

# AvaSpec-HERO SensLine

The AvaSpec-HERO is the top of the line spectrometer!  
Based on our High Sensitivity Compact (HSC) optical bench (f=100mm; NA=0.13) and a 1024x58 backthinned CCD detector, it offers the best of both worlds: high sensitivity and resolution!

The instrument is equipped with thermo-electric cooling, enabling long integration times in low light applications. In conjunction with our AS7010 electronics, including a high-end AD converter, noise is kept to a minimum, which offers you an excellent Signal to Noise and Dynamic Range performance.

A selection of gratings and slits offers you the flexibility of configuring the instrument for a wide range of applications in the 200-1160 nm range.

From low light fluorescence applications to demanding Raman applications, the AvaSpec-HERO is your ideal companion.

With the high-speed USB3.0 and Gigabit Ethernet communication interface, the connection to your computer is fast and simple.

Of course the digital IO ports enabling external triggering, control of shutters, and pulsed light sources from the Avantes line of instruments are available as well.

The AvaSpec-HERO is standard equipped for use with replaceable slits, offering optimal flexibility for a variety of applications. The combination of all the above makes the AvaSpec-HERO your ideal companion for all your spectroscopic measurements.

## AvaSpec-HERO



## Technical Data

<b>Optical Bench</b>	HSC Symmetrical Czerny-Turner, 100 mm focal length, NA: 0.13
<b>Wavelength range</b>	200-1160 nm
<b>Resolution</b>	0.2-7 nm, depending on configuration (see table)
<b>Stray-light</b>	0.5%, depending on the grating
<b>Sensitivity</b>	445,000 counts/ $\mu$ W per ms integration time
<b>Detector</b>	CCD array image sensor with one stage TE Cooled, 1024 pixels
<b>Temperature cooled CCD</b>	Max. $\Delta T = 30$ °C versus ambient
<b>Signal/Noise</b>	1200:1
<b>Dynamic Range</b>	40.000
<b>AD converter</b>	16-bit, 250 kHz
<b>Integration time</b>	5.2 ms- 180 sec
<b>Interface</b>	USB 3.0 high-speed, 5 Gbps Gigabit Ethernet 1 Gbps
<b>Digital IO</b>	HD-26 connector, 2 Analog in, 2 Analog out, 3 Digital bidirectional, trigger, sync., strobe, laser.
<b>Sample speed with on-board averaging</b>	5.2 ms/scan
<b>Data transfer speed</b>	5.2 ms/scan (USB3 and ETH)
<b>Power supply</b>	12VDC, 1.5A
<b>Dimensions, weight</b>	185 x 161 x 185mm, 3500 grams

The new AvaSpec-HERO is the answer for those who are in need of high resolution and high sensitivity!

## Grating Selection Table for AvaSpec-HSC1024x58TEC-EVO

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	190-1100	910*	246	230	HSC0246-0.23**
UV/VIS/NIR	200-1160	770-760*	300	300	HSC0300-0.30
UV/VIS/NIR	250-1160	770-760*	300	420	HSC0300-0.42
VIS/NIR	250-1160	577-553	400	550	HSC0400-0.55
UV/VIS	250-850	373-340*	600	400	HSC0600-0.40
VIS/NIR	250-1160	373-340*	600	650	HSC0600-0.65
VIS/NIR	500-1160	268-220*	830	900	HSC0830-0.90
UV/VIS	200-1160	182-130*	1200	400	HSC1200-0.40
VIS/NIR	500-1050	182-130*	1200	750	HSC1200-0.75
UV/VIS	200-580	84-61*	2400	270	HSC2400-0.27

\* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

\*\* special grating. Add on costs apply.

## Resolution Table (FWHM in nm) for AvaSpec-HSC1024x58TEC-EVO

Grating (lines/mm)	Slit size (μm)				
	25	50	100	200	500
246	2.10	2.70	4.15	7.90	17.0
300	1.80	2.30	3.40	6.50	14.0
400	1.45	1.60	2.60	5.10	12.0
600	0.85	1.10	1.70	3.40	7.50
830	0.60	0.70	1.25	2.30	5.00
1200	0.40	0.48	0.80	1.45	3.50
2400	0.30	0.36	0.50	0.80	1.75

\* Above values are average values. Due to optical properties resolution will be better in the lower wavelengths than in the higher wavelength range.

