

greateyes

DISCOVER WHAT
THE EYE CAN'T SEE

Spectroscopy



Typical Applications

- Raman Spectroscopy
- NIR Spectroscopy
- Fluorescence Spectroscopy
- Absorption, Transmission, Reflectance Spectroscopy

Key Specifications

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

Imaging



Typical Applications

- In-vivo Fluorescence Bioimaging
- Astronomy
- LIBS Spectroscopy
- Neutron Tomography
- EL / PL Imaging
- Ultracold Quantum Studies

Key Specifications

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

Full-Frame Deep Cooling Scientific CCD Camera for Spectroscopy

ELSE^S



Features & Benefits

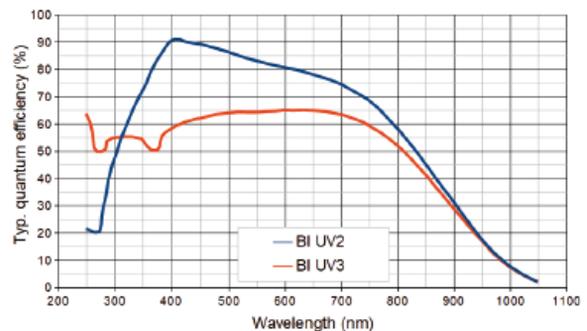
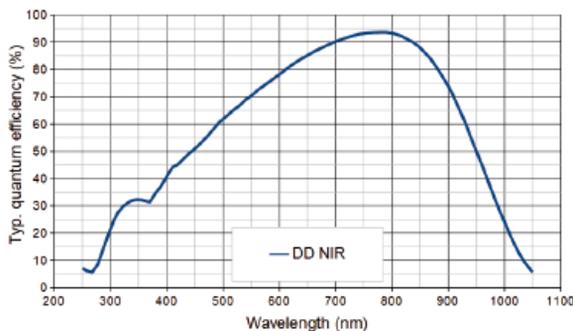
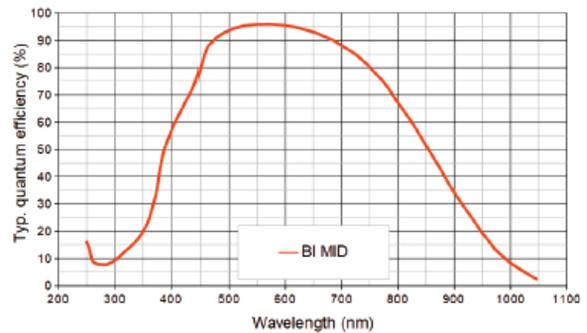
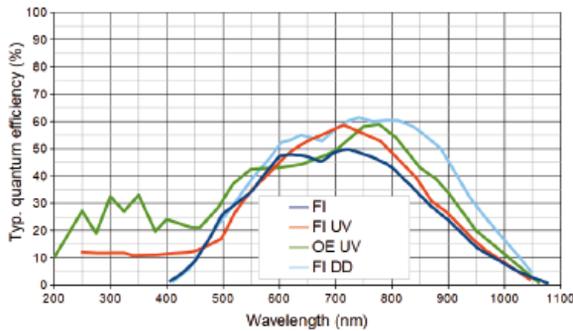
- **Ultra deep TE cooling to -100 °C**
lowest dark current for better detection limit
- **Hermetic vacuum seal**
low camera maintenance and sensor protection
- **GigE & USB 3.0 data interface**
local or remote network operation – your choice!
- **Multiple sensor options**
UV, VIS or NIR coatings for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



Common specifications

Pixel readout frequency	50 kHz, 250kHz, 1 MHz, 3 MHz (5 MHz for visualization mode; up to 6 speeds)
AD converter resolution	18-bit
Linearity	Better than 99%
Window material	MgF ₂ or UVFS for UV sensitive models, otherwise BK7
Distance flange - focal plane	10.0 mm
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 driver (optional)
TTL interface signals	Exposure out, shutter out, external trigger in
Operating conditions	Temperature: 0°C to 35°C ambient, relative humidity <80% (non-condensing)
Power supply	80-264 VAC (115/230 VAC typical), 47-63 Hz (50/60 Hz 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") × 13.1 cm (5.16") (W × H × L)
Weight	1 800 g

