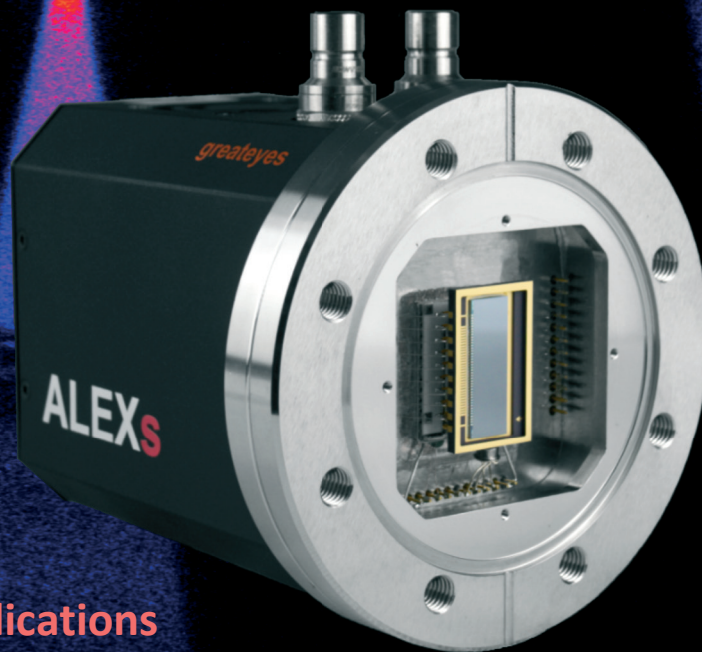


ALEX-s

greateyes

DISCOVER WHAT
THE EYE CAN'T SEE

Full-Frame Deep Cooling Scientific CCD Camera for Spectroscopy Applications



Typical Applications

- Soft X-Ray Spectroscopy
- Plasma Emission Spectroscopy
- High Harmonic Generation Spectroscopy
- NEXAFS Spectroscopy
- Resonant Inelastic X-Ray Scattering

Key Specifications

- High Quantum Efficiency
- Ultra Deep Cooling to $-100\text{ }^{\circ}\text{C}$
- 18-bit Dynamic Range
- Multi-MHz Readout
- Compact Design

ALEX-S



BERLIN IS UNIQUE FOR ITS CHARACTER AND SO IS ALEX



Straight out of Berlin comes **ALEX**, greateyes' new platform for your spectroscopy applications in the VUV, EUV, soft and hard X-Ray range. **ALEX** integrates cutting-edge low-noise electronics and ultra-deep cooling technology while keeping a compact camera design. Multiple readout speeds can be selected supporting pixel rates from 50 kHz up to 5 MHz. True 18-bit AD conversion allows to exploit the full dynamic range of the CCD sensor for highest performance and SNR. **ALEX** is ideally suited for detection of very weak signal intensities where a low-noise floor is paramount. **ALEX** offers unprecedented possibilities for your measurements of tomorrow. The absorption spectra of TiO_2 on the front page were taken using laboratory near edge X-ray absorption fine structure (NEXAFS) spectroscopy at the Berlin Laboratory for innovative X-ray Technologies (BLiX*) at the TU Berlin.



Features & Benefits

- **Ultra deep TE cooling to -100 °C**
lowest dark current for better detection limit
- **GigE & USB 3.0 data interface**
local or remote network operation – your choice!
- **Fast readout speeds up to 5 MHz**
fast frame rates paired with low-noise electronics
- **High QE up to 98%**
very sensitive sensors for low light applications
- **User selectable gain**
balance your detector for best SNR and dynamic range
- **Flexible software options**
camera software and SDKs available



