

Figure 8 Spectral output of AvaLight-DHc

Technical Data

	Deuterium Light Source	Halogen Light Source
Wavelength Range	200 - 400 nm	400 - 2500 nm
Stability	< 1 mAU	< 1 mAU
Warm-up time	8 min	1 min
Drift	< 0.25% / h	< 0.25% / h
Optical Power in 600 µm fiber	0.2 µWatt	7 µWatt
Lamp Lifetime	1000 hours	2000 hours
Temp. Range	5ºC - 35ºC	
Power Supply	12VDC / 450 mA	
Dimensions	175 x 110 x 44 mm	
Lifetime shutter	1.000.000 cycles (typical)	

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AvaLight-HAL-(S)-MINI Tungsten-Halogen Light Source

AvaLight-HAL-S-MINI

From visible light to near infrared, that's where the AvaLight-HAL-Mini works best. It's a compact, stabilized halogen light source, with adjustable focusing of the fiber connection, maximizing output power at the desired wavelength. The light source also has adjustable output power to provide extra power or longer bulb life.

A filter-slot mounted on the front of the AvaLight-HAL-Mini accepts 1" round or 2" x 2" square filters, to block specific ranges of wavelengths or instantly lower the intensity.

The adjustable focus on the AvaLight-HAL-Mini helps you get the most out of your light source: it makes sure all possible power is transmitted through your optical fiber. Bulb replacement is easy and can be done in a matter of minutes.

Optionally a combined direct-attach cuvette holder and attenuator is available (CUV-ATT-DA-HAL). for attenuation you can use the Inline Filterholder, FH-INL, or the Inline attenuator, ATT-INL.
The optical output can be controlled through a dongle at the backside or from your spectrometer. At low setting the lamp has a color temperature of 2700K but provides over 13000 hours of lifetime. The standard or medium setting changes the color temperature to 2850K and provides 50% more power with a bulb lifetime of 4000 hours. The high power setting gives a color temperature of 3000K, double power compared to the long-life setting and gives you up to 1000 hours of lifetime.

The AvaLight-HAL-S-Mini features an internal TTL-shutter, controllable from your AvaSpec spectrometer. This gives you the ability to use the auto-save dark option in AvaSoft spectroscopy software.
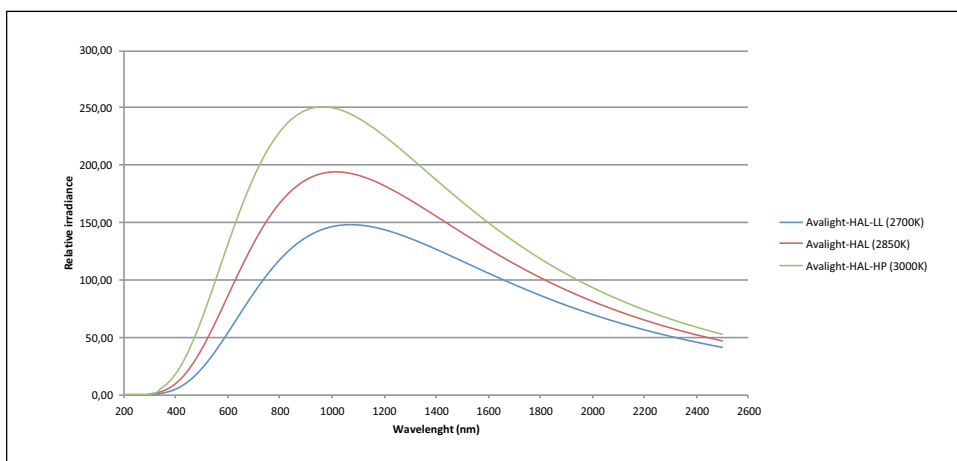

