

Apogee Alta Series

## System Features<sup>\*1</sup>

- High Resolution Sensor**  
 1.9 Megapixel sensor with 7.4  $\mu\text{m}$  pixels delivers a 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 - 25 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.
- Andor OEM optimisation**  
 Compact and robust, Andor integration support, Andor quality enhancement, Andor post-sale support. Now also supported by 'Andor SDK'

## Apogee Alta F2000: Compact, 1.9 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 F2000 has a 1.9 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 F2000 makes an ideal solution for OEM applications, biological and physical sciences.

## Specifications Summary<sup>\*1</sup>

<b>Array Size (pixels)</b>	1600 x 1200 (1.9 Megapixel)
<b>Pixel Size</b>	7.4 x 7.4 $\mu\text{m}$
<b>Sensor Size</b>	11.8 x 8.9 mm (105.1 mm <sup>2</sup> ) 14.8 mm diagonal
<b>Pixel Well Depth (typical)</b>	31,000 e <sup>-</sup>
<b>Dark Current<sup>*2</sup></b>	0.0113 e <sup>-</sup> /pixel/sec
<b>Read Noise<sup>*3</sup></b>	7.4 e <sup>-</sup> (RMS @0.91 MHz)
<b>Maximum Dynamic Range</b>	72.4 dB (4189:1)
<b>Quantum Efficiency</b>	56% @480nm 47% @400nm

## SPECIFICATIONS

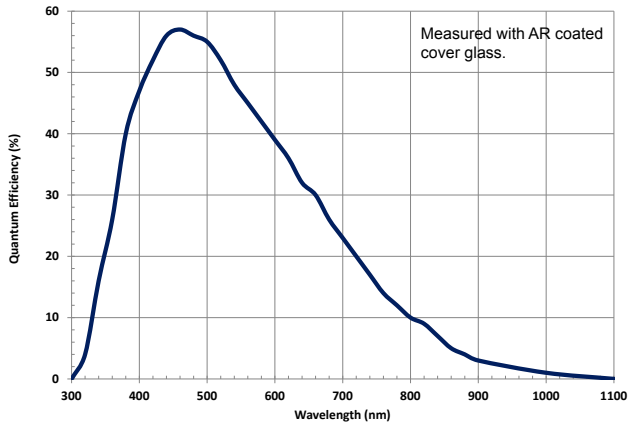
### Technical Specifications<sup>\*1</sup>

<b>Sensor Type</b>	KAI-2020 (ON Semiconductor)
<b>Active pixels</b>	1600 x 1200 W x H (1.9 Megapixel)
<b>Sensor Size</b>	11.8 x 8.9 mm (105.1 mm <sup>2</sup> ) 14.8 mm diagonal
<b>Pixel Size</b>	7.4 x 7.4 μm
<b>Pixel Well Depth</b>	31,000 e <sup>-</sup>
<b>Read Noise</b> <sup>*3</sup>	7.4 e <sup>-</sup> (RMS @0.91 MHz)
<b>Pixel Binning</b>	1 x 1 to 8 x 1200 on chip
<b>Quantum Efficiency</b> <sup>*4</sup>	56% @480nm 47% @400nm
<b>Cooling</b>	Maximum cooling up to 45°C below ambient temperature; -20°C at 25°C ambient Thermoelectric cooler with forced air.
<b>Temperature Stability</b>	+/- 0.1°C
<b>Dark Current</b> <sup>*3</sup>	0.0113 e <sup>-</sup> /pixel/sec
<b>Blemish Specification</b>	Grade S as per sensor manufacturer definition
<b>Anti-blooming factor</b>	300x
<b>Maximum Dynamic Range</b>	72.4 dB (4189:1)
<b>Linearity</b>	Better than 99%
<b>Frame Rate (fps)</b> <sup>*5</sup>	0.45 Full frame (@ 0.91 MHz) 2.52 Full frame (@6.53 MHz, focusing mode)
<b>Frame Sizes</b>	Full frame, sub-frame
<b>Digital Resolution</b>	16-bit
<b>Camera Window</b>	UV-grade fused silica