## Ordering Information

### AvaSpec-HSC1024x58TEC-EVO

- AvaSpec-HERO; High sensitivity fiber optic spectrometer, HSC 100mm bench design, 1024x58 pixel back illum TE cooled CCD detector, high-speed USB 3.0 and ETH interface, including AvaSoft-Basic, USB interface cable, specify grating, wavelength range and options

## Options

<b>SLIT-XX-RS</b>	• Replaceable slit with SMA connector, specify slit size XX=10, 25, 50, 100, 200 or 500 μm.
<b>SLIT-XX-RS-FCPC</b>	• As SLIT-XX-RS, but with FC/PC connector
<b>SLITKIT-SMA</b>	• Slit kit containing 25, 50, 100, 200 or 500 μm slits, and the tools to replace the slit. SMA-connectors
<b>SLITKIT-FCPC</b>	• As SLITKIT-SMA, but with FC/PC connectors
<b>OSF-YYY-3</b>	• Order sorting filter for reduction of 2nd order effects, 3 mm thick, please specify YYY= 305, 395, 475, 515, 550, 600 nm
<b>OSC-HSC300</b>	• Order sorting coating for use with grating HSC0300-xx
<b>OSC-HSC600</b>	• Order sorting coating for use with grating HSC0600-xx and HSC0400-xx

# AvaSpec-ULS2048XL-EVO SensLine High UV and NIR Sensitivity Back-thinned CCD Spectrometer

## AvaSpec-ULS2048XL-EVO



Combining exceptional quantum efficiency with high-speed is the value proposition of the AvaSpec-ULS2048XL-EVO spectrometer. Unlike many back-thinned CCD spectrometers, which have two dimensional arrays, the ULS2048XL-EVO has large monolithic pixels of 14x500 microns with exceptional efficiency in the UV, from 200-400 nm, and the NIR, from 950-1160 nm. The instrument also has an electronic shutter, which enables integration times as low as 2 microseconds. To further enhance sensitivity, a detector collection lens is available which improves sensitivity up to 60% when combined with larger core fibers.

Options include order-sorting filter, to reduce 2nd order effects and purge ports for deep-UV measurements. The AvaSpec-ULS2048XL-EVO comes with a wide range of slit sizes, gratings and may be configured with SMA or FC/PC fiber-optic entrance connectors.

The AvaSpec-ULS2048XL-EVO uses the AS7010 electronics board offering USB3 (10 times faster than USB2), Gigabit Ethernet and better signal processing.

Connection to your PC is handled via a USB3-connection or Ethernet, delivering a scan every 2 milliseconds. The instrument comes complete with AvaSoft-basic software, USB cable and an extensive manual.

### Technical Data

<b>Optical Bench</b>	ULS, Symmetrical Czerny-Turner, 75 mm focal length
<b>Wavelength range</b>	200 - 1160 nm
<b>Resolution</b>	0.09 -20 nm, depending on configuration (see table)
<b>Stray-light</b>	< 0.5%
<b>Sensitivity</b>	460,000 counts/ $\mu$ W per ms int. time
<b>UV Quantum efficiency</b>	60% (200-300 nm)
<b>Detector</b>	Back-thinned CCD image sensor 2048 pixels
<b>Signal/Noise</b>	525:1
<b>AD converter</b>	16-bit, 1 MHz
<b>Integration time</b>	2 $\mu$ s - 20 seconds
<b>Interface</b>	USB 3.0 high-speed, 5 Gbps Gigabit Ethernet 1 Gbps
<b>Sample speed with store to RAM</b>	2.44 ms /scan
<b>Readout Noise</b>	9.8 cnt RMS
<b>Dark Noise</b>	4.5 cnt RMS
<b>Dynamic Range</b>	13.700
<b>Data transfer speed</b>	2.44 ms /scan (USB3)
<b>Digital IO</b>	HD-26 connector, 2 Analog in, 2 Analog out, 3 Digital in, 12 Digital out, trigger, synchronization
<b>Power supply</b>	Default USB power, 700 mA. Or external 12VDC, 360 mA
<b>Dimensions, weight</b>	175 x 127 x 44,5 mm (1 channel), 1180 grams