VIS/NIR分光CCD 量子効率効率



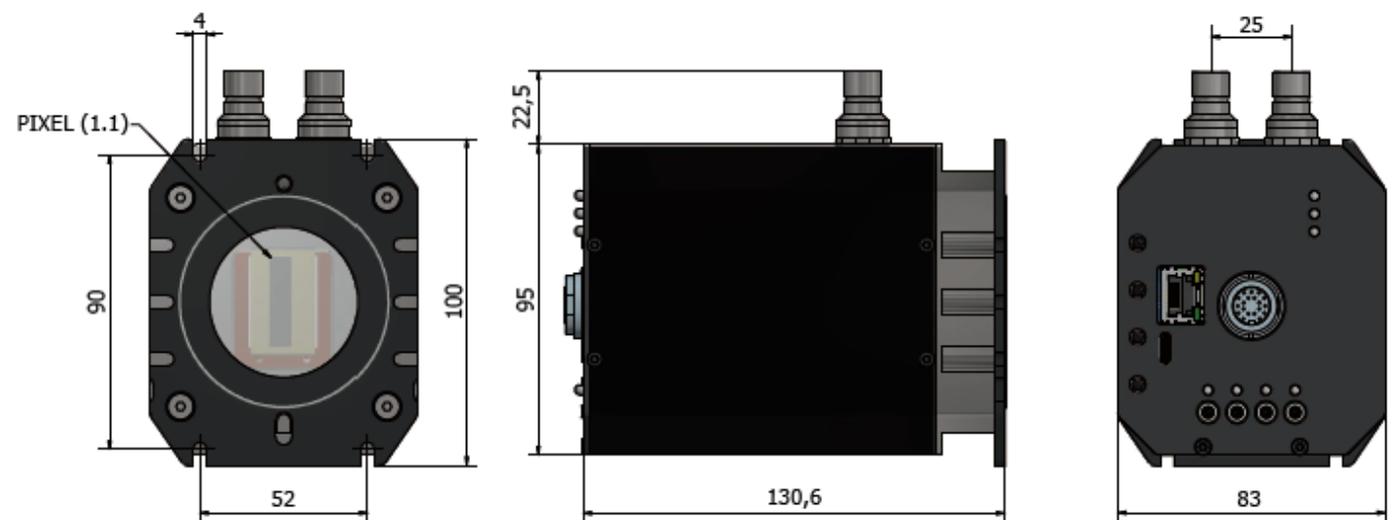
モデル

	ELSE 1024 128	ELSE 1024 256	ELSE 2048 512
Enhanced UV sensitivity		OE UV BI UV2, BI UV3	FI UV BI UV2, BI UV3
Enhanced VIS sensitivity	BI MID	FI BI MID	FI BI MID
Enhanced NIR sensitivity	DD NIR	FI DD DD NIR	
Nominal pixel format	1024 × 128	1024 × 256	2048 × 512
Image area	26.6 mm × 3.3 mm	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 ⁻
Dark current @ -100°C	0.0004 e ⁻ /pixel/s 0.005 e ⁻ /pixel/s (DD)		0.00025 e ⁻ /pixel/s
Typ. read noise (e ⁻)	BI / DD	FI BI DD	FI / BI
@ 50 kHz	5.5	4.2 6.0 5.7	3.5
@ 1 MHz	13.1	12.0 13.1 12.3	7.2
@ 3 MHz	23.0	22.0 23.0 22.5	11.3
User selectable gain	0.3 counts/e ⁻ (low noise mode)		0.4 counts/e ⁻ (high capacity) 1.2 counts/e ⁻ (low noise)
CCD sensor type	Front-illuminated (FI), back-illuminated (BI), deep depletion fringe suppression (DD), open-electrode (OE)		
Antireflective coating	UV (UV2, UV3), midband (MID), multiband (MU2), near-infrared (NIR)		
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		

分光用アクセサリ、ソフトウェア

Order code	Description
<i>A) Accessories for imaging purposes</i>	
GE-M42	M42 lens adapter (integrated filter holder optional)
GE-FM01	F-mount lens adapter (integrated filter holder optional)
GE-SR35	35mm shutter, including shutter driver module
<i>B) Accessories for enhanced cooling performance</i>	
GE-CR01	Compact recirculator operating at room temperature for deep camera cooling
GE-CR02	Recirculating water chiller, temperature range -5°C to 30°C for ultra-deep camera cooling
<i>C) Software development kit (SDK) and drivers</i>	
GE-LAB01	LabVIEW driver
GE-EP	EPICS driver
GE-LX01	Linux driver

分光用CCD外観寸法



Full-Frame Deep Cooling Scientific CCD Camera for Imaging

ELSEⁱ



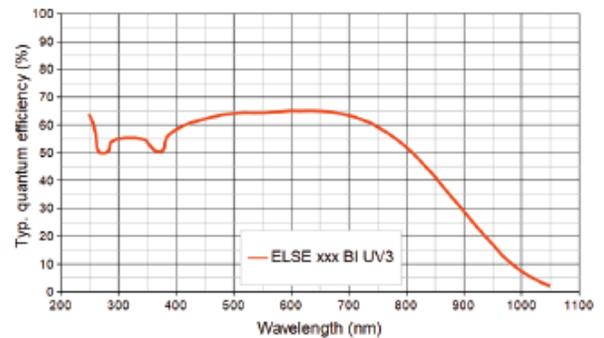
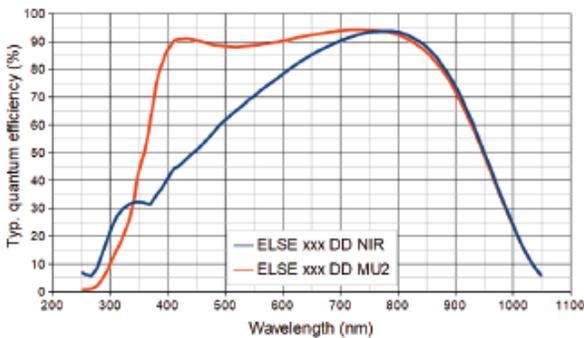
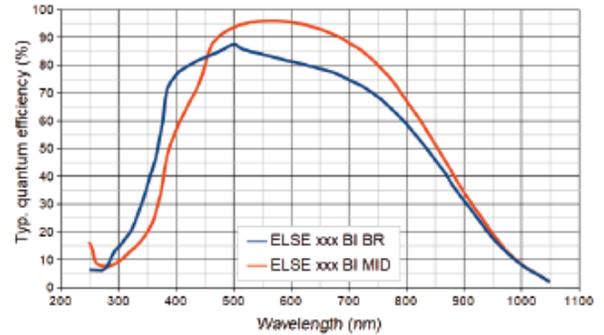
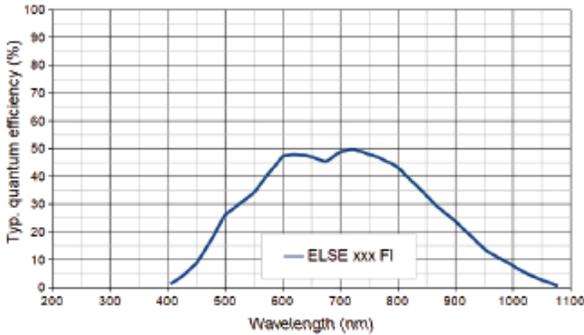
Features & Benefits

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

Common specifications

Pixel readout frequency	50 kHz, 250kHz, 1 MHz, 3 MHz (5 MHz for visualization mode; up to 6 speeds)
Readout modes	2 output nodes for 1 Mpx and 4 Mpx camera, 4 output nodes for 16 Mpx camera
AD converter resolution	18-bit
Linearity	Better than 99%
Window material	MgF ₂ or UVFS for UV sensitive models, otherwise BK7
Flange - focal plane	10.0 mm (1 Mpx & 16 Mpx); 9mm (4 Mpx)
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 driver (optional)
TTL interface signals	Exposure out, shutter out, external trigger in
Operating conditions	Temperature: 0°C to 35°C ambient, relative humidity <80% (non-condensing)
Power supply	1 Mpx & 4 Mpx: 80-264 VAC (typ. 115/230), 47-63 Hz (typ. 50/60), max. 1.1 A (230 V) / 1.9 A (115 V) 16 Mpx: 85-264 VAC (typ. 115/230), 47-63 Hz (typ. 50/60), max. 1.9 A (230 V) / 3.8 A (115 V)
Certification	CE
Dimensions	8.3 cm (3.27") × 10.0 cm (3.94") × 13.1 cm (5.16") (W × H × L, 1 Mpx & 4 Mpx) 13.7 cm (5.39") × 13.7 cm (5.39") × 17.1 cm (6.71") (W × H × L, 16 Mpx)
Weight	2.2 kg (1 Mpx & 4 Mpx), 5.4 kg (16 Mpx)