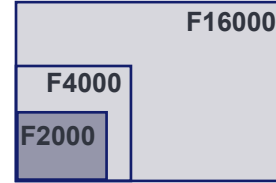
### General Specifications

<b>Interface Options</b>	USB 2.0
<b>Remote Triggering</b>	LVTTTL trigger input, expose strobe output
<b>Peripheral communications</b>	8 pin mini-DIN I/O connector
<b>Image Sequencing</b>	1 to 65535 image sequences under software control
<b>Exposure Time</b>	95 minutes (max) (1.33 microsecond increments)

## Quantum Efficiency (QE) Curve<sup>\*5</sup>

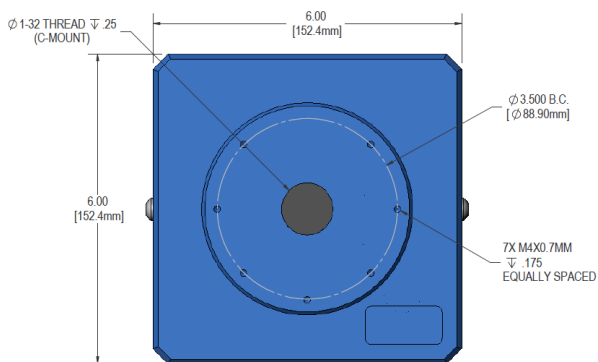
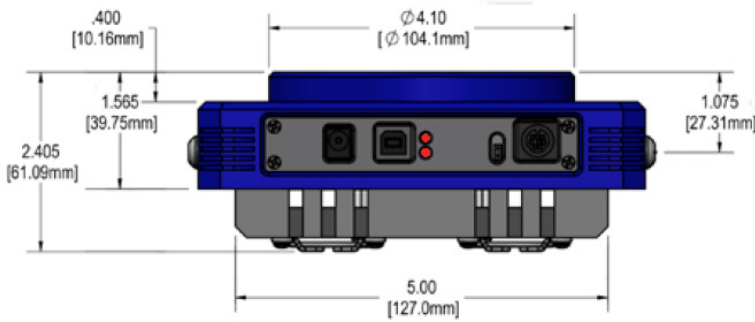


## Comparison of CCD Imaging Area for Interline models

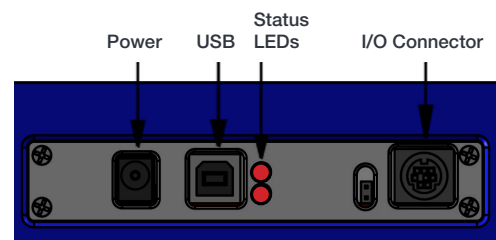


Model	Pixel Size (μm)	Resolution W x H (MP)	Area (W x H mm)
F2000	7.4	1600 x 1200 (1.9)	11.8 x 8.9
F4000	7.4	2048 x 2048 (4.2)	15.2 x 15.2
F16000	7.4	4872 x 3248 (15.8)	36.0 x 24.0

## Mechanical Drawings



## Connections



## Mechanical Specifications

Camera Housing	Aluminum, hard anodized (D01)
Camera Head Size	6" x 6" x 2.5" (15x15x6.25 cm)
Back Focal Distance	0.69" (1.75cm) [optical]
Mounting	3.5" bolt circle. C-mount (1" 32 TPI thread). Optional Nikon F-mount or Canon FD.
Shutter	25 mm shutter.
Weight	3.1 lb. (1.4 kg)

## CREATING THE OPTIMUM PRODUCT FOR YOU

How to customize the Apogee Alta F2000:

### Step 1: Select your camera type

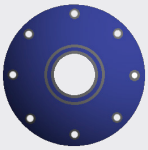


Camera

Description	Part Code
Apogee Alta F2000 1.9 Megapixel Interline CCD camera Grade S sensor and 25 mm shutter	F2000-S-D01-S25
Apogee Alta F2000 1.9 Megapixel Interline CCD camera Grade S sensor. No shutter.	F2000-S-D01-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 filters and adapters.

#### Filters

A comprehensive selection of Astrodon filters are available.

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 <a href="#">Apogee Downloads Page</a>
ASCOM Camera and Filter Wheel Driver	Please download from the <a href="#">Apogee Downloads Page</a>
Linux Driver CD	Please download from the <a href="#">Apogee Downloads Page</a>
Maxim DL Pro Software CD	MAXIM-DL/PRO-SW
MicroManager	Please see <a href="https://micro-manager.org/wiki/Apogee">https://micro-manager.org/wiki/Apogee</a>

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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.

**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)