## Grating Selection Table for AvaSpec-ULS2048XL-EVO

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1160**	960**	300	300	UA
UV/VIS/NIR	200-1160**	900**	300	300/1000	UNA-DB
UV/VIS	200-850	520	600	300	UB
UV	200-750	250-220*	1200	250	UC
UV	200-650	165-145*	1800	UV	UD
UV	200-580	115-70*	2400	UV	UE
UV	200-400	70-45*	3600	UV	UF
UV/VIS	250-850	520	600	400	BB
VIS/NIR	300-1160**	860**	300	500	VA
VIS	360-1000	500	600	500	VB
VIS	300-800	250-200*	1200	500	VC
VIS	350-750	145-100*	1800	500	VD
VIS	350-640	75-50*	2400	VIS	VE
NIR	500-1050	500	600	750	NB
NIR	500-1050	220-150*	1200	750	NC
NIR	600-1160	350-300	830	800	SI
NIR	600-1160**	560**	300	1000	IA
NIR	600-1160	500	600	1000	IB

\* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

\*\* please note that not all 2048 pixels will be used for the useable range

## Resolution Table (FWHM in nm) for AvaSpec-ULS2048XL-EVO

Grating (lines/mm)	Slit size (µm)					
	10	25	50	100	200	500
300	1.40	1.50	2.5	4.8	9.2	21.3
600	0.70 - 0.80*	0.75-0.85*	1.2	2.4	4.6	10.8
830	0.42 - 0.48*	0.50-0.58*	0.93	1.7	3.4	8.5
1200	0.25 - 0.31*	0.37 - 0.43*	0.52-0.66*	1.1	2.3	5.4
1800	0.17 - 0.21*	0.26 - 0.32*	0.34-0.42*	0.8	1.6	3.6
2400	0.12 - 0.18*	0.18 - 0.24*	0.26-0.34*	0.44-0.64*	1.1	2.7
3600	0.09 - 0.12*	0.11 - 0.15*	0.19	0.4	0.8	1.8

\* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution

## Ordering Information

**AvaSpec-ULS2048XL-EVO**

**PS-12V / 1.0A**

- Ultra-low Stray-light Fiber-optic Spectrometer, 75 mm AvaBench, 2048 large 500 µm pixel back-thinned CCD detector, USB powered, high-speed USB3.0 and ETH interface, incl. AvaSoft-Basic, USB interface cable.  
Specify grating, wavelength range and options
- External power supply, needed for use in ETH mode

Why is the XL so sensitive?  
We're using back-illuminated detectors.  
They have the electronics on the backside of the detector,  
allowing more light to be caught by the front side.

## Options

<b>-RS</b>	• Replaceable slit
<b>DCL-UV/VIS-200</b>	• Quartz Detector Collection Lens (200-1100 nm)
<b>SLIT-XX</b>	• Slit size, please specify XX = 10, 25, 50, 100, 200 or 500 $\mu\text{m}$
<b>SLIT-XX-RS</b>	• Replaceable slit with SMA connector , specify slit size XX=25, 50, 100, 200 or 500 $\mu\text{m}$ . Only in combination with AvaSpec-ULS2048XL-EVO-RS
<b>SLIT-XX-RS-FCPC</b>	• as SLIT-XX-RS, but with FC/PC connector
<b>OSF-YYY</b>	• Order-sorting filter for reduction of 2nd order effects, 1 mm thick, please specify YYY= 305, 395, 475, 515, 550 or 600 nm
<b>OSC</b>	• Order-sorting coating with 600 nm long-pass filter for BB (>350 nm) and VB gratings, recommended with OSF-305
<b>OSC-UA</b>	• Order-sorting coating Linear Variable Filter for UA, VA gratings
<b>OSC-UB</b>	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings
<b>-FCPC</b>	• FC/PC fiber-optic connector

The grating can only be changed by Avantes.  
Therefore, choose your grating wisely.  
Our application specialists are available to support you with your choice.  
In general, a higher resolution means a lower bandwidth.  
By combining multiple spectrometers  
in our AvaSpec-Dual or rack-mountable versions,  
you can create one virtual spectrometer with high-resolution  
and high bandwidth.

# AvaSpec-HS2048XL-EVO SensLine High UV and NIR Sensitivity Back-thinned CCD Spectrometer

For high sensitivity applications where high resolution is not of paramount concern, the AvaSpec-HS2048XL-EVO is an exceptional instrument. Featuring Avantes' HS optical bench which has a full 0.22 numerical aperture for superior throughput, the AvaSpec-HS2048XL has a back-thinned CCD detector with 2048 pixels measuring 14X500 microns.

