

# SuperK EXTREME

High Power Supercontinuum fiber laser series

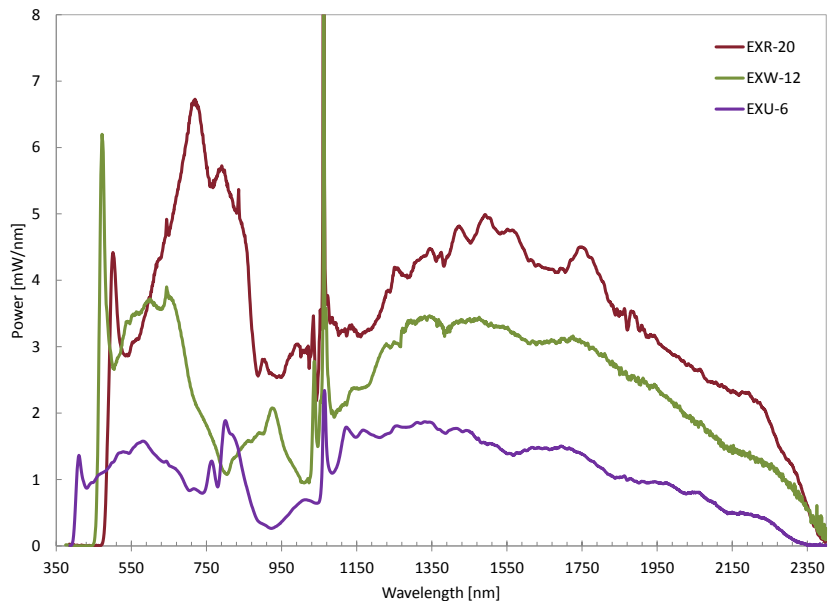
- 400-2400nm single mode spectrum
- Unsurpassed reliability and lifetime
- On-the-fly variable repetition rate
- Plug'n'Play filter accessories
- Flexible trigger and power locking functions
- Operation at the press of a button
- Instant on with light on-demand
- NIM trigger output approved for FLIM



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.

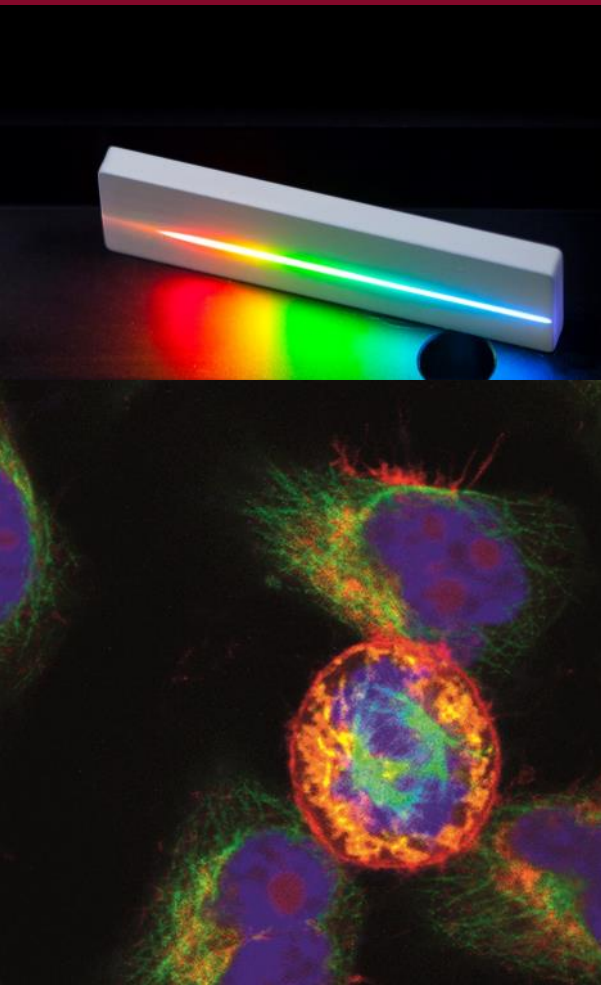
The SuperKontrol graphic user interface ensures that users from any discipline finds the SuperK EXTREME an easy tool to use.



Violet (EXU), Blue (EXB), White (EXW) and Red (EXR) systems provide users with a comprehensive coverage of the supercontinuum spectrum in the 400-2400 nm range.

