

## AvaSpec-ULS2048L StarLine Versatile Fiber-optic Spectrometer

### AvaSpec-ULS2048L



A close cousin to the AvaSpec-ULS2048 but with larger pixels, is the AvaSpec-ULS2048L. It provides enhanced sensitivity at an affordable price. The AvaSpec-ULS2048L has pixels that are almost four times higher than those in the AvaSpec-ULS2048. It gives you a better signal to noise ratio and 40% less dark noise.

Options include a deep-UV detector coating, for better performance in the deep-UV-range, a detector collection lens to enhance sensitivity in the 200-1100 nm range and order-sorting filter to reduce 2<sup>nd</sup> order effects. Furthermore, the AvaSpec-ULS2048L is available with a wide range of slit sizes, gratings and fiber-optic entrance connectors.

The AvaSpec-2048L is also available in dual or multi-channel versions (up to 10 spectrometers), where all spectra are taken simultaneously.

Connection to your PC is handled via USB2-connection, delivering a scan every 1.8 milliseconds. Integration time can be as short as 1.05 milliseconds up to a maximum of 10 minutes. It comes complete with AvaSoft-Basic software, USB cable and an extensive manual, including a quick start guide in four languages.

### Technical Data

<b>Optical Bench</b>	ULS Symmetrical Czerny-Turner, 75 mm focal length
<b>Wavelength range</b>	200-1100 nm
<b>Resolution</b>	0.06 -20 nm, depending on configuration (see table)
<b>Stray-light</b>	0.16-0.28%, depending on the grating
<b>Sensitivity</b>	470,000 counts/ $\mu$ W per ms integration time
<b>Detector</b>	CCD linear array, 2048 pixels
<b>Signal/Noise</b>	300:1
<b>AD converter</b>	16-bit, 2 MHz
<b>Integration time</b>	1.05 ms - 10 minutes
<b>Interface</b>	USB 2.0 high-speed, 480 Mbps RS-232, 115.200 bps
<b>Sample speed with store to RAM</b>	1.05 ms /scan
<b>Data transfer speed</b>	1.8 ms/scan (USB2) 430 ms/scan (RS-232)
<b>Digital IO</b>	HD-26 connector, 2 Analog in, 2 Analog out, 3 Digital in, 12 Digital out, trigger, sync.
<b>Power supply</b>	Default USB power, 350 mA Or with SPU2 external 12VDC, 150 mA
<b>Dimensions, weight</b>	175 x 110 x 44 mm (1 channel), 716 grams

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

## Grating selection table for AvaSpec-ULS2048L

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1100**	900**	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	300-1100**	800**	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	350-610	75-50*	2400	VIS	VE
NIR	500-1050	500	600	750	NB
NIR	500-1050	220-150*	1200	750	NC
NIR	600-1100	350-300	830	800	SI
NIR	600-1100**	500**	300	1000	IA
NIR	600-1100	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-ULS2048L

Grating (lines/mm)	Slit size (µm)					
	10	25	50	100	200	500
<b>300</b>	1.0	1.4	2.5	4.8	9.2	21.3
<b>600</b>	0.40-0.53*	0.7	1.2	2.4	4.6	10.8
<b>830</b>	0.32	0.48	0.93	1.7	3.4	8.5
<b>1200</b>	0.20-0.28*	0.27-0.38*	0.52-0.66*	1.1	2.3	5.4
<b>1800</b>	0.10-0.18*	0.20-0.29*	0.34-0.42*	0.8	1.6	3.6
<b>2400</b>	0.09-0.13*	0.13-0.17*	0.26-0.34*	0.44-0.64*	1.1	2.7
<b>3600</b>	0.06-0.08*	0.10	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-ULS2048L-USB2

- Fiber-optic Spectrometer, 75 mm AvaBench, 2048 pixel CCD detector 14 x 200 µm, USB powered, high-speed USB2 interface, incl. AvaSoft-Basic, USB interface cable. Specify grating, wavelength range and options