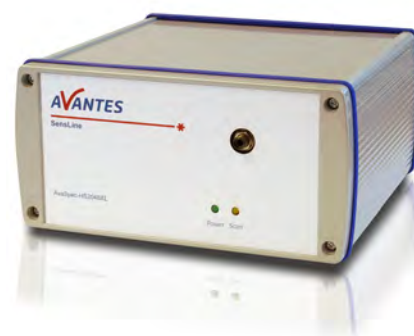
Unlike many back-thinned CCD spectrometers, which have two dimensional arrays the HS2048XL has large monolithic pixels with exceptional efficiency in the UV, from 200-400 nm, and the NIR, from 950-1160 nm, while retaining sensitivity in the visible range. The unique optical design features torroid collimating and focusing mirrors to control image magnification and enhance efficiency. The instrument also features an electronic shutter, which enables integration times as low as 2 microseconds.

For configurations, which require second order filtering, order-sorting filters are avail-

able. The AvaSpec-HS2048XL is available with a wide range of slit sizes, gratings and may be configured with SMA or FC/ PC fiber-optic entrance connectors.

The AvaSpec-HS2048XL-EVO uses the AS7010 electronics board offering USB3 (10 times faster than USB2), Gigabit Ethernet and better signal processing.

## AvaSpec-HS2048XL-EVO



### Technical Data

<b>Optical Bench</b>	High-sensitivity asymmetrical design, 37.5 mm focal length; NA - 0.22, f/2.27
<b>Wavelength range</b>	200 - 1160 nm
<b>Resolution</b>	1 - 20 nm, depending on configuration (see table)
<b>Stray-light</b>	< 1 %
<b>Sensitivity</b>	1,250,000 counts/ $\mu$ W per ms int. time
<b>UV Quantum efficiency</b>	60% (200-300 nm)
<b>Detector</b>	Back-thinned CCD image sensor 2048 pixels
<b>Signal/Noise</b>	525:1
<b>AD converter</b>	16-bit, 1 MHz
<b>Integration time</b>	2 $\mu$ s - 600 seconds
<b>Interface</b>	USB 3.0 high-speed, 5 Gbps Gigabit Ethernet, 1 Gbps
<b>Sample speed with on-board averaging</b>	2.44 ms /scan
<b>Dynamic Range</b>	14.900
<b>Data transfer speed</b>	2.44 ms /scan (USB3)
<b>Digital IO</b>	HD-26 connector, 2 Analog in, 2 Analog out, 3 Digital in, 12 Digital out, trigger, synchronization
<b>Power supply</b>	Default USB power, 700 mA. or external 12VDC, 360 mA
<b>Dimensions, weight</b>	175 x 165 x 85 mm, 1,950 kg

## Grating Selection Table for AvaSpec-HS2048XL-EVO

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1160	900	500	330	HS500-0.33
UV/VIS	200-660	440	1000	250	HS1000-0.25
UV	200-850	520	600	300	HS600-0.30
UV/VIS	200-850	520	600	400	HS600-0.40
UV/VIS	300-1160	860	500	560	HS500-0.56
VIS	360-1000	500	600	500	HS600-0.50
NIR	500-1050	500	600	750	HS600-0.75
VIS	350-850	460	900	550	HS900-0.55
VIS	400-722	322	1200	500	HS1200-0.5
NIR	600-1160	500	600	1000	HS600-1.0
NIR	600-1160	350	830	900	HS830-0.9
NIR	750-990	240	1200	1000	HS1200-1.0

## Resolution Table (FWHM in nm) for AvaSpec-HS2048XL-EVO

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
500	2.6	4.5	5.5	6.5	10.0	22.0
600	2.2	3.8	4.5	5.5	7.5	18.0
830*	2.1	3.6	4.0	5.0	7.0	15.0
900*	2.0	3.5	3.8	4.8	6.8	14.5
1000*	1.9	3.3	3.6	4.6	6.6	14.0
1200*	1.8	3.0	3.3	4.3	6.2	13.5

\* theoretical values

## Ordering Information

### AvaSpec-HS2048XL-EVO

- High-sensitivity fiber-optic Spectrometer, 2048 large 500 μm pixel back-thinned CCD detector, USB powered, high-speed USB3.0 and ETH interface, incl. AvaSoft-Basic, USB interface cable. Specify grating, wavelength range and options