## Applications

- Microscopy
- Fluorescence Lifetime Imaging
- Optical Coherence Tomography
- Spectroscopy
- White light interferometry
- Plasmonics & meta materials



## Spectral coverage

The SuperK EXTREME is available in three different variants:

- Violet EXU series
- White EXW series
- Red EXR series

Choose the EXU series if you need short blue/violet wavelengths. The EXW series is a great all-around source providing good coverage of the visible spectrum while offering higher power than the blue EXU 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.

EXU series	EXW series	EXR series	Visible power* (350-850nm)
		EXR-4	400 mW
EXU-6	EXW-6	-	600 mW
	EXW-12	-	1200 mW
		EXR-15	1500 mW
		EXR-20	2000 mW
		Custom	3500 mW

\* SuperK EXTREME is the industry's most efficient supercontinuum lasers with the highest visible to total power ratio. High efficiency means better reliability and less unwanted residual pump power at the output. For a thorough description of optical power measurement, see our [application note](#) on [www.nktphotonics.com/superk\\_extreme\\_support](http://www.nktphotonics.com/superk_extreme_support).

## Support and Warranty

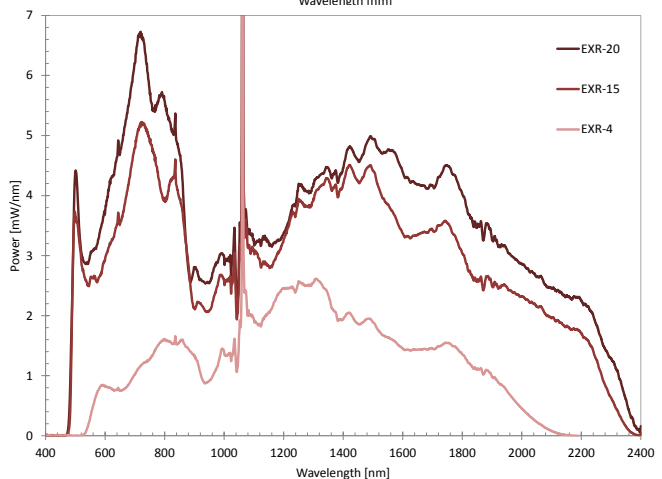
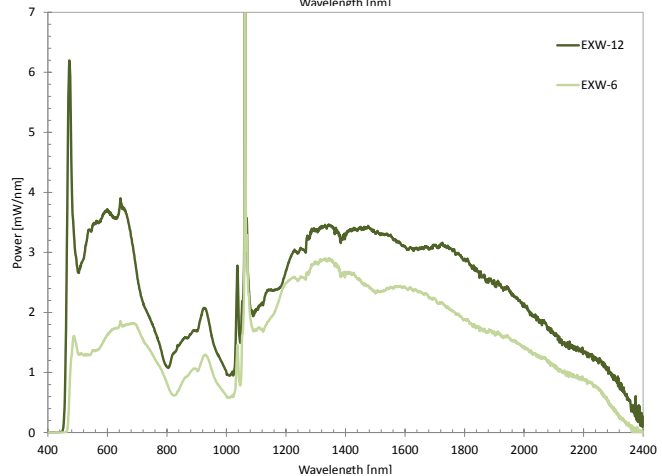
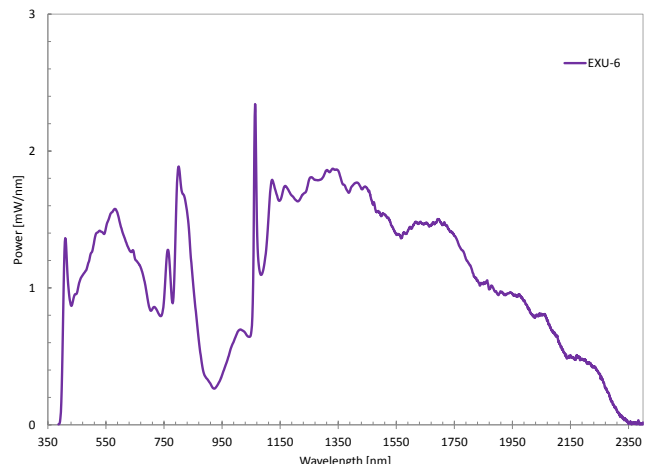
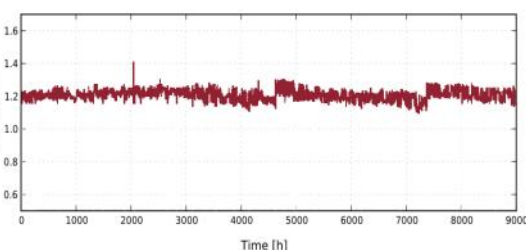
### SuperK CARE support/warranty

All SuperK EXTREME products comes with industry leading reliability and are backed by our standard 2 year warranty. 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.

