SuperK EXTREME

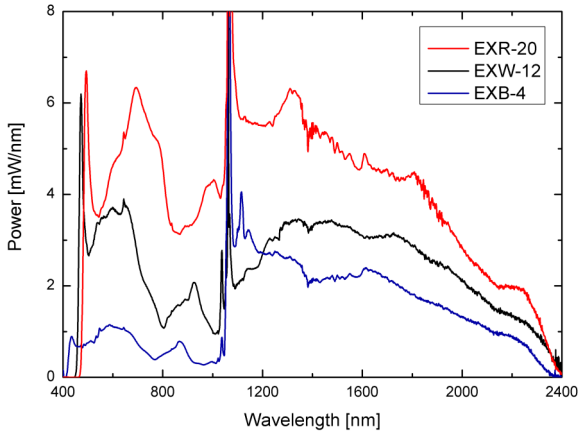
High Power Supercontinuum Fiber Laser Series

- 400-2400nm white light single mode spectrum
- Highest visible power
- Unsurpassed reliability and lifetime
- On-the-fly variable repetition rate
- Plug'n'Play light manipulation accessories
- Flexible trigger and power locking functions
- Operation at the press of a button
- Light on-demand within 20ms
- NIM trigger output approved for FLIM

SuperK supercontinuum sources delivers a wide spectral output covering hundreds of nanometers while keeping the high brightness and mode quality known from single line lasers. Our lasers are fully fiber monolithic ensuring excellent reliability — completely alignment and maintenance free.

The SuperK EXTREME series is based on NKT Photonics world renowned Crystal Fibre technology that has reliably delivered supercontinuum to all fields for over 10 years. The SuperK platform is fully modular, allowing easy operation and service where accessory modules can be added without configuration— all plug&play. Operation is simple and functions can be changed on-the-fly without powering down the system. The SuperK EXTREME series provides high power and exceptional lifetime together with the highest of safety standards.

The SuperKontrol graphic user interface ensures that users from any discipline finds the SuperK EXTREME an easy tool to use.



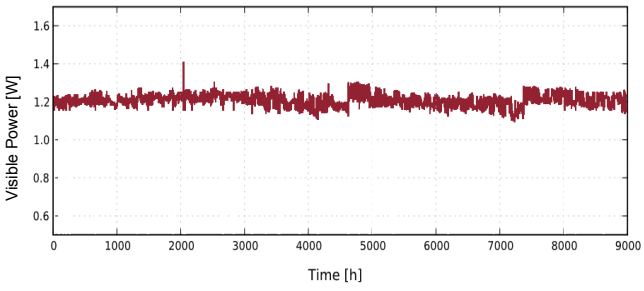
Blue (EXB), White (EXW) and Red (EXR) systems provide users with a comprehensive coverage of the supercontinuum spectrum with power levels from 1.5W to over 8W.

Options:

- Blue (EXB), White (EXW) or Red (EXR) spectrum
- 1.5-8W total power
- 100mW-2W Visible power
- Master repetition rate 40 MHz or 80 MHz
- On-the-fly variable repetition rate (pulse picker)
- Software Development Kit (SDK)
- 12 and 24 months warranty extension packages
- Power Lock external power locking functionality

Accessories:

- VARIA: Single channel variable bandwidth filter
- SELECT: Single/Twin AOTF wavelength tuning
- GAUSS: Optimized spectral output for OCT/WLI
- SPLIT: Spectral division in to sub-bands
- POLAR: Polarized output
- FIBER DELIVERY: Efficient single mode, broadband fiber coupling and guidance



Systems exhibiting over 10,000 hours of continuous lifetime underlines the high reliability of NKT Photonics Crystal Fibre technology. High power systems delivering 8W of total power with 2W of visible power emphasize the high ratio of visible to total power of SuperK Extreme systems. This efficient generation of visible supercontinuum reinforces the high lifetime performance of the SuperK EXTREME Series.

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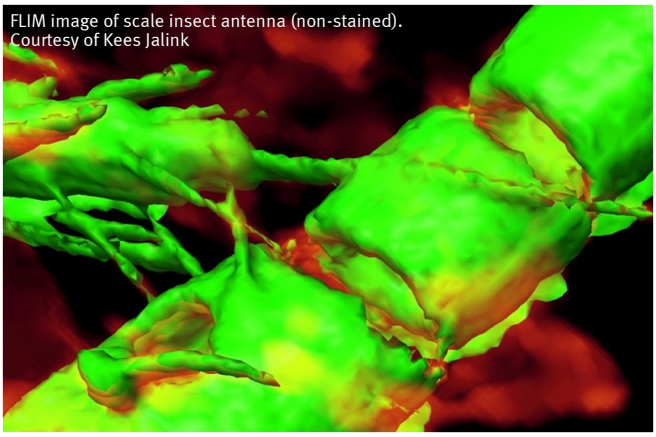
Options and add-ons