### PS-12V/1.0A

- External power supply, needed for use in ETH mode

## Options

<b>SLIT-XX</b>	• Slit size, please specify XX = 10, 25, 50, 100, 200 or 500 μm
<b>OSF-YYY</b>	• Order-sorting filter for reduction of 2nd order effects, 1 mm thick, please specify YYY= 305, 385, 475, 515, 550 or 600 nm
<b>OSC-HS500</b>	• Order-sorting coating with 350 and 600 nm long-pass filter for HS500 gratings in AvaSpec-HS
<b>OSC-HS600</b>	• Order-sorting coating with 350 and 600 nm long-pass filter for HS600 gratings in AvaSpec-HS
<b>OSC-HS900</b>	• Order-sorting coating with 600 nm long-pass filter for HS900 gratings in AvaSpec-HS
<b>OSC-HS1000</b>	• Order-sorting coating with 350 nm long-pass filter for HS1000 gratings in AvaSpec-HS
<b>FCPC</b>	• FC/PC fiber optic connector

The AvaSpec-HS2048XL-EVO is ideally suited for diffuse reflection measurements (UV, VIS, NIR) and fluorescence.

**NEW**

# AvaSpec-ULS2048x64-EVO SensLine High UV and NIR Sensitivity Spectrometer

Alongside the cooled AvaSpec-ULS2048x64TEC-EVO with low-noise detector, Avantes also offers the more cost-effective, uncooled AvaSpec-ULS2048x64-EVO. With its standard 2048x64 backthinned detector, this spectrometer is perfect for less demanding applications in the UV and NIR range.

For applications that require integration times lower than 2 seconds, the cooling option is often not needed. For example, this uncooled AvaSpec-ULS2048x64-EVO has an established track record in various DOAS applications all over the world because of its high UV response and 0.9 mm detector height that enables detecting the wavelengths of interest.

Options include an order-sorting filter, to reduce second-order effects and purge ports for deep-UV measurements. The AvaSpec-ULS2048x64-EVO comes with a wide range of slit sizes, gratings and can be configured with SMA or FC/PC fiber-optic entrance connectors.

The AvaSpec-ULS2048x64-EVO uses the AS7010 electronics board offering USB3 (10 times faster than USB2), Gigabit Ethernet and better signal processing.

Connection to your PC is handled via USB3-connection or Ethernet, delivering a scan every 2 milliseconds. The instrument comes complete with AvaSoft-basic software, USB cable and an extensive manual.

**AvaSpec-ULS2048x64-EVO**



## Technical Data

<b>Optical bench</b>	ULS, Symmetrical Czerny-Turner, 75 mm focal length
<b>Wavelength range</b>	200-1160 nm
<b>Resolution</b>	0.09-20 nm, depending on configuration (see table)
<b>Stray light</b>	< 1%, depending on the grating
<b>Sensitivity</b>	650,000 counts/μW per ms int. time
<b>Detector</b>	Back-thinned CCD image sensor 2048x64 pixels (height: 0.89 mm)
<b>Signal/noise</b>	450:1
<b>AD converter</b>	16-bit, 1.33 MHz
<b>Integration time</b>	2.4 ms-25 seconds
<b>Interface</b>	USB 3.0 high-speed, 5 Gbps Gigabit Ethernet 1 Gbps
<b>Sample speed with on-board averaging</b>	2.4 ms/scan
<b>Readout noise</b>	7.5 cnt RMS
<b>Dark noise</b>	11.5 cnt RMS
<b>Dynamic range</b>	6100
<b>Data transfer speed</b>	2.4 ms/scan (USB3)
<b>Digital IO</b>	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bidirectional, trigger, sync., strobe, laser
<b>Power supply</b>	Default USB power, 885 mA. Or external 12VDC, 420 mA
<b>Dimensions, weight</b>	177 x 127 x 44,5 mm (1 channel), 1180 grams



## Grating Selection Table for AvaSpec-ULS2048x64-EVO

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1160**	960**	300	300	UA
UV/VIS/NIR	200-1100**	900**	300	300/1000	UNA-DB
UV/VIS	200-850	520	600	300	UB
UV	200-750	250-220*	1200	250	UC
UV	200-650	165-145*	1800	UV	UD
UV	200-580	115-70*	2400	UV	UE
UV	200-400	70-45*	3600	UV	UF
UV/VIS	250-850	520	600	400	BB
VIS/NIR	300-1160**	860**	300	500	VA
VIS	360-1000	500	600	500	VB
VIS	300-800	250-200*	1200	500	VC
VIS	350-750	145-100*	1800	500	VD
VIS	350-640	75-50*	2400	VIS	VE
NIR	500-1050	500	600	750	NB
NIR	500-1050	220-150*	1200	750	NC
NIR	600-1160	350-300	830	800	SI
NIR	600-1160**	560**	300	1000	IA
NIR	600-1160	500	600	1000	IB

\* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

\*\* please note that not all 2048 pixels will be used for the useable range

## Resolution Table (FWHM in nm) for AvaSpec-ULS2048x64-EVO

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
300	1.40	1.50	2.5	4.8	9.2	21.3
600	0.70 - 0.80*	0.75-0.85*	1.2	2.4	4.6	10.8
830	0.42 - 0.48*	0.50-0.58*	0.93	1.7	3.4	8.5
1200	0.25 - 0.31*	0.37 - 0.43*	0.52-0.66*	1.1	2.3	5.4
1800	0.17 - 0.21*	0.26 - 0.32*	0.34-0.42*	0.8	1.6	3.6
2400	0.12 - 0.18*	0.18 - 0.24*	0.26-0.34*	0.44-0.64*	1.1	2.7
3600	0.09 - 0.12*	0.11 - 0.15*	0.19	0.4	0.8	1.8

\* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution

## Ordering Information

- AvaSpec-ULS2048x64-EVO**
- Ultra-low Stray-light Fiber-optic Spectrometer, 75 mm AvaBench, 2048x64 pixel back-thinned CCD detector, USB powered, high-speed USB3.0 and ETH interface, incl. AvaSoft-Basic, USB interface cable. Specify grating, wavelength range and options

## Options

<b>-RS</b>	• Replaceable slit
<b>DCL-UV/VIS-200</b>	• Quartz detector collection lens (200 - 1100 nm)
<b>SLIT-XX</b>	• Slit size, please specify XX = 5, 10, 25, 50, 100, 200 or 500 μm
<b>SLIT-XX-RS</b>	• Replaceable slit with SMA connector, specify slit size XX = 25, 50, 100, 200 or 500 μm. Only available for AvaSpec-ULS2048CL-EVO-RS
<b>SLIT-XX-RS-FCPC</b>	• As SLIT-XX-RS, but with FC/PC connector
<b>OSF-YYY</b>	• Order-sorting filter for reduction of second-order effects please specify YYY = 305, 395, 475, 515, 550 or 600 nm
<b>OSC</b>	• Order-sorting coating with 600 nm long-pass filter for BB (>305 nm) and VB gratings, recommended with OSF-305
<b>OSC-UA</b>	• Order-sorting coating with 350 and 600 nm linear variable filter for UA, VA gratings
<b>OSC-UB</b>	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings
<b>-FCPC</b>	• FC/PC fiber-optic connector

# AvaSpec-ULS2048x64TEC-EVO SensLine Thermoelectrically Cooled Fiber-Optic Spectrometer

The AvaSpec-ULS2048x64TEC-EVO is an updated version of our AvaSpec-ULS2048x64TEC spectrometer, with improved electronics and cooling.

This instrument enhances the Sensline series with its cooled, back-thinned detector. The back-thinned detector has good sensitivity in the UV and IR region. The 64 pixelheight (0.89 mm) enables catching as many photons as possible while the cooling enables long integration times up to 120 seconds with low-noise levels.

The instrument features Peltier cooling device integrated into our exclusive ultra-low stray light optical bench, which can reduce the temperature of the CCD chip to -30°C against ambient, improving the dark baseline and PRNU level significantly. The detector cooling also reduces the dark noise by a factor of 2-3.

The AvaSpec-ULS2048x64TEC-EVO uses a special low-noise version of the 2048x64 detector with integrated cooling.

All the features mentioned above make this instrument ideally suited for measuring low-light applications, such as fluorescence or low-light Raman measurements.

Optimal flexibility is guaranteed with the replaceable slit, making the instrument suitable for various kinds of applications.

The above mentioned qualities make the AvaSpec-ULS2048x64TEC-EVO an excellent choice for low light-level applications, such as fluorescence and Raman measurements, where integration times of more than 5 seconds may be needed.