### Lifetime and Service

Before shipping, all our SuperK lasers undergo a 96 hours burn-in to ensure performance and conformity to specifications. Systems exhibiting over 10,000 hours of continuous lifetime underlines the high reliability of NKT Photonics Crystal Fibre technology.

A SuperK laser is completely maintenance-free in the entire lifetime, and should your laser be damaged, the modular platform ensures fast turnaround on service and repairs. Typically, four weeks or less after a repair is ordered.



## Options

- Violet (EXU), Blue (EXB), White (EXW) or Red (EXR) spectrum
- 100 mW—2 W visible power
- Master repetition rate 40 MHz or 78 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

Typical power stability*	< ± 0.5 %
Modulation input voltage	0 – 10 V
Current mode	
Modulation bandwidth, 3dB	70 Hz (typ)
Rise- and falltime	<5 ms (typ)
Power mode	
Modulation bandwidth, 3dB	40 Hz (typ)
Rise- and falltime	<10 ms (typ)
Feedback input voltage	0 – 4 V
Feedback bandwidth	<100 Hz
Feedback sample rate	200 Hz

\*Depending on setup and wavelength range

## Software

### NKT Photonics CONTROL

Like other NKT Photonics lasers, the SuperK EXTREME can be controlled by our unified CONTROL software that gives easy access to all the functions in the source.

The software automatically detects all units attached to the computer and you can control both the source and any filtering accessories from the same software. CONTROL is easy to use and supports touch input as well as traditional mouse+keyboard control. Download the latest version at [www.nktphotonics.com/software](http://www.nktphotonics.com/software)

### Software Development Kit (SDK)

The free 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 and C++/C# source code.

## Features and Options

### Power Lock (external power locking)

The Power Lock option enables you to lock the power at any place in a set-up. 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 100 Hz.

Most of our SuperK accessories are also available with a build-in Power Lock monitor for ultra stable output (typically < ± 0.5 %). See more in our [application note](http://www.nktphotonics.com/superk_extreme_support) at [www.nktphotonics.com/superk\\_extreme\\_support](http://www.nktphotonics.com/superk_extreme_support).

### Variable repetition rate (pulse picker)

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 1-40 MHz or 2-78 MHz are available as standard (down to 150 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 see e.g. Leica Microsystems SP8X confocal microscope.

- Ideal for FLIM, FRET and diffuse optical tomography
- 1-78 MHz on-the-fly variable repetition rate with 23 steps
- > 1:10,000 Pulse Suppression ratio
- NIM standard trigger output (directly usable for FLIM)
- Timing delay generator

Master Seed Repetition Rate	78 (standard) or 40 MHz
Repetition Rate Reduction	78 – 2 MHz (23 steps)
	40 – 1 MHz (23 steps)
Pulse Suppression Ratio	> 1:10,000
Operation Mode	Constant Pulse Energy
Changing Repetition Rate <sup>1)</sup>	< 1 s
Timing Trigger Output Jitter	< 20 ps
NIM Trigger Output (BNC)	0.1 – 1 V peak
Monitor Trigger Output (BNC)	0 – 1 V
Adjustable Trigger Delay Timing <sup>2)</sup>	up to 9.2 ns
Adjustable Trigger Delay Resolution <sup>2)</sup>	15 ps

1) The system does not need to be electrically shut down.

2) 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.

# Specifications

## Optical

Master Rep Rate	40 MHz or 78 MHz
Master seed laser pulse	~5 ps
Total visible power stability	+/-1.5 % (without Power Lock) < ± 0.5 % (typical with Power Lock)
Polarization	Unpolarized
Beam output	Gaussian, single mode
M <sup>2</sup>	< 1.1
Output options	Collimated (standard) Divergent (on request)
Length of output fiber	1.5 m
Beam diameter	~1 mm at 530 nm ~2 mm at 1100 nm ~3 mm at 2000 nm
Beam Divergence (half angle)	< 5 mrad
Beam Pointing Accuracy <sup>1)</sup>	< 1 mrad
Beam Pointing Stability	< 50 µrad
Typical single mode fiber coupling efficiency	>70 %

## Mechanical/Electrical

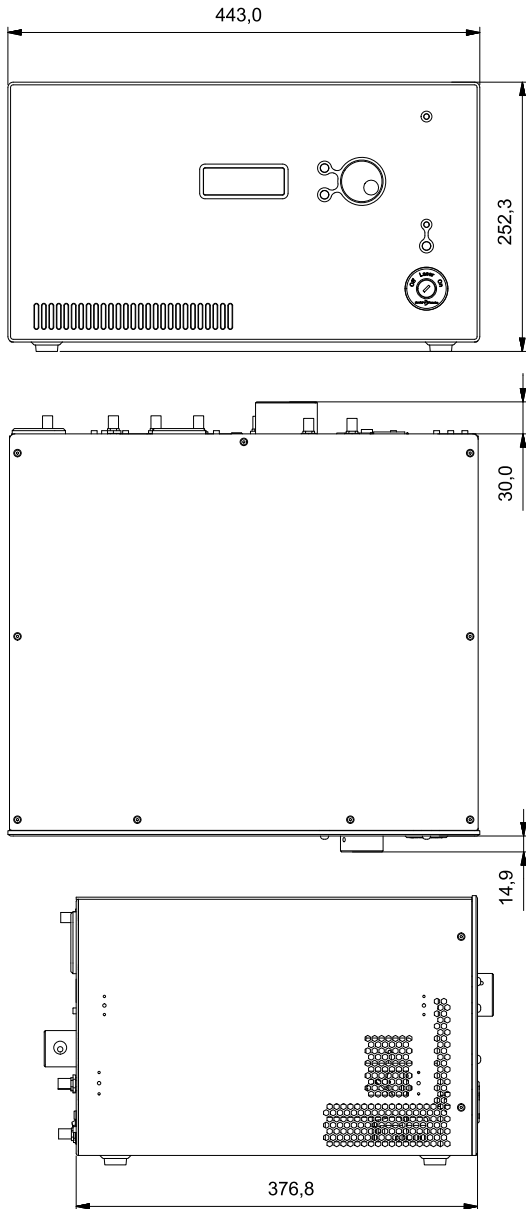
Computer Interface	USB 2.0
Operation Voltage	100-240 VAC 50/60 Hz
Power Consumption	<100 W (<120W with pulse picker)
Door Interlock Connector <sup>2)</sup>	2-pin LEMO
External Bus interface <sup>3)</sup>	16-pin sub-D
System Cooling	Air Cooled
Operation Temperature	+18° to +30°C
Storage Temperature	-10° to +60°C
Dimensions (WxHxL)	440x243x380 mm <sup>3</sup>
Weight	18 kg (19 kg with pulse picker)

- 1) Measured relative to the mechanical axis running through the center of the collimator
- 2) The SuperK Extreme is a Class 4 laser and is required to be connected to a door interlock/circuit
- 3) External communication and power supply port for accessories

All NKT Photonics products are produced under our quality management system certified in accordance with the ISO 9001:2008 standard.



SuperK\_EXTREME\_150616



All dimensions in mm

**NKT Photonics A/S (Headquarters)**  
 Blokken 84, 3460 Birkerød, Denmark  
 Phone: +45 4348 3900  
 Fax: +45 4348 3901

**NKT Photonics GmbH**  
 Schanzenstrasse 39, Bldg D9-D13  
 51063 Cologne, Germany  
 Phone: +49 221 99511-0  
 Fax: +49 221 99511-650

**NKT Photonics Inc.**  
 1400 Campus Drive West  
 Morganville NJ 07751, USA  
 Phone: +1 732 972 9937  
 Fax: +1 732 414 4094

## Light Manipulation Accessories

### SuperK VARIA



SuperK VARIA is a cost effective and flexible alternative to a monochromator, effectively turning the SuperK into a powerful single-line laser with a 440 nm tuning range and variable bandwidth. The center wavelength of the pass band can be tuned between 400 and 840 nm and the bandwidth is variable between 10 and 100 nm, making the VARIA the most flexible filter solution on the market. Increasing the bandwidth of the filter increases power throughput and reduces speckle in imaging applications. Moreover, a high out-of-band suppression of 50dB makes the SuperK VARIA ideal for FLIM and other applications using high sensitivity detectors.

### SuperK EXTEND-UV



SuperK EXTEND-UV is a deep-UV spectral extension unit for our SuperK EXTREME supercontinuum lasers. Get tunable UV light from a robust fiber laser source with 270-480 nm range and 2-80  $\mu$ W output power. The collimated output enables tight focusing and the fast pulses, down to 20 ps in length, make it ideal for studying ultrafast photochemical processes. The performance and output characteristics of the system depends on the Supercontinuum source used.

### SuperK SELECT



SuperK SELECT is a tunable wavelength filter based on acousto-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 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.