Variable repetition rate (pulse picker)

- Ideal for FLIM, FRET and diffuse optical tomography
- 1-80MHz on-the-fly variable repetition rate with 40 steps
- › 1:10,000 Pulse Suppression ratio
- NIM standard trigger output (directly usable for FLIM)
- Timing delay generator

The pulse picker option allows the repetition rate of the SuperK EXTREME to be easily changed on-the-fly while the system is running at full output. Repetition rates of 1-40MHz or 2-80MHz are available as standard (down to 100 kHz on custom request), giving the user ultimate choice for lifetime measurement applications such as FLIM.
For more information on how to use the SuperK EXTREME for FLIM se e.g. Leica Microsystems SP5X confocal microscope (http://www.leica-microsystems.com) or the application note "DCS-120 Confocal Scanning FLIM System with User-Specific Lasers: NKT SuperK EXTREME Laser" available at the Becker & Hickl website.


FLIM image of scale insect antenna (non-stained).
Courtesy of Kees Jalink

Software Development Kit (SDK)

The SuperK EXTREME software development kit (SDK) enables control of the SuperK laser using third party software and hardware. The SDK contains a full description of the communication protocols as well as LabView drivers.

SuperK CARE support/warranty

All SuperK EXTREME products comes with industry leading reliability and are backed by our standard 1 year warranty. However, should you need the extra security of an extended warranty and remote diagnostics support this is available in our SuperK CARE support and warranty extension package. Please contact your sales representative for more information.

Parameter	Value
Master Seed Repetition Rate	80 (standard) or 40 MHz
Repetition Rate Reduction	80 – 2 MHz (40 steps)
	40 – 1 MHz (40 steps)
Pulse Suppression Ratio	› 1:10,000
Operation Mode	Constant Pulse Energy
Changing Repetition Rate [1]	‹ 1 s
Timing Trigger Output Jitter	‹ 20 ps
NIM Trigger Output (BNC)	0.1 – 1 V peak
Monitor Trigger Output (BNC)	0 – 1 V
Gate Trigger Output (BNC)	0 – 1 V
Delay Shift between Pulse Picker Ration [2]	‹ ± 250 ps
Adjustable Trigger Delay Timing [3]	up to 9.2 ns
Adjustable Trigger Delay Resolution [3]	15 ps

1) The system does not need to be electrically shut down.
2) The delay between optical and electrical pulse may only change by less than ± 250 ps relative to the value obtained with 80MHz, when changing the output repetition rate by means of the pulse picker divisor.
3) The electrical output trigger signal can be delayed up to 9.2 ns in steps of 15 ps. This enables trigger delay optimization without the need for a expensive delay box. Adjustable from front panel

Power Lock (external power locking)

The Power Lock options enables you to lock the power at any place in a setup. Simply place a photo detector at the desired location and connect the detector to the External Feedback BNC connector of the SuperK. Activate locking from the control panel and the SuperK will now lock the power level at the position of the photo detector—automatically compensating for any drift or variation in external components in the setup up to 200 Hz.
Most of our SuperK accessories are also available with a build-in Power Lock monitor for ultra stable output.

Parameter	Value
Modulation input voltage	**0 – 10V**
Current mode	
Modulation bandwidth, 3dB	100Hz (typ)
Rise- and falltime	‹5ms (typ)
Power mode	
Modulation bandwidth, 3dB	50Hz (typ)
Rise- and falltime	‹10ms (typ)
Feedback input voltage	**0 – 4V**
Feedback bandwidth	‹200Hz
Feedback sample rate	200Hz