## AvaSpec-ULS2048x64TEC-EVO



### Technical Data

<b>Optical bench</b>	ULS Symmetrical Czerny-Turner, 75 mm focal length
<b>Wavelength range</b>	200-1160 nm
<b>Resolution</b>	0.09 -20 nm, depending on configuration (see table)
<b>Stray light</b>	<1%, depending on the grating
<b>Sensitivity</b>	300,000 counts/μW per ms integration time
<b>Detector</b>	Backthinned CCD, 2048x64 pixels, low noise, integrated cooling
<b>Temperature-cooled CCD</b>	Max. ΔT = -30°C versus ambient. Optimal setting: 5°C
<b>Signal/noise</b>	550:1
<b>AD converter</b>	16-bit, 500 KHz
<b>Dynamic range</b>	19,000
<b>Dark noise</b>	5 cnts
<b>Integration time</b>	9.7 ms-120 s
<b>Interface</b>	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps
<b>Sample speed with on-board averaging</b>	9.7 ms/scan
<b>Data transfer speed</b>	9.7 ms/scan (USB3) 9.7 ms/scan (ETH)
<b>Digital IO</b>	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bidirectional, trigger, sync., strobe, laser
<b>Power supply</b>	12 VDC, 1.5 A
<b>Operating temperature</b>	0-40°C
<b>Cooling</b>	30°C versus ambient
<b>Dimensions, weight</b>	185 x 145 x 185 mm, 3500 grams

## Grating Selection Table for AvaSpec-ULS2048x64TEC-EVO

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1160**	960**	300	300	UA
UV/VIS/NIR	200-1100**	900**	300	300/1000	UNA-DB
UV/VIS	200-850	520	600	300	UB
UV	200-750	250-220*	1200	250	UC
UV	200-650	165-145*	1800	UV	UD
UV	200-580	115-70*	2400	UV	UE
UV	200-400	70-45*	3600	UV	UF
UV/VIS	250-850	520	600	400	BB
VIS/NIR	300-1160**	860**	300	500	VA
VIS	360-1000	500	600	500	VB
VIS	300-800	250-200*	1200	500	VC
VIS	350-750	145-90*	1800	500	VD
VIS	350-640	75-50*	2400	VIS	VE
NIR	500-1050	500	600	750	NB
NIR	500-1050	220-150*	1200	750	NC
NIR	600-1160	350-300	830	800	SI
NIR	600-1160**	560**	300	1000	IA
NIR	600-1160	500	600	1000	IB

\* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

\*\* please note that not all 2048 pixels will be used for the useable range

## Resolution Table (FWHM in nm) for AvaSpec-ULS2048x64TEC

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
300	1.40	1.50	2.5	4.8	9.2	21.3
600	0.70-0.80*	0.75-0.85*	1.2	2.4	4.6	10.8
830	0.42-0.48*	0.50-0.58*	0.93	1.7	3.4	8.5
1200	0.25-0.31*	0.37-0.43*	0.52-0.66*	1.1	2.3	5.4
1800	0.17-0.21*	0.26-0.32*	0.34-0.42*	0.8	1.6	3.6
2400	0.12-0.18*	0.18-0.24*	0.26-0.34*	0.44-0.64*	1.1	2.7
3600	0.09-0.12*	0.11-0.15*	0.19	0.4	0.8	1.8

\* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution

## Ordering Information

## AvaSpec-ULS2048x64TEC-EVO

Thermoelectrically cooled fiber-optic spectrometer, 75 mm ultra-low stray light AvaBench, 2048x64 pixel, TE-cooled and regulated low-noise CCD detector, USB3/ETH high-speed interface and replaceable slit, incl. AvaSoft-Basic, USB cable, desktop housing. Specify grating, wavelength range and options

## Options

<b>DCL-UV/VIS-200</b>	• Detector Collection Lens to enhance sensitivity, Quartz, 200-1100 nm
<b>SLIT-XX-RS</b>	• Replaceable slit with SMA connector. Specify slit size XX= 10, 25, 50, 100, 200 or 500 μm
<b>SLIT-XX-RS-FCPC</b>	• As SLIT-XX-RS, but with FC/PC connector
<b>OSF-YYY</b>	• Order-sorting filter for reduction of 2 <sup>nd</sup> order effects, 1 mm thick, please specify YYY= 305, 395, 475, 515, 550 or 600 nm
<b>OSC</b>	• Order-sorting coating with 600 nm long-pass filter for BB (>350 nm) and VB gratings, recommended with OSF-305
<b>OSC-UA</b>	• Order-sorting coating with linear variable filter for UA, VA gratings
<b>OSC-UB</b>	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings