



System Features^{*1}

- High Resolution Sensor**
 4.2 Megapixel sensor with 7.4 μm pixels delivers an exceptionally large field of view with high resolution.
- Programmable TE cooling down to 45°C below ambient**
 Ideal for detection of weak chemiluminescence or astronomy images, enabling long exposure acquisitions with optimized signal to noise ratio.
- 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 - 43 mm.
- 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.
- Andor OEM optimisation**
 Compact and robust, Andor integration support, Andor quality enhancement, Andor post-sale support. Now also supported by 'Andor SDK'

Apogee Alta F4000: Compact, 4.2 Megapixel CCD

Ideal for OEM and astronomy applications, the Apogee Alta family has been a mainstay of high end imaging for many years, offering a wide range of full frame and interline CCDs. A USB 2.0 interface offers the convenience of simple, robust connection to PC.

The Alta F4000 has a 4.2 megapixel interline transfer sensor with a high quantum efficiency and twice the dynamic range of similar Sony sensors. Cooling down to 45°C below ambient results in a low dark current contribution. When combined with its low noise and small pixels, the Alta F4000 makes an ideal solution for OEM applications, biological and physical sciences.

Specifications Summary^{*1}

Array Size (pixels)	2048 x 2048 (4.2 Megapixel)
Pixel Size	7.4 x 7.4 μm
Sensor Size	15.2 x 15.2 mm (230 mm ²) 21.4 mm diagonal
Pixel Well Depth (typical)	31,000 e ⁻
Dark Current^{*2}	0.0075 e ⁻ /pixel/sec
Read Noise^{*3}	5.7 e ⁻ (RMS @ 0.91 MHz)
Maximum Dynamic Range	74.7 dB (5439:1)
Quantum Efficiency	55% @480nm 41.5% @400nm

SPECIFICATIONS

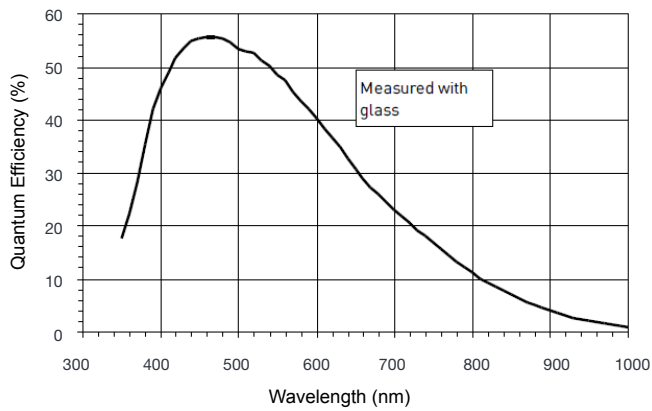
Technical Specifications^{*1}

Sensor Type	KAI-4022 (ON Semiconductor)
Active pixels	2048 x 2048 W x H (4.2 Megapixel)
Sensor Size	15.2 x 15.2 mm (230 mm ²) 21.4 mm diagonal
Pixel Size	7.4 x 7.4 μ m
Pixel Well Depth	31,000 e ⁻
Read Noise ^{*3}	5.7 e ⁻ (RMS @0.91 Mhz)
Pixel Binning	1 x 1 to 8 x 2048 on chip
Quantum Efficiency ^{*4}	55% @480nm 41.5% @400nm
Cooling	Maximum cooling up to 45°C below ambient temperature; -20°C at 25°C ambient Thermoelectric cooler with forced air.
Temperature Stability	+/- 0.1°C
Dark Current ^{*3}	0.0075 e ⁻ /pixel/sec
Blemish Specification	Grade S as per sensor manufacturer definition
Anti-blooming factor	300x
Maximum Dynamic Range	74.7 dB (5439:1)
Linearity	Better than 99%
Frame Rate (fps) ^{*5}	0.22 Full frame (@0.91 MHz) 1.59 Full frame (@6.67 MHz, focusing mode)
Frame Sizes	Full frame, sub-frame
Digital Resolution	16-bit
Camera Window	UV-grade fused silica

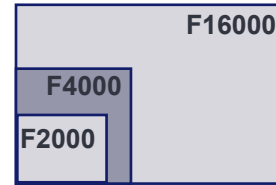
General Specifications

Interface Options	USB 2.0
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	95 minutes (max) (1.33 microsecond increments)

