



System Features^{*1}

- **High Resolution Sensor**
1 Megapixel sensor with 13 μm pixels delivers a large field of view with high resolution.
- **Programmable TE cooling down to 60°C below ambient**
Ideal for detection of weak chemiluminescence or astronomy images, enabling long exposure acquisitions with optimized signal to noise ratio.
- **Ethernet interface with built-in web server**
Remote access and control over the Internet, via standard web browser.
- **USB 2.0 interface**
Direct 'Plug and Play' simplicity of USB 2.0.
- **16-Bit digitization**
High photometric accuracy.
- **High longevity shutter**
Shutter during readout and take dark reference frames - 35 mm.
Specified for >5 million cycles.
- **Programmable I/O port**
Synchronization with intricate experimental set-ups.
- **Remote Triggering**
LVTTTL input allows exposure to start within 25 microseconds of the rising edge of the trigger.
- **Focusing mode**
Faster readout option, ideal for focus optimisation.
- **Precision locking filter wheels optional**
Choose from a range of Apogee family filter wheels with up to 17 positions.

Apogee Aspen CG47: Compact, 1 Megapixel CCD

Ideally suited to challenging astronomy and physical science imaging applications, the Apogee Aspen family offers a range of popular full frame and interline CCD sensors, within a camera platform that is designed to push performance. Deep thermoelectric cooling ensures optimal sensitivity for long exposure applications. The simple convenience of a USB 2.0 interface is accompanied by an Ethernet network interface with a built-in web server. The Apogee Aspen also utilizes a new extremely high reliability shutter, specified for > 5 million shutter cycles.

The Aspen CG47 has a back-illuminated full frame 1 megapixel CCD with very high quantum efficiency (>90% @550nm). The standard midband coating provides the highest peak in the visible range. Cooling down to 60°C below ambient results in a low dark current contribution. These features combine to make the Aspen CG47 an exceptionally versatile performer, and an ideal solution for many astronomy or physical science applications.

Specifications Summary^{*1}

Array Size (pixels)	1024 x 1024 (1Megapixel)
Pixel Size	13 x 13 μm
Sensor Size	13.3 x 13.3 mm (177 mm ²) 18.8 mm diagonal
Pixel Well Depth (typical)	85,000 e ⁻
Dark Current^{*2}	0.207 e ⁻ /pixel/sec
Read Noise^{*3}	16.9 e ⁻ (RMS @ 0.82 Mhz)
Maximum Dynamic Range	74 dB (5030:1)
Quantum Efficiency	>90% maximum @550 nm 52% @400 nm

SPECIFICATIONS

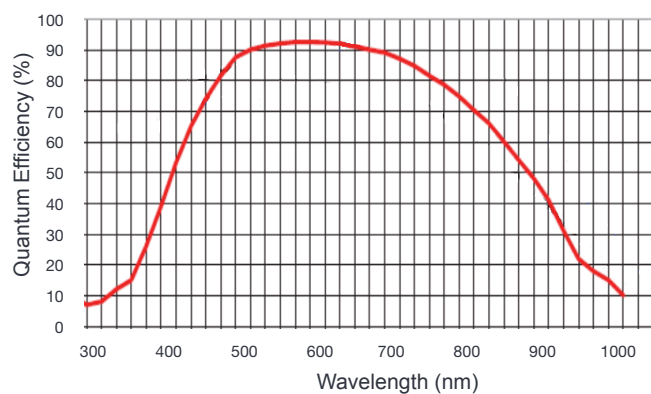
Technical Specifications^{**}

Sensor Type	CCD47-10 (E2V)
Active pixels	1024 x 1024 W x H (1 Megapixel)
Sensor Size	13.3 x 13.3 mm (177 mm ²) 18.8 mm diagonal
Pixel Size	13 x 13 μ m
Pixel Well Depth	85,000 e ⁻
Read Noise ^{**3}	16.9 e ⁻ (RMS @ 0.82 MHz)
Pixel Binning	1 x 1 to 8 x 1024 on chip
Quantum Efficiency ^{**4}	96% maximum @550 nm 52 % @400 nm
Cooling	Maximum cooling up to 60°C below ambient temperature; -35°C at 25°C ambient Thermoelectric cooler with forced air.
Temperature Stability	+/- 0.1°C
Dark Current ^{**3}	0.207 e ⁻ /pixel/sec
Blemish Specification	Grade 1 as standard, as per sensor manufacturer definition
Anti-blooming factor	None
Maximum Dynamic Range	74 dB (5030:1)
Linearity	Better than 99%
Frame Rate (fps) ^{**5}	0.74 Full frame (@0.82 MHz) 2.32 Full frame (@2.91 MHz, focusing mode)
Frame Sizes	Full frame, sub-frame
Digital Resolution	16-bit
Camera Window	UV-grade fused silica

General Specifications

Interface Options	USB 2.0 Ethernet: Network interface with built-in web server, up to 2 MHz throughput
Remote Triggering	LVTTTL trigger input, expose strobe output
Peripheral communications	8 pin mini-DIN I/O connector
Image Sequencing	1 to 65535 image sequences under software control
Exposure Time	100 milliseconds to 95 minutes (2.56 microsecond increments)
Operating System Support	Windows, Linux