VIS/NIRイメージングCCD 量子効率曲線



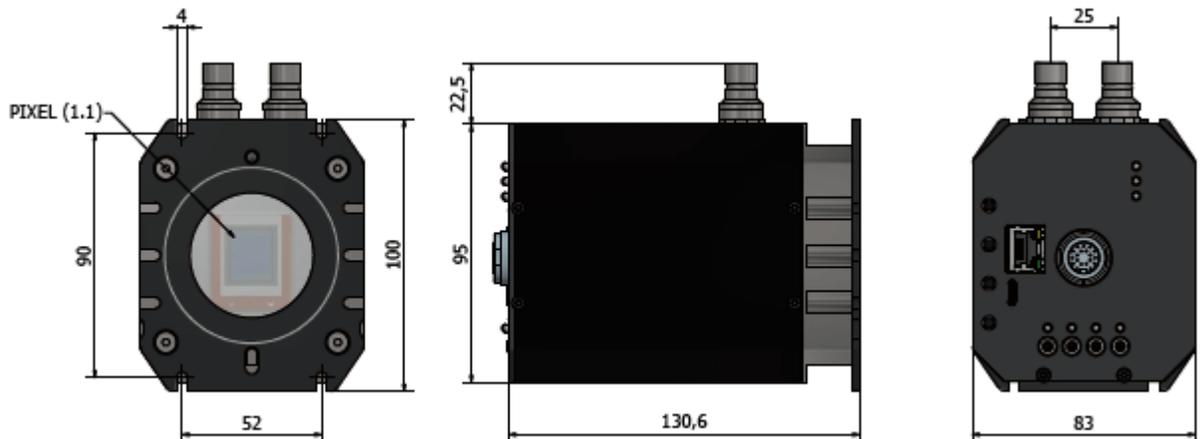
モデル

ELSE ⁱ Series	 ELSE 1024 1024	 ELSE 2048 2048	 ELSE 4096 4096
Enhanced UV sensitivity	BI UV3	BI UV3	
Enhanced VIS sensitivity	FI BI BR BI MID	FI BI MID	FI BI BR BI MID
Enhanced NIR sensitivity	DD NIR DD MU2	DD NIR	DD MU2
Nominal pixel format	1024 × 1024	2048 × 2048	4096 × 4096
Image area	13.3 mm × 13.3 mm	27.6 mm × 27.6 mm	61.4 mm × 61.4 mm
Pixel size	13 μm × 13 μm	13.5 μm × 13.5 μm	15 μm × 15 μm
CCD sensor cooling	-100 °C to 20 °C	-80 °C to 20 °C	-90 °C to 20 °C
Full well capacity	100 ke ⁻ 120 ke ⁻	100 ke ⁻ 150 ke ⁻	150 ke ⁻ 350 ke ⁻
Register well / Output node	400 ke ⁻ / -	400 ke ⁻ / - 600 ke ⁻ / -	- / 900 ke ⁻ - / 600 ke ⁻
Typ. read noise (e ⁻)			
@ 50 kHz	2.5	3.8	4.7 2.5
@ 1 MHz	6.5	8.7	9.5 6.3
@ 3 MHz	9.0	13.6	17.0 10.5
Dark current (e ⁻ /pixel/s)	@ -100 °C 0.00015 0.0005	@ -80 °C 0.0003 0.01	@ -90 °C 0.00008 0.004
User selectable gain	0.65 counts/e ⁻	0.5 counts/e ⁻ (low noise) 1.5 counts/e ⁻ (high capacity)	0.4 counts/e ⁻ (low noise) 1.2 counts/e ⁻ (high capacity)
CCD sensor type	Front-illuminated (FI), back-illuminated (BI), deep depletion fringe suppression (DD)		
Antireflective coating	UV (UV3), broadband (BR), midband (MID), near-infrared (NIR), multiband (MU2)		
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		

イメージング用アクセサリ、ソフトウェア

Order code	Description
<i>A) Accessories for imaging purposes</i>	
GE-CM01	C-mount lens adapter for 1 Mpx camera (integrated filter holder optional)
GE-M42	M42 lens adapter for 1 Mpx & 4 Mpx cameras (integrated filter holder optional)
GE-FM01	F-mount lens adapter for 1 Mpx & 4 Mpx cameras (integrated filter holder optional)
GE-SR25	25mm shutter for 1 Mpx camera, including shutter driver module
GE-SR45	45mm shutter for 4 Mpx camera, including shutter driver module
<i>B) Accessories for enhanced cooling performance</i>	
GE-CR01	Compact recirculator operating at room temperature for deep camera cooling
GE-CR02	Recirculating water chiller, temperature range -5°C to 30°C for ultra-deep camera cooling
<i>C) Software development kit (SDK) and drivers</i>	
GE-LAB01	LabVIEW driver
GE-EP	EPICS driver
GE-LX01	Linux driver
GE-PYT01	Python SDK

イメージング用CCD外觀寸法



*Only valid for ELSE 1024 1024 and ELSE 2048 2048. For the drawing of ELSE 4096 4096, please send us an enquiry.