Common specifications

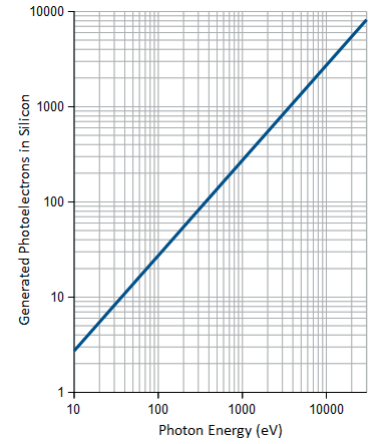
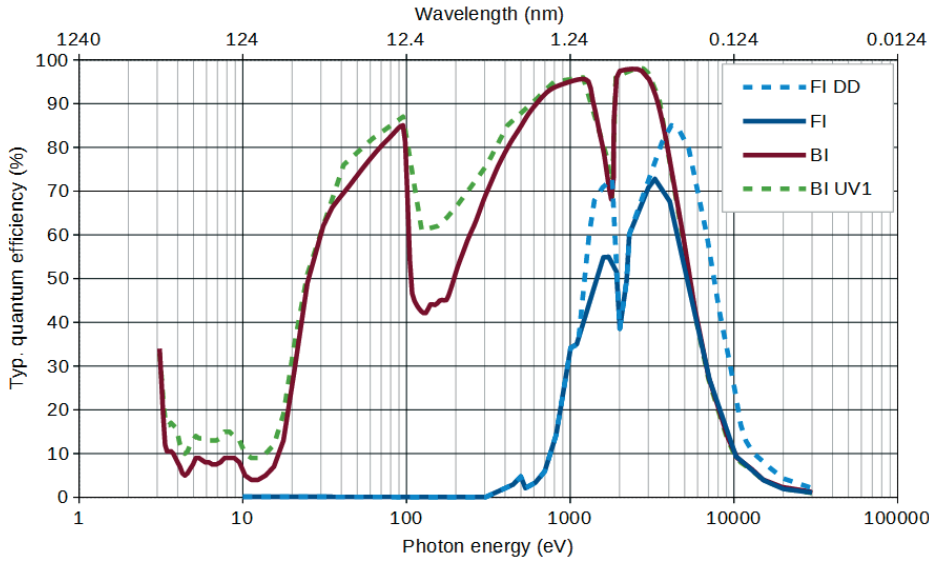
Pixel readout frequency	50 kHz, 250 kHz, 1 MHz, 3 MHz (5 MHz for visualization mode)
AD converter resolution	18-bit
Linearity	Better than 99%
CCD epitaxial thickness	15 μm standard, 40 μm for deep depletion (DD) models
Flange types	ISO-F DN63, knife-edge sealed CF DN63, CF DN100, CF DN160
Vacuum compatibility	With CF flange: 10^{-10} mbar (UHV capability)
Bakeout temperature	Max. +80 °C
Distance flange - focal plane	6 mm for CF DN63, 8 mm for CF DN100 (can be customised)
CCD sensor cooling	-100°C to 20°C, forced air or liquid cooling
Temperature monitoring	Two thermistors at CCD sensor and thermoelectric cooler (hot side)
Data link	Gigabit Ethernet, USB 3.0
Software	greateyes Vision software for Windows 7 / 10
SDK and drivers	DLL for Windows; LabVIEW, EPICS, Linux, Python, Tango driver (optional)
TTL interface signals	Sync out, shutter out, 2 external trigger in
Operating conditions	Temperature: 0°C to 35°C ambient, relative humidity <80% (non-condensing)
Power supply	80-264 VAC (115/230 typical), 47-63 Hz (50/60 typical), max. 1.1 A (230 VAC), 1.9 A (115 VAC)
Certification	CE
Dimensions	8.3 cm (3.27") × 10.0 cm (3.94") × 10.9 cm (4.29") (W × H × L, camera body)
Weight	2.9 Kg (with CF DN63 flange)

*for details, see https://www.axp.tu-berlin.de/research/ns_nexafs_with_soft_x_rays/

ALEX-S



The Berlin TV Tower (the tallest building in Germany) and the ALEX square below it are symbols of Berlin and beloved by Berliners.



The mean energy of a photon to generate an electron-hole pair in silicon is 3.66 eV.



Step 1: Choose your camera model

ALEX-s series	ALEX-s 1k256			ALEX-s 2k512	
Sensor code	FI FI DD BI UV1			FI BI BI UV1	
Usable pixels (columns × rows)	1024 × 255			2048 × 515	
Active image area	26.6 mm × 6.7 mm			27.6 mm × 6.9 mm	
Pixel size	26 μm × 26 μm			13.5 μm × 13.5 μm	
Full well capacity	500 ke ⁻ / 700 ke ⁻ (DD)			100 ke ⁻	
Register well capacity	1 000 ke ⁻ / 1 400 ke ⁻ (DD)			400 ke ⁻	
Typ. read noise (e ⁻)	FI	BI	DD		
@ 50 kHz	4.2	6.0	5.4	3.5	
@ 1 MHz	12.0	13.1	12.3	6.8	
@ 3 MHz	25.0	26.0	25.0	10.7	
Dark current @ -100°C	0.0004 e ⁻ /pixel/s 0.005 e ⁻ /pixel/s (DD)			0.00025 e ⁻ /pixel/s	
User selectable gain:					
Standard mode	0.4 counts/e ⁻			1 counts/e ⁻	
High capacity mode	-			0.34 counts/e ⁻	
CCD sensor type	Front-illuminated (FI), back-illuminated (BI), deep depletion fringe suppression (DD), enhanced back-illuminated (BI UV1)				
Blemish specifications	Grade 0 or grade 1 (standard) as specified by sensor manufacturer. For more information, please see: https://www.greateyes.de/en/glossar.html				



