

# ELSE-i

# greateyes

DISCOVER WHAT  
THE EYE CAN'T SEE

## 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 Imaging Applications

## THE GOLDEN CHILD OF LOW NOISE CCD CAMERAS



Straight out of Berlin comes **ELSE**, greateyes' new platform for your spectroscopy and imaging applications in the UV-VIS-NIR range. **ELSE** 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. Choose from a wide range of sensors to find the best match with your requirements. **ELSE** is ideally suited for detection of very weak signal intensities where a low-noise floor is paramount. **ELSE** offers unprecedented possibilities for your measurements of tomorrow.



### 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

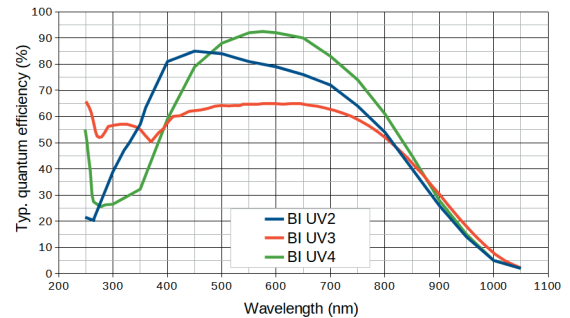
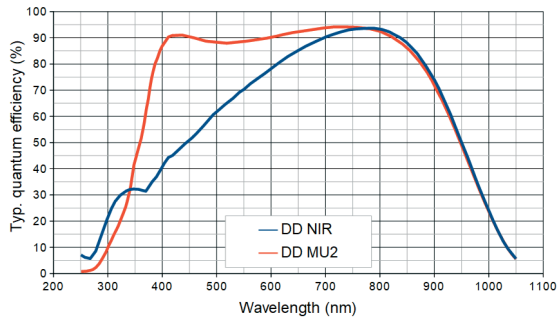
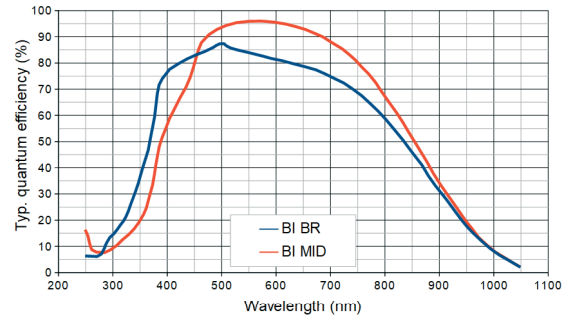
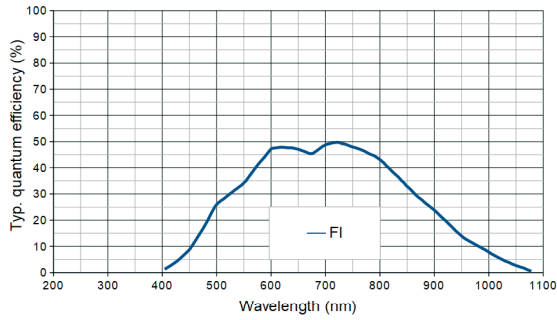


### Common specifications

Pixel readout frequency	50 kHz, 250 kHz, 1 MHz, 3 MHz (5 MHz for visualization mode; up to 20 MHz with multi-output)
Readout modes	2 output nodes for 1k1k & 2k2k cameras, 4 output nodes for 2k2k plus & 4k4k cameras
AD converter resolution	18-bit
Linearity	Better than 99%
Window material	MgF <sub>2</sub> or UVFS for UV sensitive models, otherwise BK7
Flange - focal plane	10.0 mm (1k1k, 2k2k plus & 4k4k cameras); 9mm (2k2k camera)
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 and Tango driver (optional)
TTL interface signals	Exposure out, shutter out, 2 external trigger in
Operating conditions	Temperature: 0°C to 35°C ambient, relative humidity <80% (non-condensing)
Power supply	1k1k & 2k2k: 80-264 VAC (typ. 115/230), 47-63 Hz (typ. 50/60), max. 1.1 A (230 V) / 1.9 A (115 V) 2k2k plus & 4k4k: 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, 1k1k & 2k2k camera body) 13.7 cm (5.39") × 13.7 cm (5.39") × 17.1 cm (6.71") (W × H × L, 2k2k plus & 4k4k camera body)
Weight	2.2 kg (1k1k & 2k2k), 5.4 kg (2k2k plus & 4k4k)

# ELSE-i

The golden statue of Victoria upon the Berlin Victory Column has been given the nickname "Else" by Berliners.



