1100S CCD Camera

SI's 1100S camera is designed for the highest performance in a very flexible configuration. TE or cryo cooling options are available for short exposure high speed applications or the long integrations of astronomy.

Features

- **Cooling:** The 1100 can be outfitted for cryo cooling to below -100°C or with thermoelectric cooling for temperatures as low as -60°C.
- **Readout:** Multiple read speeds are available. Common speeds start at 100kHz, and can go as high as 2MHz depending on the sensor selection.
- **Noise:** The 1100's sub 3e- RMS noise is the lowest in the industry.
- **Dynamic Range:** The low read noise with 16-bit digitization and high full well provide wide-dynamic-range imaging.
- **Sensors:** The 1100 is typically fitted with 4k x 4k 15µm pixel sensors but can handle 4-port CCDs with up to 6k x 6k 15µm pixels.
- **High Performance:** Low read noise, uncompromised binning , and ROI imaging for small area high speed readout are available as performance enhancing options.
- **Ports:** One to four port simultaneous readout is available depending on the sensor selection.
- **Fiber Optic Input:** Fiber optic inputs, 1:1 faceplates or tapers for magnification, can be bonded directly to the CCD.
- **Shutter:** Shutters can be mounted on the camera, driven by the camera itself and operated by user software.
- **Interface:** Standard communication to the computer is by fiber optic cable to proprietary PCI or PCIe card. Camera link is available as well.
- **Software:** Included with every camera is our SI Image software suite for camera control, data manipulation and archiving. The native file format is FITS. C++ and LabView SDKs are available upon request. Linux drivers exist in the public domain.

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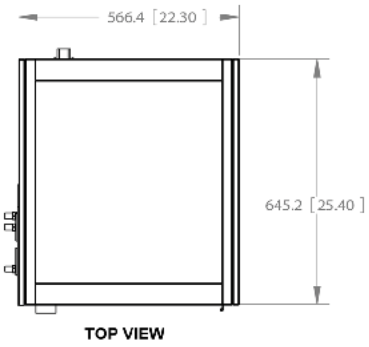
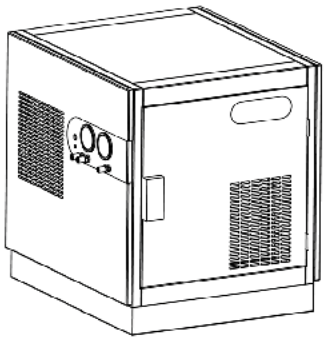
Camera Details

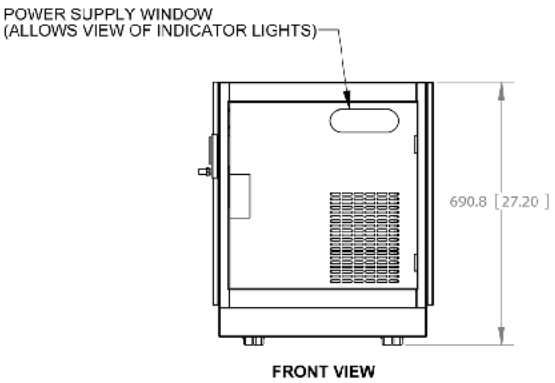
Cryo cooling	One compressor housed in supplied cabinet with braided stainless steel lines running to camera head, up to 100'
Thermoelectric Cooling	One liter per minute @ 20°C water cooling required for most configurations and CCD temperatures down to –60° for most 4k x 4k sensors
Window details	Many AR coatings are available by custom order. Typical Broadband specs: <1% Reflectivity per surface, 450- 800nm
Window heater	Adhered to front window for cryo versions
CCD to mounting surface	~20mm, depends on CCD and options
Read speeds	Software selectable, customizable
Camera weight	About 12lbs, depending on options

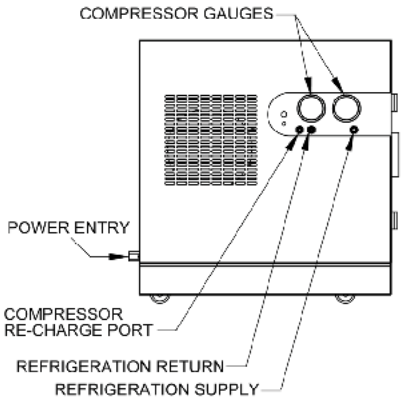
All camera specifications are subject to change. Contact SI for details on configuring a camera specific to your application.