Figure 9 Spectral output of AvaLight-HAL-Mini

Technical Data

	AvaLight-HAL-(S)-Mini (standard)	AvaLight-HAL-(S)-Mini (long life)	AvaLight-HAL-(S)-Mini (high power)
Wavelength Range	360-2500 nm		
Stability	± 0.1%/ ºC		
Time to stabilize	Ca. 10 min.		
Output to bulb	12.0 VDC/ 0.83A	11.3 VDC/ 0.8A	14.1 VDC/ 1.0A
Bulb Life	4000 hrs	> 13000 hrs	< 1000 hrs
Min. Optical power* 200 µm fiber	0.5 mWatt	0.35 mWatt	0.7 mWatt
Min. Optical power* 600 µm fiber	4.5 mWatt	3.2 mWatt	6 mWatt
Min. Optical power* 1000 µm fiber	10 mWatt	7 mWatt	14 mWatt
Bulb Color Temperature	2,850 K	2,730 K	3,000 K
Power requirement	12 VDC / 1.5A		
Temperature range	0-55 ºC		
Dimensions, weight	150 x 78 x 37 mm, 510 grams		
Lifetime shutter	1,000,000 cycles (typical)		

* Optical power measured from 350-1100nm

Separate 50x50 mm filters to install in AvaLight-HAL-(S)-Mini

GL-WG305-3	Separate 50 x 50 x 3 mm long-pass filter > 305 nm
GL-KG3-3	Separate 50 x 50 x 3 mm band-pass filter, transparent > 325 nm and < 700 nm
GL-BG28-3	Separate 50 x 50 x 3 mm band-pass filter, transparent > 360 nm and < 500 nm
GL-GG385-3	Separate 50 x 50 x 3 mm long-pass filter > 385 nm
GL-GG475-3	Separate 50 x 50 x 3 mm long-pass filter > 475 nm
GL-OG515-3	Separate 50 x 50 x 3 mm long-pass filter > 515 nm
GL-OG550-3	Separate 50 x 50 x 3 mm long-pass filter > 550 nm
GL-OG590-3	Separate 50 x 50 x 3 mm long-pass filter > 590 nm
GL-NG9-1	Separate 50 x 50 x 1 mm Neutral Density filter (transmission 10%, 400-1100 nm)
GL-NG9-2	Separate 50 x 50 x 2 mm Neutral Density filter (transmission 1%, 400-1100 nm)
GL-NG9-3	Separate 50 x 50 x 3 mm Neutral Density filter (transmission 0.1%, 400-1100 nm)

More filter types available, please contact us for ordering information

Ordering Information

AvaLight-HAL-Mini	• 10W Tungsten Halogen Lamp, fan-cooled, needs extra PS-12V/1.5A power supply
AvaLight-HAL-S-Mini	• As AvaLight-HAL-Mini, incl. TTL shutter, needs extra PS-12V/1.5A power supply
AvaLight-HAL-S-RM	• Rack-mounted version of AvaLight-HAL-S-Mini
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-HAL-(S)-Mini
AvaLight-HAL-B-Mini	• 10W Tungsten Halogen Replacement bulb for AvaLight-HAL-(S)-Mini
PS-12V/1.5A	• Power supply 100-240VAC/12VDC, 1.5A, necessary for AvaLight-HAL-Mini
DONGLE-Mini-H	• Dongle for high power setting
DONGLE-Mini-L	• Dongle for long life setting

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AvaLight-DH-S Deuterium-Halogen Light Source

AvaLight-DH-S

In need of more power than the AvaLight-DHc? The AvaLight-DH-S is Avantes' most powerful deuterium halogen source. Like the DHc it is also a combined deuterium and halogen light source, capable of transmitting light in the UV/VIS/NIR-range, but has 35 times more halogen output and up to 300 times more deuterium power. The source has a prominent 656 nm deuterium peak which can limit dynamic range (see Avalight-DH-S-BAL as an alternative). It includes a focusing lens assembly, to fully utilize the possibilities and size of your fiber.

The AvaLight-D-S is a deuterium light source only, making it a great option for measurements in the UV range, 190-400 nm. The AvaLight-D-S-DUV version starts even lower at 175 nm, for your deep-UV experiments. This version also offers twice the intensity at 200nm.

The output of the AvaLight-DH-S is optimized for fibers or bundles up to 600 micrometers. For larger fibers the focal point is manually adjustable to optimize the light coupling into your fiber.

The AvaLight-D(H)-S features an integrated TTL-shutter and filter holder for filters of up to 50x50x5.0 mm.