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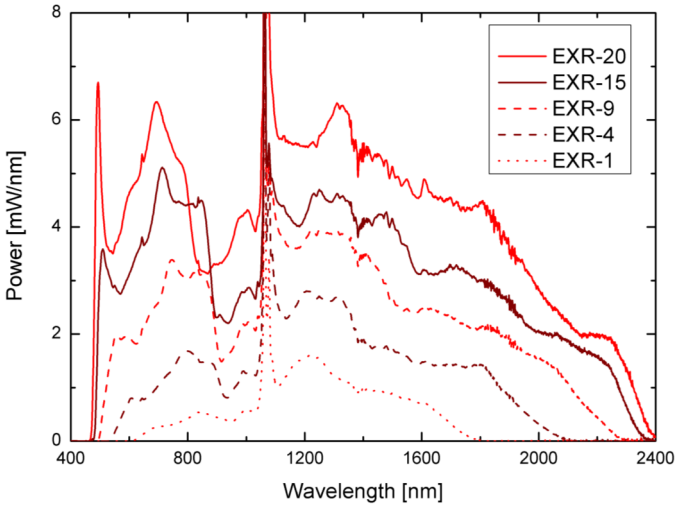
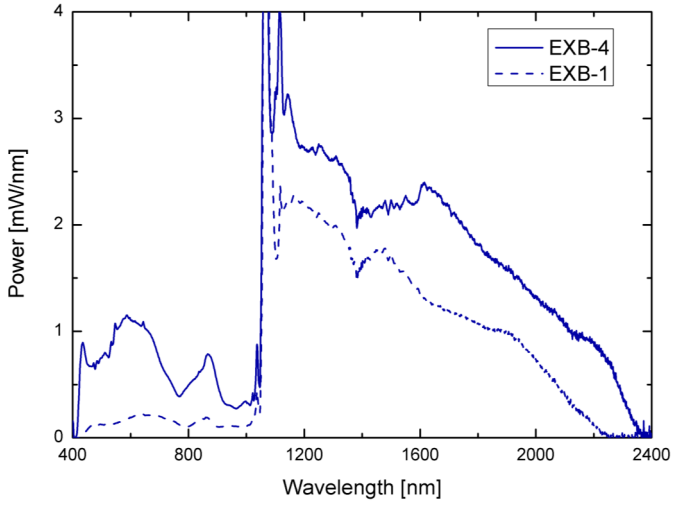
Spectral coverage

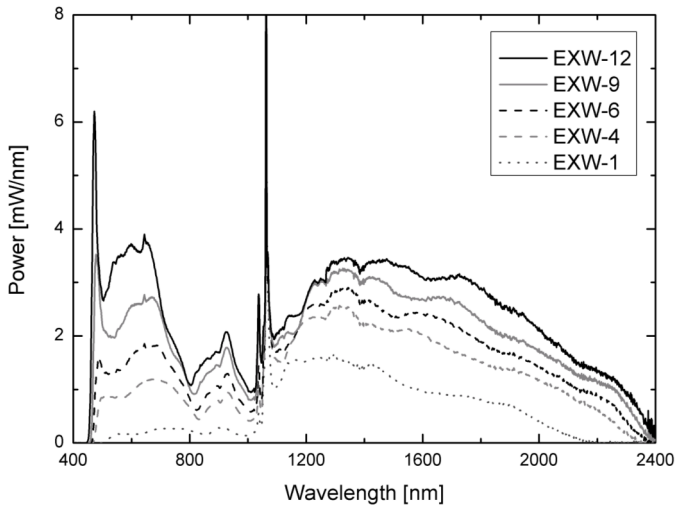
The SuperK EXTREME is available in three different variants:

- Blue EXB series
- White EXW series
- Red EXR series

Choose the EXB series if you need short blue wavelengths down to 420nm. The EXW series is a great all-around source providing good coverage of the visible spectrum while offering higher power than the blue EXB series. The red EXR series are for those who need serious power or applications where the shortest wavelengths are not important. The EXR series is our most popular model for high resolution OCT— typically in combination with a SuperK GAUSS filter.







Blue (EXB series)	White (EXW series)	Red (EXR series)	Visible power*	Typical Total Power
EXB-1	EXW-1	EXR-1	100 mW	1W
EXB-4	EXW-4	EXR-4	400 mW	2.4W
-	EXW-6	-	600 mW	3W
-	EXW-9	EXR-9	900 mW	4W
-	EXW-12	-	1200 mW	4.5W
-	-	EXR-15	1500 mW	6W
		EXR-20**	2000 mW	8W

* SuperK EXTREME has the industry's highest VIS to TOTAL power ratio yielding more visible power at a given total power level. For a thorough description of optical power measurement, see our application note on www.nktphotonics.com/