## Step 1: Choose your camera model

ELSE-i Series	ELSE-i 1k1k		ELSE-i 2k2k		ELSE-i 2k2k plus		ELSE-i 4k4k	
Enhanced UV sensitivity	BI UV3		BI UV3		BI UV3		BI UV2 BI UV4	
Enhanced VIS sensitivity	FI BI BR BI MID		FI BI MID		BI MID		FI BI BR BI MID	
Enhanced NIR sensitivity	DD NIR DD MU2		DD NIR DD MU2				DD MU2	
Usable pixels (columns × rows)	1024 × 1024 (FI) 1056 × 1027 (others)		2048 × 2052		2048 × 2064		4096 × 4112	
Active image area	13.3 mm × 13.3 mm		27.6 mm × 27.6 mm		30.7 mm × 30.7 mm		61.4 mm × 61.4 mm	
Pixel size	13 μm × 13 μm		13.5 μm × 13.5 μm		15 μm × 15 μm		15 μm × 15 μm	
CCD sensor cooling	-100 °C to 20 °C		-90 °C to 20 °C		-90 °C to 20 °C		-90 °C to 20 °C	
Full well capacity	100 ke <sup>-</sup>	120 ke <sup>-</sup>	100 ke <sup>-</sup>	150 ke <sup>-</sup>	150 ke <sup>-</sup>		150 ke <sup>-</sup>	350 ke <sup>-</sup>
Register well / Output node	400 ke <sup>-</sup> / -		400 ke <sup>-</sup> / 600 ke <sup>-</sup> / -		850 ke <sup>-</sup> / 900 ke <sup>-</sup>		- / 900 ke <sup>-</sup>	- / 600 ke <sup>-</sup>
Typ. read noise (e <sup>-</sup> )								
@ 50 kHz	2.8		3.4		4.6		4.6	
@ 1 MHz	6.4		7.0		8.5		8.5	
@ 3 MHz	10.9		13.6		17.0		17.0	
Dark current (e <sup>-</sup> /pixel/s)	@ -100 °C		@ -90 °C		@ -90 °C		@ -90 °C	
	0.00015	0.0005	0.0001	0.001	0.00008		0.00008	0.0006
Gain (counts/e <sup>-</sup> ):								
Standard mode	1		1		0.6		0.6	
High capacity mode			0.34		0.2		0.2	
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), astro broadband (UV2), astro midband (UV4)							
Blemish specifications	Grade 0 or grade 1 (standard) as specified by sensor manufacturer. For more information, please see: <a href="https://www.greateyes.de/en/glossar.html">https://www.greateyes.de/en/glossar.html</a>							



## Step 2: Choose your accessories and software

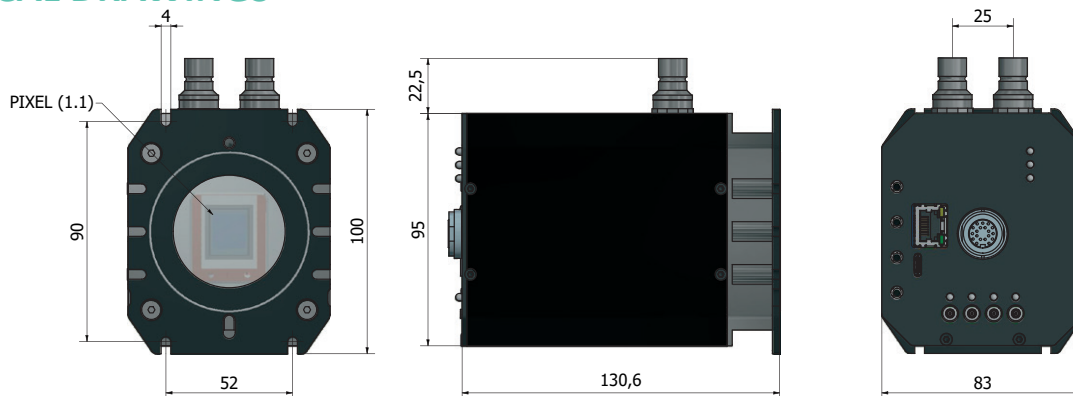
Order code	Description
<i>A) Accessories for imaging purposes</i>	
GE-CM02	C-mount lens adapter for 1k1k camera
GE-M4202	M42 lens adapter for 1k1k, 2k2k, and 2k2k plus cameras (integrated filter holder optional)
GE-FM02	F-mount lens adapter for 1k1k, 2k2k, and 2k2k plus cameras (integrated filter holder optional)
GE-SR25	25mm shutter for 1k1k camera, including shutter driver module
GE-SR45	45mm shutter for 2k2k and 2k2k plus camera, including shutter driver module
<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 3: Flexible customisation service

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

### TECHNICAL DRAWINGS\*



\*Only valid for ELSE-i 1k1k and ELSE-i 2k2k. For other drawings, please send us an enquiry.



### 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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