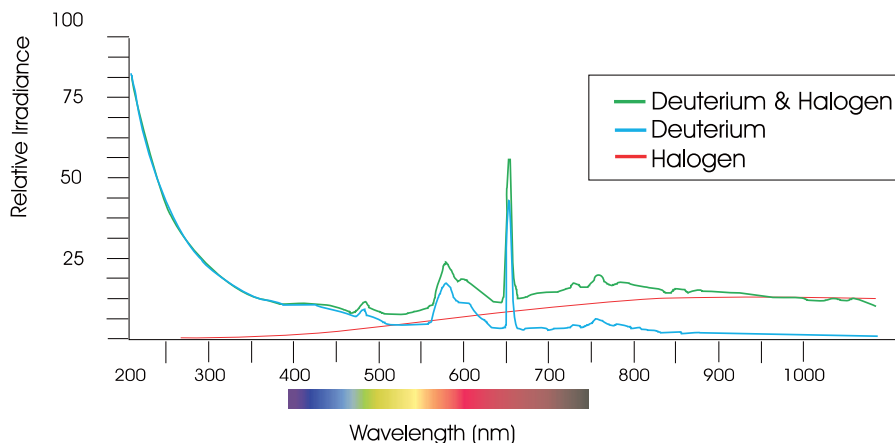* Combined Deuterium-Halogen
* UV-VIS-NIR
* Deep-UV optional
* Powerful

Figure 10 Spectral output AvaLight-DH-S

Technical Data

	Deuterium (Deep-UV) Long life	Deuterium (Standard) Long life	Halogen
Wavelength Range	175-400 nm	190-400 nm	360-2500 nm
Warm-up Time	30 min.		20 min.
Lamp Power	78W / 0.75A		5W /0.5A
Lamp Lifetime	2000 h		1000 h
Noise (AU)	2×10^{-5}		10^{-4}
Max. drift	± 0.5%/h		±0.1%/h
Color Temperature	-	-	3000 K
Optical Power* in 200µm fiber	11 µW	11 µW	43 µW
Optical Power* in 600µm fiber	72 µW	72 µW	239 µW
Optical Power* in 1000µm fiber	206 µW	206 µW	354 µW
Power consumption	90 Watt (190Watt for heating D-Lamp 4-5 sec.)		
Power Requirements	100-240VAC 50/60 Hz		
Dimensions / Weight	315 x 165 x 140 mm / ca 5 kg.		
Lifetime shutter	1,000,000 cycles (typical)		

* total power for the specified wavelength range

For a table of separate 50x50 mm filters to install in AvaLight-D(H)-S see AvaLight-HAL.

Ordering Information

AvaLight-D-S	• Deuterium light source, 190-400 nm, incl. TTL shutter, -SR fibers needed
AvaLight-DH-S	• Deuterium-Halogen light source, 190-2500 nm, incl. TTL shutter, -SR fibers needed
AvaLight-D-S-DUV	• Deep-UV deuterium light source, 175-400 nm , TTL shutter, -SR fibers needed, 2000h
AvaLight-DH-S-DUV	• Deep-UV deuterium-halogen light source, 175-2500 nm , TTL shutter, -SR fibers needed
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-D(H)S-BAL
AvaLight-D-B	• Replacement deuterium bulb for AvaLight-D/AvaLight DH-BAL light source
AvaLight-D-B-DUV	• Replacement deep-UV deuterium bulb for AvaLight-D/AvaLight DH-BAL light source
AvaLight-DH-B	• Replacement halogen bulb for AvaLight-DH-BAL light source
CUV-DA-DHS	• Direct-attach cuvette holder for AvaLight-D(H)S-BAL

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AvaLight-DH-S-BAL
Balanced Power

AvaLight-DH-S-BAL

The AvaLight-DH-S is a powerful deuterium halogen source, but like any unbalanced deuterium halogen source it does have a very dominant alpha peak at 656 nm. This is why Avantes developed the DH-S-BAL, in which this peak is drastically reduced by a dichroic filter. This means less power, but an increase in the dynamic range of a factor 20. A comparison spectrum, which is taken with a standard AvaSpec-2048, is shown on the next page.

