



System Features^{*1}

- High Resolution Sensor**
 15.8 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 - 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.
- 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 F16000: Compact, 15.8 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 F16000 has a 15.8 megapixel interline transfer sensor with a high quantum efficiency. Cooling down to 45°C below ambient results in a low dark current contribution. With its very large field of view, low noise performance and small pixels, the Alta F16000 is an ideal solution for many OEM applications, biological and physical sciences.

Specifications Summary^{*1}

Array Size (pixels)	4872 x 3248 (15.8 Megapixel)
Pixel Size	7.4 x 7.4 μm
Sensor Size	36 x 24 mm (866 mm ²) 43.3 mm diagonal
Pixel Well Depth (typical)	32,000 e ⁻
Dark Current^{*2}	0.005 e ⁻ /pixel/sec
Read Noise^{*3}	7 e ⁻ (RMS @ 0.94 MHz)
Maximum Dynamic Range	73.2 dB (4571:1)
Quantum Efficiency	>45% @420-510nm 41.5% @400nm

SPECIFICATIONS

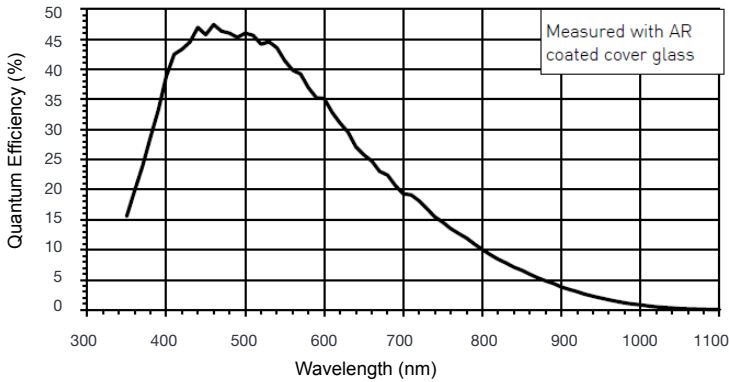
Technical Specifications^{*1}

Sensor Type	KAI-16000 (ON Semiconductor)
Active pixels	4872 x 3248 W x H (15.8 Megapixel)
Sensor Size	36 x 24 mm (866 mm ²) 43.3 mm diagonal
Pixel Size	7.4 x 7.4 μm
Pixel Well Depth	32,000 e ⁻
Read Noise ^{*3}	7 e ⁻ (RMS @0.94 Mhz)
Pixel Binning	1 x 1 to 8 x 3248 on chip
Quantum Efficiency ^{*4}	>45% @420-510nm 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}	0.005 e ⁻ /pixel/sec
Blemish Specification	Grade 2 as standard, as per sensor manufacturer definition
Anti-blooming factor	300x
Maximum Dynamic Range	73.2 dB (4571:1)
Linearity	Better than 99%
Frame Rate (fps) ^{*5}	0.059 Full frame (@0.94 MHz) 0.453 Full frame (@7.34 MHz, focusing mode)
Frame Sizes	Full frame, sub-frame
Digital Resolution	16-bit
Camera Window	UV-grade fused silica

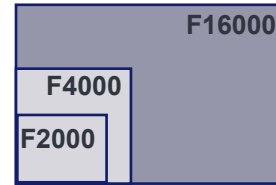
General Specifications

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}

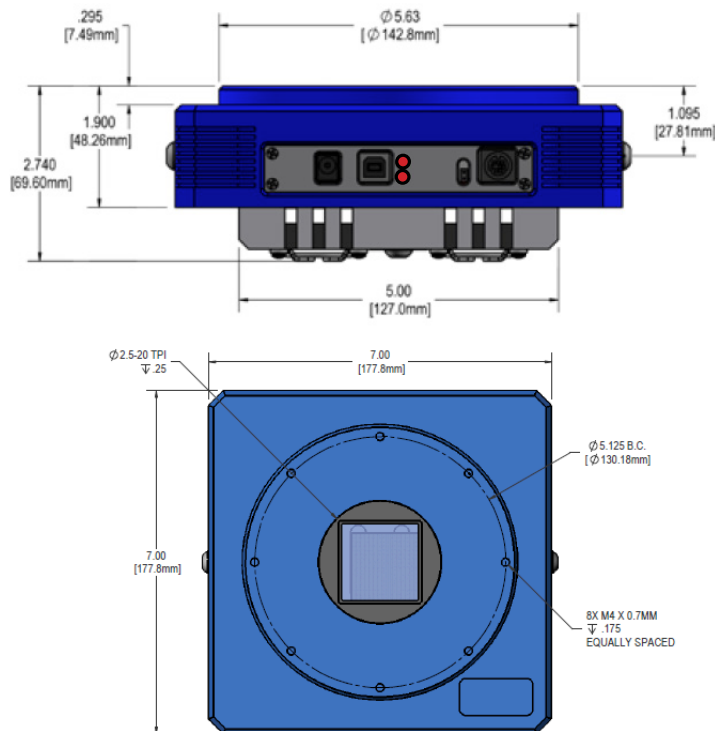


Comparison of CCD Imaging Area for Alta Interline models

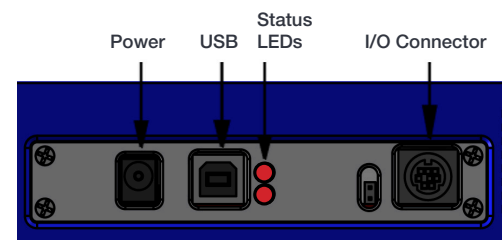


Model	Pixel Size (μm)	Resolution W x H (MP)	Area (W x H mm)
F2000	7.4	1600 x 1200 (1.9)	11.8 x 8.9
F4000	7.4	2048 x 2048 (4.2)	15.2 x 15.2
F16000	7.4	4872 x 3248 (15.8)	36.0 x 24.0

Mechanical Drawings



Connections



Mechanical Specifications

Camera Housing	Aluminum, hard anodized (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 F16000:

Step 1: Select your camera type

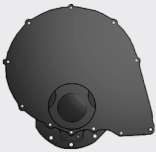


Camera

Description	Part Code
Apogee Alta F16000 15.8 Megapixel Interline CCD camera Grade 2 sensor and 63 mm shutter.	F16000-2-D07-S63
Apogee Alta F16000 15.8 Megapixel Interline CCD camera Grade 2 sensor. Without shutter.	F16000-2-D07-NSH

Note: Please enquire for price and availability of Grade 1 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 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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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

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)

