



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

- High Resolution Sensor**  
 9.3 Megapixel sensor with 12  $\mu\text{m}$  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 - 63 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 F9000: Compact, 9.3 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 F9000 uses a very large format 9.3 megapixel full frame sensor with anti-blooming gates, ideal for applications requiring large field of view, such as astrophotography, sky surveys and radiology. Cooling down to 45°C below ambient results in a low dark current contribution. These features combine to make the Alta F9000 an ideal solution for applications requiring both a large field of view and optimal signal to noise ratio, such as astrophotography, sky surveys and radiology.

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

<b>Array Size (pixels)</b>	3056 x 3056 (9.3 Megapixel)
<b>Pixel Size</b>	12 x 12 $\mu\text{m}$
<b>Sensor Size</b>	36.7 x 36.7 mm (1345 mm <sup>2</sup> ) 51.9 mm diagonal
<b>Pixel Well Depth (typical)</b>	94,000 e <sup>-</sup>
<b>Dark Current<sup>2</sup></b>	0.0704 e <sup>-</sup> /pixel/sec
<b>Read Noise<sup>3</sup></b>	11 e <sup>-</sup> (RMS @ 0.86 MHz)
<b>Maximum Dynamic Range</b>	78.6 dB (8545:1)
<b>Quantum Efficiency</b>	64% @550 nm 37% @400 nm

## SPECIFICATIONS

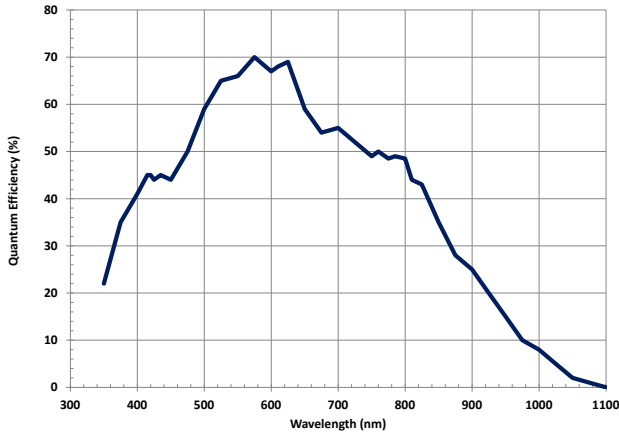
### Technical Specifications<sup>\*1</sup>

<b>Sensor Type</b>	KAF-09000 (ON Semiconductor)
<b>Active pixels</b>	3056 x 3056 W x H (9.3 Megapixel)
<b>Sensor Size</b>	36.7 x 36.7 mm (1345 mm <sup>2</sup> ) 51.9 mm diagonal
<b>Pixel Size</b>	12 x 12 $\mu$ m
<b>Pixel Well Depth</b>	94,000 e <sup>-</sup>
<b>Read Noise</b> <sup>*3</sup>	11 e <sup>-</sup> (RMS @0.86 Mhz)
<b>Pixel Binning</b>	1 x 1 to 8 x 3056 on chip
<b>Quantum Efficiency</b> <sup>*4</sup>	64% @550 nm 37% @400 nm
<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>	0.0704 e <sup>-</sup> /pixel/sec
<b>Blemish Specification</b>	Grade S as per sensor manufacturer definition
<b>Anti-blooming factor</b>	>100x
<b>Maximum Dynamic Range</b>	78.6 dB (8545:1)
<b>Linearity</b>	Better than 99%
<b>Frame Rate (fps)</b> <sup>*5</sup>	0.09 Full frame (@0.86 MHz) 0.41 Full frame (@4.17 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>

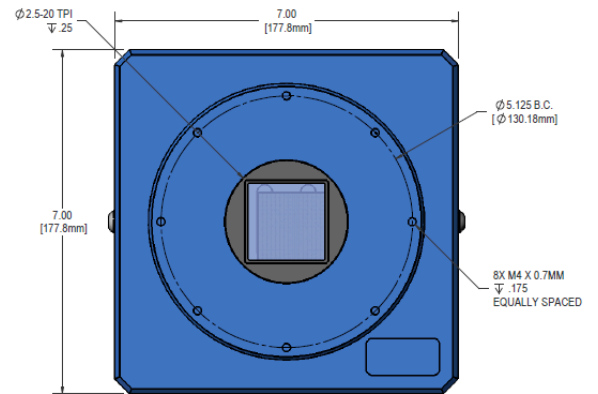
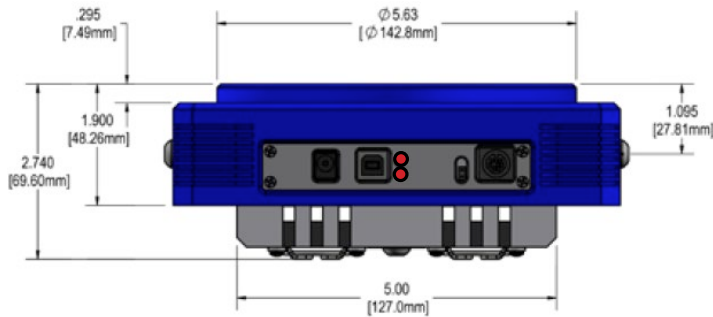


## Size of CCD Imaging Area

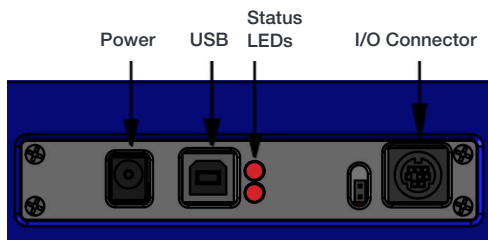
36.7 x 36.7 mm



## Mechanical Drawings



## Connections



## Mechanical Specifications

Camera Housing	Aluminum, hard anodized (D07)
Camera Head Size	7"x7"x2.55" (17.8x17.8x6.48 cm)
Back Focal Distance	1.005" (2.56 cm) [optical]
Mounting	5.125" bolt circle. 2.5" 20 TPI thread. Optional Nikon F-mount or Canon EOS/EF or FD mount.
Shutter	63 mm shutter.
Weight	4.2 lb. (1.9 kg)

## CREATING THE OPTIMUM PRODUCT FOR YOU

How to customize the Apogee Alta F9000:

### Step 1: Select your camera type

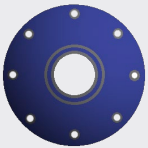


Camera

Description	Part Code
Apogee Alta F9000 9.3 Megapixel Full frame CCD camera Grade S sensor and 63 mm Shutter	F9000-S-D07-S63



### 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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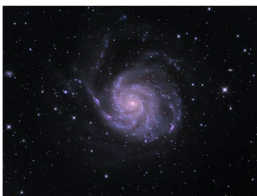
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Phone +1 (860) 290 9211  
Fax +1 (860) 290 9566

**China**

Beijing  
Phone +86 (10) 8271 9066  
Fax +86 (10) 8271 9055

## 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).