** Available on custom request

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Common specifications

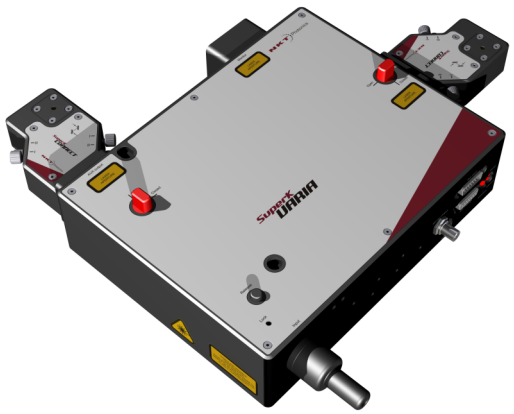
Common Optical Specifications		Common Mechanical and Electrical Specifications	
Master Rep Rate	40MHz or 80MHz	Computer Interface	USB 2.0
Master seed laser pulse	~5ps	Operation Voltage	100-240 VAC 50/60 Hz
Total power stability	+/-1.5%	Power Consumption [4]	<100W (120W)
Polarization	Unpolarized	Door Interlock Connector [5]	2-pin LEMO
Beam output	Gaussian, single mode	External Bus Communication interface [6]	16-pin sub-D
M^2	< 1.1	System Cooling	Air Cooled
Output options	Collimated or divergent output	Operation Temperature	+18° to +30°C
Length of output fiber	1.5m	Storage Temperature	-10° to +60°C
Beam diameter	~1mm at 530nm	Dimensions (WxHXL)	440x243x380mm[3]
	~2mm at 1100nm	Weight [7]	18kg (19kg)
	~3mm at 2000nm		
Beam Divergence[1]	< 5mrad		
Beam Pointing Accuracy[2]	< 1mrad		
Beam Pointing Stability	< 50µrad		
Single mode fiber coupling[3]	>72%		
Analog Master Seed Laser Trigger Output (BNC)	0 – 3.3V		

1) Half angle beam divergence
2) The pointing accuracy is measured relative to the mechanical axis running through the center of the collimator
3) For example, the visible spectral range
4) Power consumption without and with Pulse Picker
5) SuperK Extreme is a Class 4 laser and is required to be connected to a door interlock/circuit
6) External communication and power supply port for accessories
7) The weight without and with the pulse picker option

Light Manipulation Accessories

SuperK VARIA

SuperK VARIA is a cost effective and flexible alternative to a monochromator, effectively turning the SuperK supercontinuum white light source into a powerful single-line laser with a 450 nm tuning range and variable bandwidth. The center wavelength of the pass band can be tuned anywhere between 400 and 850 nm and the bandwidth is variable between 2 and 100 nm, making the SuperK VARIA the most flexible filter solution on the market. Increasing the bandwidth of the filter has the added advantages of higher power throughput and reduced speckle in imaging applications. Moreover, a high out-of-band suppression of up to 50dB makes the SuperK VARIA an ideal tool for FLIM and other applications using high sensitivity detectors.



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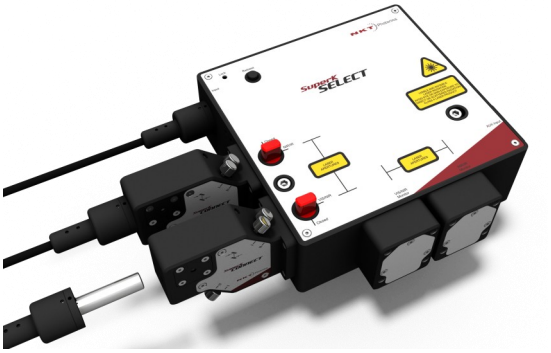
Light Manipulation Accessories

SuperK SELECT

SuperK SELECT is a tunable wavelength filter based on acusto-optic tunable filter technology (AOTF). AOTFs tune over one octave of optical frequency and the SuperK SELECT allows the integration of two AOTF crystals to provide wide spectral coverage. Together with a range of unique features, the SuperK SELECT provides an easy to use, flexible and accurate tuning accessory to access any wavelength in the SuperK spectrum.



SuperK GAUSS

SuperK GAUSS is a dual-output filter that transforms the wide spectral bandwidth of the SuperK EXTREME and provides a Gaussian-like spectrum.
For OCT, the SuperK GAUSS provides two high power spectral outputs centred at 800nm and 1300nm, with bandwidths of up to 200nm. Similar configurations are also available for WLI applications. The two Gaussian shaped spectra can be used simultaneously but independed from each other due to its unique design. The SuperK GAUSS even allows tuning of the center wavelength of each band over 200nm.

SuperK SPLIT

SuperK SPLIT allows the SuperK spectrum to be divided into two spectral outputs. In its standard form, the SuperK SPLIT provides two outputs: Visible and nIR. However, the choice of the split in the spectrum can be user-defined to be anywhere in the SuperK spectrum. Additionally, standard mounts within the SPLIT allow the insertion of narrow band filters, polarisers or attenuators at each output exit for further flexibility.

SuperK CONNECT

SuperK CONNECT is a high performance fiber delivery system complete with broadband fibers and a range of termination options such as FC/PC connectors or collimators. Interfacing is handled by the CONNECT fiber coupling unit that ensure easy and stable single-mode coupling that can be disconnected and reconnected without alignment.

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