The light source delivers a continuous spectrum with high efficiency. The highest stability is in the ultraviolet, visible and near infrared range, from 215 to 2500 nm. An integrated TTL-shutter and filter holder for filters of up to 50x50x5.0 mm are included. The TTL-shutter can be controlled from any AvaSpec spectrometer, which means the auto-save dark-option in AvaSoft software can be used (please note: IC-DB26-2 cable needed).

Connection to the fiber is done through an SMA-905 connector, which features an adjustable focusing lens assembly. This ensures you getting the maximum possible power into your fiber. For all deuterium light sources solarization resistant fibers (-SR) are recommended (see the fiber-optic section of this catalog). The output of the AvaLight-DH-S-BAL is optimized for fibers or bundles up to 600 µm.

* Balanced light source
* Wide spectrum: 215-2500 nm
* Integrated TTL shutter
* High efficiency
* Increased dynamic range

The filter holder can be easily replaced by a direct-attach cuvette holder CUV-DA-DHS (see section accessories) useful for fluorescence or absorbance measurements.

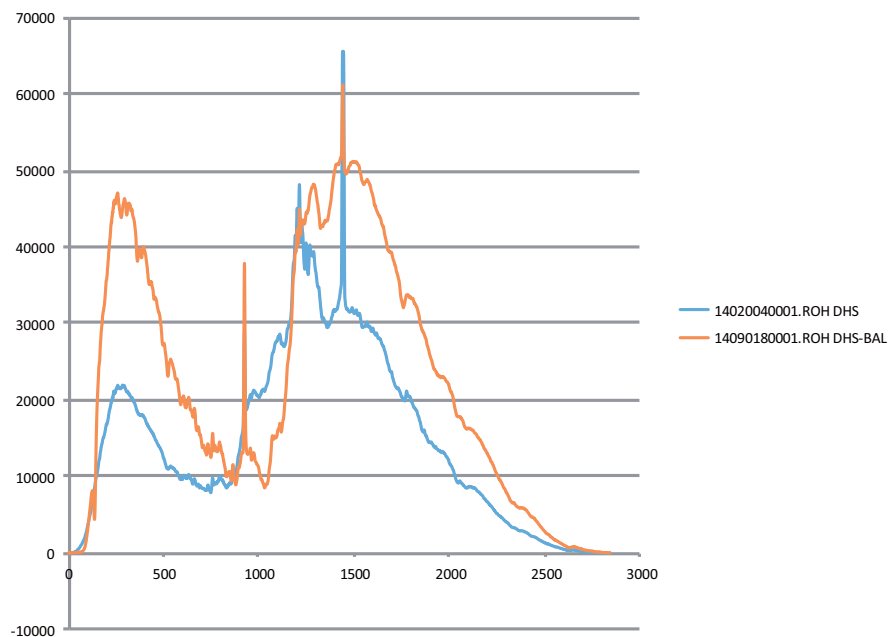|	Balanced Deuterium (Standard)	Balanced Halogen Lamp
Wavelength Range	215-500 nm	500-2500 nm
Warm-up Time	30 min.	20 min.
Lamp Power	78 W / 0.75 A	5 W / 0.5 A
Lamp Lifetime	2000 hrs	1000 hrs
Noise (AU)	$2x\ 10^{-5}$	10^{-4}
Max. drift	± 0.5%/hr	±0.1%/hr
Color Temperature	-	3000 K
Optical Power in 200 µm fiber	6 µW	17 µW
Optical Power in 600 µm fiber	33 µW	160 µW
Optical Power in 1000 µm fiber	90 µW	448 µW
Power consumption	90 Watt (190 Watt for heating D-Lamp 4-5 sec.)	
Power Requirements	100-240VAC 50/60 Hz	
Dimensions / Weight	315 x 165 x 140 mm / ca 5 kg.	
Lifetime shutter	1,000,000 cycles (typical)	

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Figure 11 Spectral output AvaLight-DH-S-BAL (red) vs. AvaLight-DH-S (blue)