Cabinet Details









Grade 1 CCD Cosmetics (42-40)

Column Defects	3
Dark pixels	150
Bright pixels	150
Traps	20

CCD cosmetics subject to change
Contact SI if other requirements must be met
See www.e2v.com for the latest specifications

Typical Camera performance 230-84 CCD (high speed)

Read noise 500kHz	7.0e-
Read noise 1MHz	10.2e-
Read noise 2MHz	14.7e-
Dark current –60°C	0.01e-/pixel/s
Non-Linearity	<1%, 200e- to 100ke-
CCD size	61.4mm x 61.4mm
CCD pixel size	15.0µm
CCD pixel dimension	4096(H) x 4112(V)
Backside AR coatings available	Midband, Broadband, and uncoated

Typical Camera Performance 231-84 CCD

Read noise 100kHz	2.1e-
Read noise 344kHz	2.7e-
Read noise 709kHz	5.3e-
Read noise 1.5MHz	9.7e-
Dark current -90°C	0.0003e-/pixel/s
Full well	320ke-
Non-Linearity	<1%, 400e- to 300ke-
CCD Size	61.4mm x 61.4mm
CCD pixel size	15µm
CCD pixel dimension	4096(H) x 4112(V)
Backside AR coatings available	Astro Broadband, Astro Midband, Astro ER1, Deep depletion silicon available

Typical Fiber Faceplate Specifications

Fiber size	6µm	
Magnification	1.0	
EMA	Enhanced Statistical	
Surface finish	20/10 Scratch-Dig	
Flatness	2 waves max (1/2 wave goal)	
Shear distortion	<0.0025 inches	
Gross distortion	<1% in clear aperture	
Blemishes	<0.003" 0.003-0.006" >0.006"	<1% area 8 max none
Fiber optic specifications subject to change		