Quantum Efficiency (QE) Curve⁴

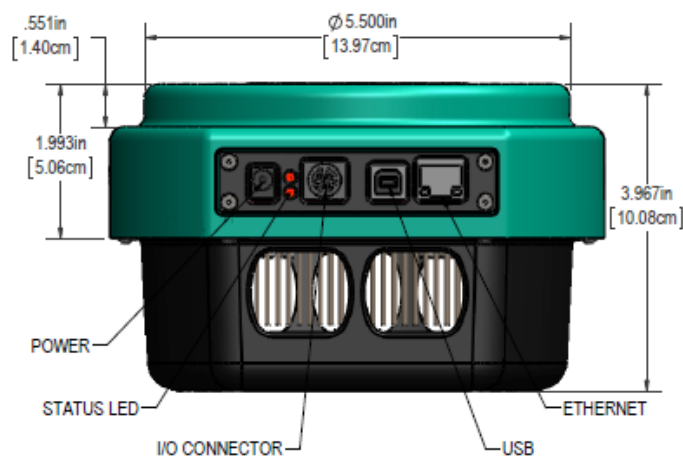
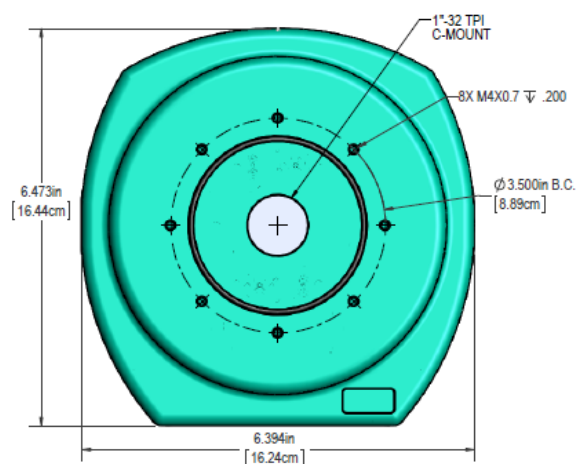


Size of CCD Imaging Area

13.3 x 13.3 mm



Mechanical Drawings



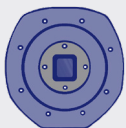
Mechanical Specifications

Camera Housing	Aluminum, hard anodized (G01)
Camera Head Size	6.5" x 6.4" x 3.9" [16.4 x 16.2 x 10 cm]
Back Focal Distance	0.68" (1.72 cm) [optical]
Mounting	1" aperture, C-mount, 1-32 UN-2B Thread
Shutter	35 mm shutter (specified for >5 million cycles)
Weight	3.1 lb. (1.4 kg)

CREATING THE OPTIMUM PRODUCT FOR YOU

How to customize the Apogee Aspen CG47:

Step 1: Select your camera type



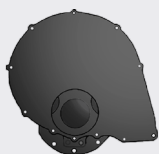
Camera

Description	Code
Apogee Aspen CG47 1 Megapixel Full frame CCD camera with midband coating, grade 1 sensor and 35 mm Shutter	CG47-MB-1-G01-S35

Note: Please enquire for price and availability of Grade 0 sensor options.



Step 2: Please indicate which adapters and accessories are required



Adapters & Accessories

A wide range of mounting adapters and accessory options are available for the Aspen. Please refer to the links below on the Andor website for further information on filter wheels, filters and adapters.

Filter Wheels

Filter wheels available with up to 17 filter positions.

Please refer to [Apogee Filter Wheels](#)

Filters

A comprehensive selection of Astrodon filters and filters are available to complement your selected filter wheel

Please refer to [Apogee Filters](#)

Lens Adapters and flanges

Select the required camera mounting option for your application, from our range of lens, telescope and slip-fit faceplate adapters.

Please refer to [Apogee Adapter Matrix](#)



Step 3: Please indicate which software you require



Software

The Apogee Aspen also requires at least one of the following software options:

Description	Ordering Information
Windows SDK for Apogee	Please download from the Apogee Downloads Page
ASCOM Camera and Filter Wheel Driver	Please download from the Apogee Downloads Page
Linux Driver CD	400053
Maxim DL Pro Software CD	400054
MicroManager	Please see https://micro-manager.org/wiki/Apogee

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Need more information? At Andor we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Andor products. For a full listing of our local sales offices, please see: andor.com/contact



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Footnotes



Front page image: Melotte 15 in the Heart Nebula, courtesy of Dan Goldman. Check out other astounding images with Apogee cameras on the Andor website.

1. Figures are typical unless stated otherwise
2. At minimum temperature
3. Readout noise is for the entire system. It is a combination of sensor readout noise and A/D noise.
4. Quantum efficiency of the sensor at 25°C, as supplied by the sensor manufacturer.
5. Assumes internal trigger mode of operation and minimum exposure time.



PC Requirements

- 3.0 GHz single core or 2.4 GHz multi core processor
- 2 GB RAM
- 100 MB free hard disc to install software (at least 1GB recommended for data spooling)
- USB 2.0 High Speed Host Controller capable of a sustained rate of 40MB/s
- Windows (XP, Vista, 7 and 8) or Linux

Operating and Storage Conditions

- Operating Temperature: 0 to 40°C
- Relative Humidity: < 70% (non-condensing)
- Storage Temperature: -25°C to 50°C
- Altitude up to 2000 m

Power Requirements

- 100-240V, AC 50-60Hz, or alternate 12V input from user's source.
- 75W maximum power consumption (shutter open and cooling maximum)