Quantum Efficiency (QE) Curve^{*5}

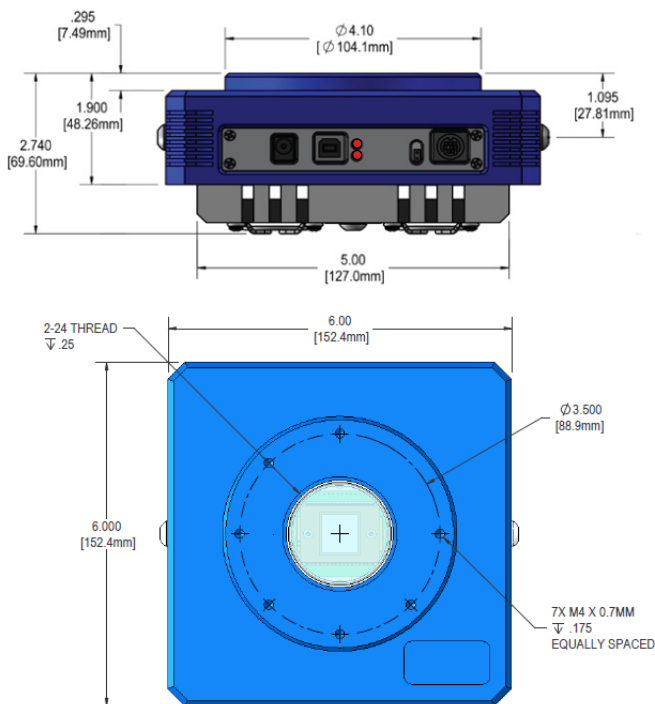


Comparison of CCD Imaging Area for Interline models

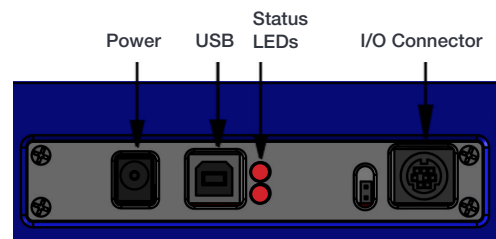


Model	Pixel Size (μm)	Resolution W x H (MP)	Area (W x H mm)
F2000	7.4	1600 x 1200 (1.9)	11.8 x 8.9
F4000	7.4	2048 x 2048 (4.2)	15.2 x 15.2
F16000	7.4	4872 x 3248 (15.8)	36.0 x 24.0

Mechanical Drawings



Connections



Mechanical Specifications

Camera Housing	Aluminum, hard anodized (D02)
Camera Head Size	6" x 6" x 2.5" (15x15x6.35 cm)
Back Focal Distance	1.025" (2.6 cm) [optical]
Mounting	3.5" bolt circle. 2" 24 TPI thread. Optional Nikon F-mount or Canon EOS/EF or FD mount.
Shutter	43 mm shutter.
Weight	3.1 lb. (1.4 kg)

CREATING THE OPTIMUM PRODUCT FOR YOU

How to customize the Apogee Alta F4000:

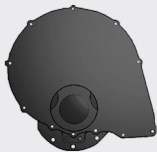
Step 1: Select your camera type



Camera

Description	Part Code
Apogee Alta F4000 4.2 Megapixel Interline CCD camera Grade S sensor and 43 mm shutter.	F4000-S-D02-S43
Apogee Alta F4000 4.2 Megapixel Interline CCD camera Grade S sensor. No shutter.	F4000-S-D02-NSH

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 Alta. Please refer to the links below 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 filter sets 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 Adapters](#)

Step 3: Please indicate which software you require



Software

The Alta 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	Please download from the Apogee Downloads Page
Maxim DL Pro Software CD	MAXIM-DL/PRO-SW
MicroManager	Please see https://micro-manager.org/wiki/Apogee

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Footnotes

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.



Front page image M101, the Pinwheel Galaxy courtesy of Greg Morgan.

Check out other astounding images captured with Apogee cameras at the Andor image gallery

**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 (7, 8, 8.1 and 10) or Linux (please contact us for specific build compatibility)

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 via alternate 12V input from user's source.
- 40W maximum power consumption (shutter open and cooling maximum)