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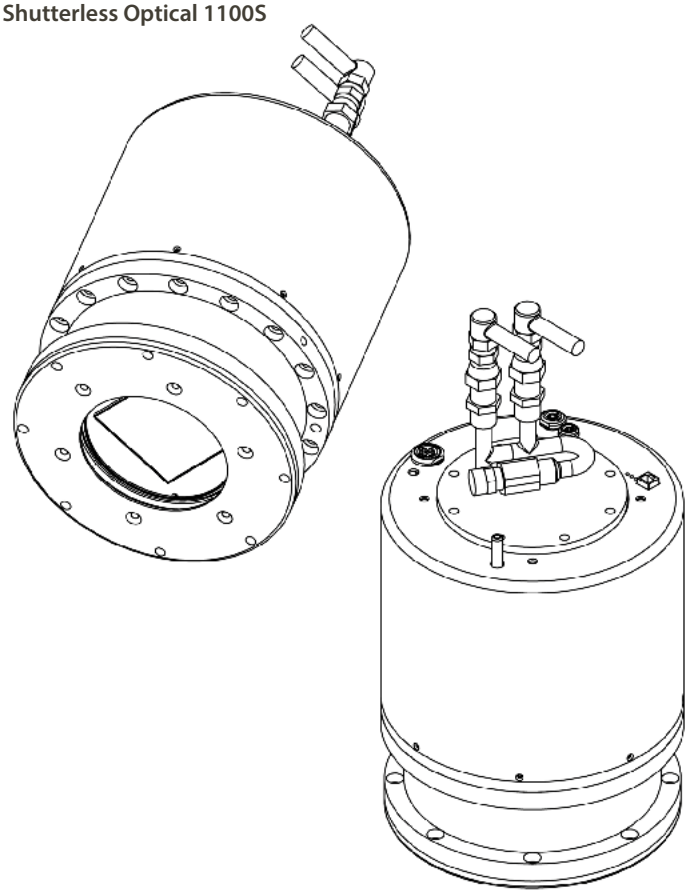
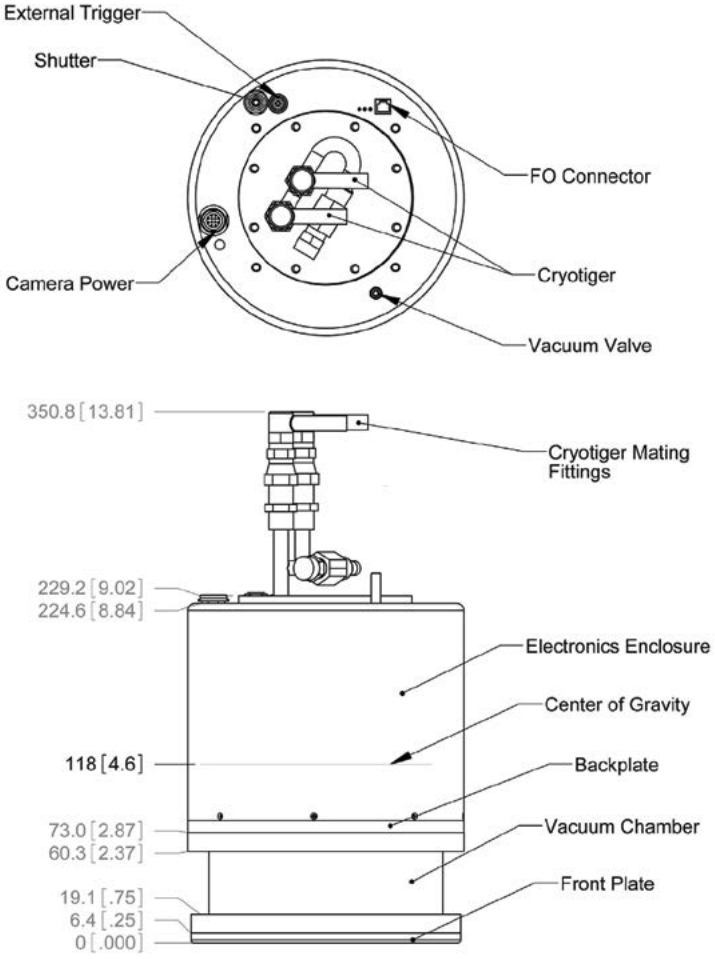
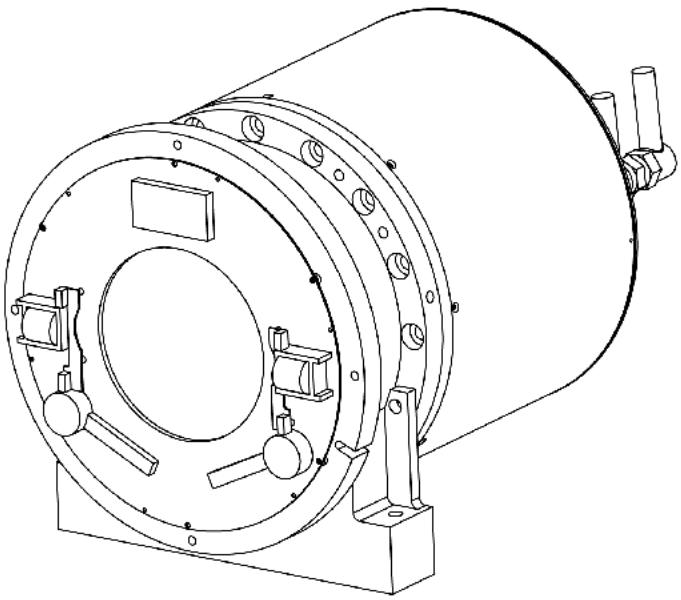
1100S CCD Camera

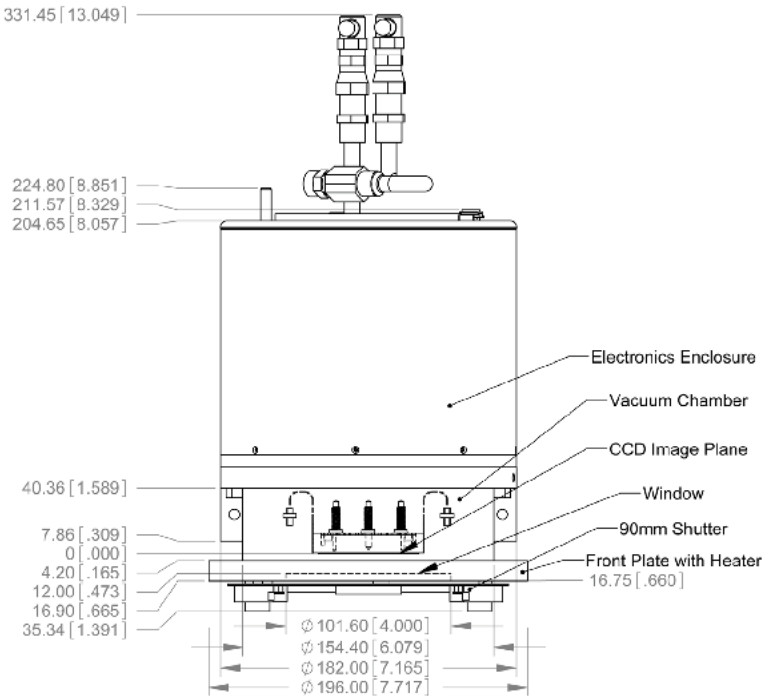
Shutterless Optical 1100S





1100S with 90mm Shutter





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Astronomy

The demanding requirements of Astronomical observations, high sensitivity, low read noise, low dark current are all satisfied by the performance of an 1100S camera. Astronomers around the world have utilized SI's renowned skills to exceed the imaging requirements of their applications.