We can also calibrate  
your AvaSpec series  
spectrometer

### Options

<b>-SPU2</b>	• incl. switch for USB powered USB2 or external power for RS-232
<b>-RS</b>	• Replaceable slit
<b>DUV</b>	• Deep-UV detector coating >150 nm
<b>DCL-UV/VIS-200</b>	• Detector Collection Lens to enhance sensitivity, Quartz, 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 in combination with AvaSpec-ULS2048L-USB2-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, 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 in AvaSpec-ULS2048L, recommended with OSF-305
<b>OSC-UA</b>	• Order-sorting coating with 350 and 600 nm long-pass filter for UA, VA gratings in AvaSpec-ULS2048L
<b>OSC-UB</b>	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings in AvaSpec-ULS2048L
<b>-FCPC</b>	• FC/PC fiber-optic connector

For extra sensitivity:  
take a look at the  
AvaSpec-ULS2048XL

# AvaSpec-ULS2048XL SensLine

## High UV- and NIR-sensitivity back-thinned CCD Spectrometer

Combining exceptional quantum efficiency with high-speed is the value proposition of the AvaSpec-ULS2048XL spectrometer. Unlike many back-thinned CCD spectrometers, which have two dimensional arrays, the ULS2048XL 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 2<sup>nd</sup> order effects and purge ports for deep-UV measurements. The AvaSpec-ULS2048XL 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 is also available in dual or multi-channel versions (up to 10 spectrometers), where all spectra are acquired simultaneously.

Connection to your PC is handled via a USB2-connection, delivering a scan every 2 milliseconds. The instrument comes complete with AvaSoft-basic software, USB cable and an extensive manual, including a quick start guide in four languages.

### AvaSpec-ULS2048XL



### 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>	< 0.3%
<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>	450:1
<b>AD converter</b>	16-bit, 1 MHz
<b>Integration time</b>	2 $\mu$ s - 20 seconds
<b>Interface</b>	USB 2.0 high-speed, 480 Mbps RS-232, 115.200 bps
<b>Sample speed with store to RAM</b>	2.09 ms /scan
<b>Data transfer speed</b>	2.09 ms /scan (USB2) 432 ms / scan (RS-232)
<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, 450 mA. Or with SPU2 external 12VDC, 200 mA
<b>Dimensions, weight</b>	175 x 110 x 44 mm (1 channel), 855 grams

## Grating selection table for AvaSpec-ULS2048XL

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1160**	960**	300	300	JA
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-ULS2048XL

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-USB2

- Ultra-low Stray-light Fiber-optic Spectrometer, 75 mm AvaBench, 2048 large 500 µm pixel back-thinned CCD detector, USB powered, high-speed USB2 interface, incl. AvaSoft-Basic, USB interface cable.  
Specify grating, wavelength range and options

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>-SPUZ</b>	<ul style="list-style-type: none"><li>• incl. switch for USB power or external power for RS-232</li></ul>
<b>-RS</b>	<ul style="list-style-type: none"><li>• Replaceable slit, see page 41</li></ul>
<b>DCL-UV/VIS-200</b>	<ul style="list-style-type: none"><li>• Quartz Detector Collection Lens (200-1100 nm)</li></ul>
<b>SLIT-XX</b>	<ul style="list-style-type: none"><li>• Slit size, please specify XX = 10, 25, 50, 100, 200 or 500 <math>\mu\text{m}</math></li></ul>
<b>SLIT-XX-RS</b>	<ul style="list-style-type: none"><li>• Replaceable slit with SMA connector, specify slit size XX=25, 50, 100 or 200 <math>\mu\text{m}</math>. Only in combination with AvaSpec-ULS2048XL-USB2-RS</li></ul>
<b>SLIT-XX-RS-FCPC</b>	<ul style="list-style-type: none"><li>• as SLIT-XX-RS, but with FC/PC connector</li></ul>
<b>OSF-YYY</b>	<ul style="list-style-type: none"><li>• 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</li></ul>
<b>OSC</b>	<ul style="list-style-type: none"><li>• Order-sorting coating with 600 nm long-pass filter for BB (&gt;350 nm) and VB gratings in AvaSpec-2048XL, recommended with OSF-305</li></ul>
<b>OSC-UA</b>	<ul style="list-style-type: none"><li>• Order-sorting coating with 350 and 600 nm long-pass filter for UA, VA gratings in AvaSpec-ULS2048XL</li></ul>
<b>OSC-UB</b>	<ul style="list-style-type: none"><li>• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (&lt;350 nm) gratings in AvaSpec-ULS2048XL</li></ul>
<b>-FCPC</b>	<ul style="list-style-type: none"><li>• FC/PC fiber-optic connector</li></ul>