Step 2: Select interface vacuum flange

Order code	Description
CF1	Knife-edge sealed CF DN63 flange with threaded holes
CF2	Knife-edge sealed CF DN100 flange with through holes
CF4	Rotatable, knife-edge sealed CF DN100 flange with through holes

We also provide quick release, rotatable and other flanges of various sizes, please let us know your requirement.

ALEX-S



Step 3: Choose your accessories and software

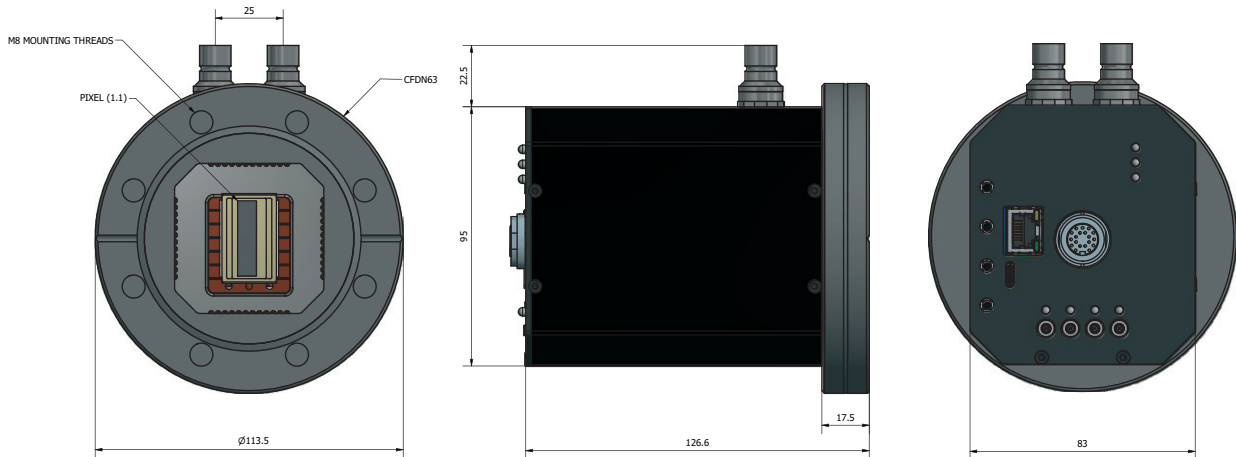
Order code	Description
<i>A) Accessories for imaging purposes</i>	
GE-SR35	35mm shutter, including shutter driver module (compatible with CF DN100 or larger)
GE-AE01	Additional CF DN63 flange with a window of Beryllium, MgF2, UVFS or other materials, can be sealed with the camera flange, with a port for external vacuum pump, enables ALEX to be used in air independently
<i>B) Accessories for enhanced cooling performance</i>	
GE-CR01	Compact liquid cooling, circulating the coolant at room temperature for deep camera cooling
GE-CR02	Recirculating water chiller, PID control with temp. from -5°C to 30°C for ultra-deep camera cooling
<i>C) Software development kit (SDK) and drivers</i>	
GE-LX01	SDK for Linux (c/c++ based)
GE-PYT01	Python driver
GE-LAB01	LabVIEW driver
GE-EP	EPICS driver
GE-TAN	Tango driver



Step 4: Flexible customisation service

With direct and fast response, we provide various customisations and OEM services. For example, other sensor types, the alteration of sensor position/tilt, the modification of camera housing or cooling system, etc. Let us know what **ALEX** you require.

TECHNICAL DRAWINGS



Items included with your camera

GE-VI01	greateyes Vision software suite for Windows
GE-SDK01	SDK for Windows (C/C++ based)
GE-USB3m3	3m USB 3.0 cable type A to type C
GE-GigE10m	10m Ethernet cable
GE-StoB2m	2m SMB to BNC connection cable x 2
GE-POW01	Camera power supply with cabling
GE-ManCam	Camera instruction manual



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