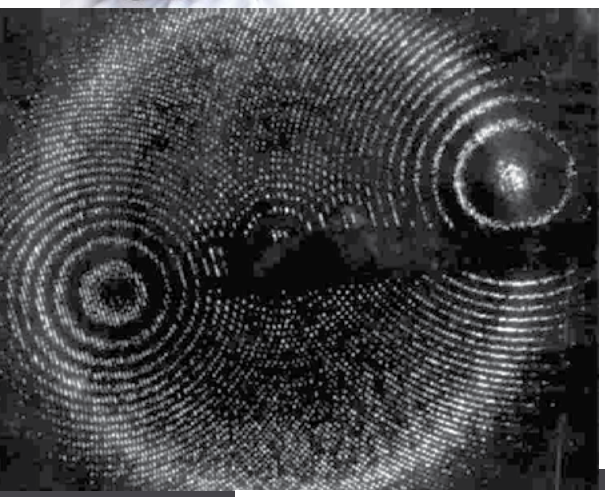
Photo credit: Daniel López, IAC
Imagd with a 2k x 2k Spectral Instruments CCD Camera

Custom Cameras

SI specializes in the manufacture of custom cameras for unique applications. Shown at left is an 1100S with the CCD mounted perpendicular to the usual axis at the end of a long arm. The customers' final lens element is mounted as the entrance to the CCD vacuum chamber. All of this was accomplished while retaining cryo cooling levels of the 2k x 2k CCD.

Custom Cameras

1100S TE cooled camera with a 4k x 4k CCD and a 1:1 fiber optic manufactured for indirect detection of high energy particles.



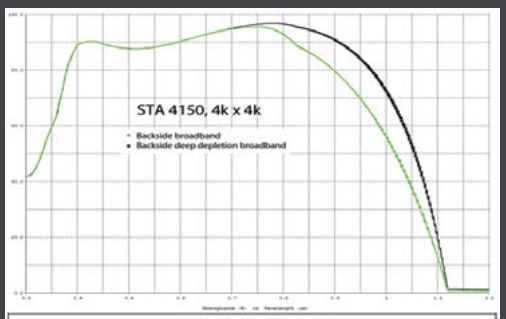
X-Ray and High Energy Particles

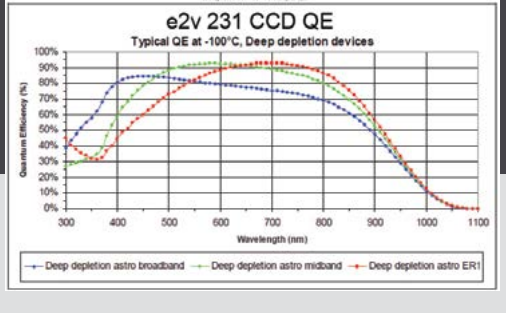
Large fiber optic taper reducers are frequently bonded to the 4k x 4k 15µm pixel sensor and mated to a phosphor for x-ray work. Our cameras can be frequently found at synchrotron facilities and national laboratories around the world. The 1100S has been used in conjunction with mirrors and lenses to get the sensitive CCD and electronics out of the path of harmful radiation from the application while retaining high resolution imaging.

Typical Camera performance 44-82 CCD

Read noise 100kHz	2.5e-
Read noise 400kHz	6.0e-
Dark current –100°C	0.0007e-/pixel/s
Non-linearity	<1%, 200e- to 100ke-
CCD size	30.7mm x 61.4mm
CCD pixel size	15.0µm
CCD pixel dimension	2048(H) x 4096(V)
Backside AR coatings available	Astronomy Broadband, Midband, Enhanced Red, Deep depletion silicon available as well

The 1100S can handle practically any CCD available on the market today, but was designed for the large format 2k x 2k to 4k x 4k and larger sensors. Refer to the CCD manufacturer's website for updated QE data, but just a small example of the different backside AR coatings available from two potential manufacturers is shown at right.





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