Ordering Information

AvaLight-D-S-BAL	• Balanced Deuterium light source, 215-500nm, incl. TTL shutter, -SR fibers needed
AvaLight-DH-S-BAL	• Balanced Deuterium-Halogen light source, 215-2500 nm, incl. TTL shutter, -SR fibers needed
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-D(H)S-BAL
AvaLight-D-B	• Replacement deuterium bulb for AvaLight-D/AvaLight DH-BAL light source
AvaLight-DH-B	• Replacement halogen bulb for AvaLight-DH-BAL light source
CUV-DA-DHS	• Direct-attach cuvette holder for AvaLight-D(H)S-BAL

Add flexibility
to your spectrometer with
the Replaceable Slit (-RS) option

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AvaLight-XE Pulsed Xenon

AvaLight-XE

Perfect for ultraviolet applications like fluorescence, the AvaLight-XE is a pulsed xenon light source. When connected to your AvaSpec spectrometer through the IC-DB26-2 cable (sold separately), the flashes are synchronized with the data collected by the spectrometer. In AvaSoft the number of flashes per scan can be selected.

With a special DUV bulb the AvaLight-XE can be used for deep ultraviolet application (below 200 nm). A special direct-attach cuvette holder is available for your fluorescence applications. For transmission measurements, the Avalight-XE can be used in conjunction with the CUV-ATT-DA which has an iris attenuator to limit the light output and to avoid saturation.

* Pulsed light source
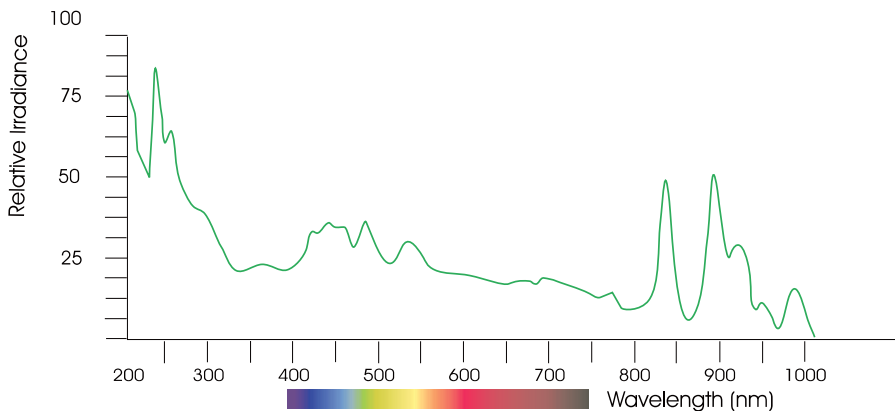* Perfect for fluorescence
* Cuvette holder available
* Long lifetime

Figure 12 Spectral output of the AvaLight-XE

Technical Data

Spectral Output	200 nm to 1000 nm
Total Optical Power output	39 μJ per pulse (average 66 mW)
Optical Power in 200 μm fiber	0.66 μJ per pulse (average 20 μW)
Optical Power in 600 μm fiber	3.2 μJ per pulse (average 320 μW)
Optical Power in 1000 μm fiber	7.4 μJ per pulse (average 744 μW)
Synchronization Input	15 pin sub-D connector, TTL level
Pulse Duration	5 μs (at 1/3 height)
Pulse delay	6 μs
Pulse rate (max.)	100 Hz
Bulb Life	min. 10^9 pulses
Connector	SMA-905 connector
Power requirement	12 VDC/550 mA
Dimensions, weight	175 x 110 x 44 mm, 540 grams

Ordering Information

AvaLight-XE	• Xenon Light Source (200-1000 nm), needs interface cable and power supply
AvaLight-XE-DUV	• DUV (160-1000 nm) version of the AvaLight-XE, needs interface cable and power supply
AvaLight-XE-B	• Spare bulb for the AvaLight-XE (200-1000 nm)
AvaLight-XE-B-DUV	• Spare bulb for the AvaLight-XE-DUV (160-1000 nm)
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-XE
CUV-DA	• Direct-attach cuvette holder for AvaLight-DHc/XE/LED
ATT-DA	• Direct-attach attenuator for AvaLight-DHc/XE/LED
CUV-ATT-DA	• Direct-attach cuvette holder and attenuator for AvaLight-DHc/XE/LED
PS-12V/1.0A	• Power supply 100-240VAC/12VDC, 1.0A for AvaLight-XE