OXFORD INSTRUMENTS

OCAM²

High Speed, Low Light EMCCDs

Key Specifications

- ✓ 240 x 240 pixels | 24 µm pixel pitch
- ✓ Cooled EMCCD sensor
- ✓ Up to 2067 fps full frame
- ✓ Sub-electron readout noise
- ✓ Ultra-low latency
- ✓ CameraLink® interface
- ✓ OCAM²S integrated electronic shutter

Key Applications

- ✓ Astronomy & Adaptive Optics
- ✓ Astronomical Observations
- ✓ Life Sciences / Research
- ✓ Exo-Planets Research
- ✓ Wavefront Sensing
- ✓ Secure laser communications
- ✓ Laser pulsed applications

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Introducing the OCAM EMCCD Family

OCAM²K and OCAM²S are high speed low noise EMCCD cameras able to run at 2067 fps (3700 fps in binning) with sub-electron readout noise.

To achieve this performance, OCAM²K integrates the Teledyne E2V CCD220 sensor, a Peltier-cooled 240 x 240 pixel frame-transfer 8- output back-illuminated sensor. Whereas, OCAM²S features an integrated electronic shutter and uses the Teledyne E2V CCD 219 Peltier-cooled 240 x 240 pixel 8 output split frame transfer CCD.

The Embedded Electronic Shutter in OCAM²S is able to deliver an arbitrary number of integration pulses that can be shorter than 1 µs with a precision better than 50 ns.

To minimize smearing, the CCD 220 and CCD 219 high speed metal buttressed clock lines are driven by OCAM²K and OCAM²S at a speed as high as 7 Mlines/s transferring each frame in the store section in only 12 microseconds. OCAM²K and OCAM²S also offer an extremely low latency: 43 µs between exposure and first pixel availability.

Developed by astronomers for astronomers for visible imaging, with up to 95% quantum efficiency over a wide spectrum (from 400 to 900 nm), the EMCCD cameras OCAM²K and OCAM²S are the fastest visible cameras with sub-electron read out noise. For wavefront sensing applications, OCAM²K and OCAM²S can be equipped with a 20 x 20 sub-apertures microlens array (customizable on request).

Astronomy

In the visible range, the OCAM² camera is a proven product, with an established track record in adaptive optics for astronomical imaging in the world's largest telescopes.

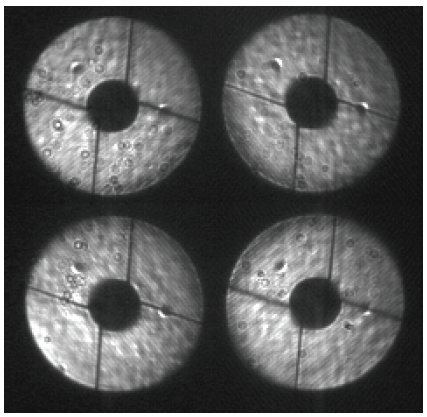
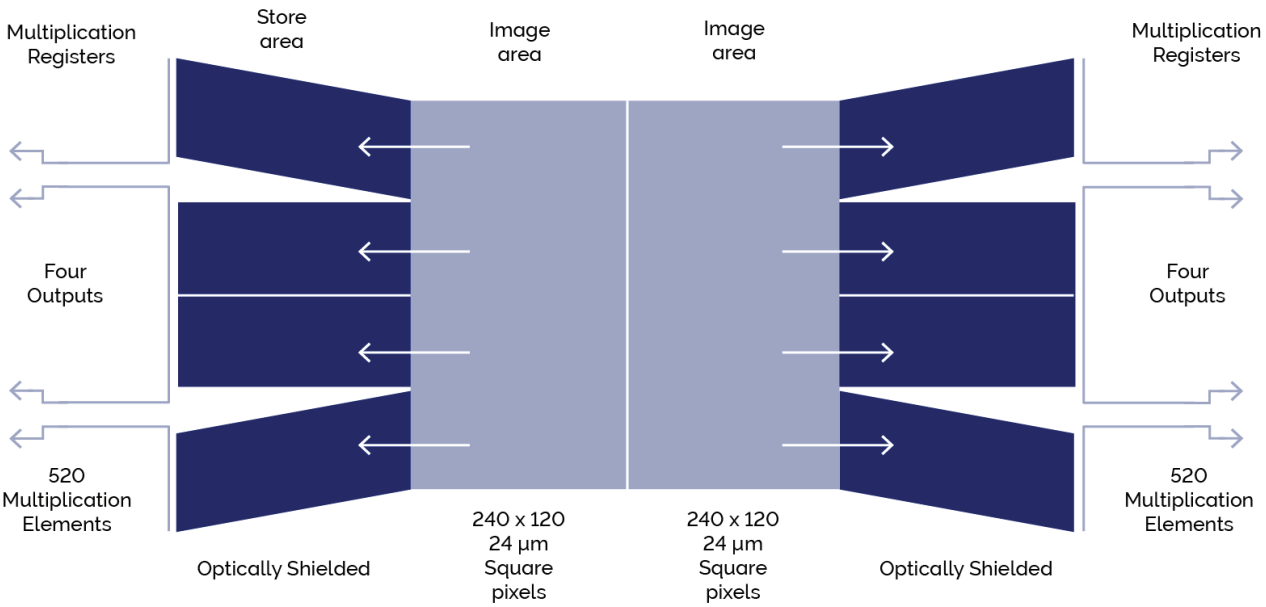
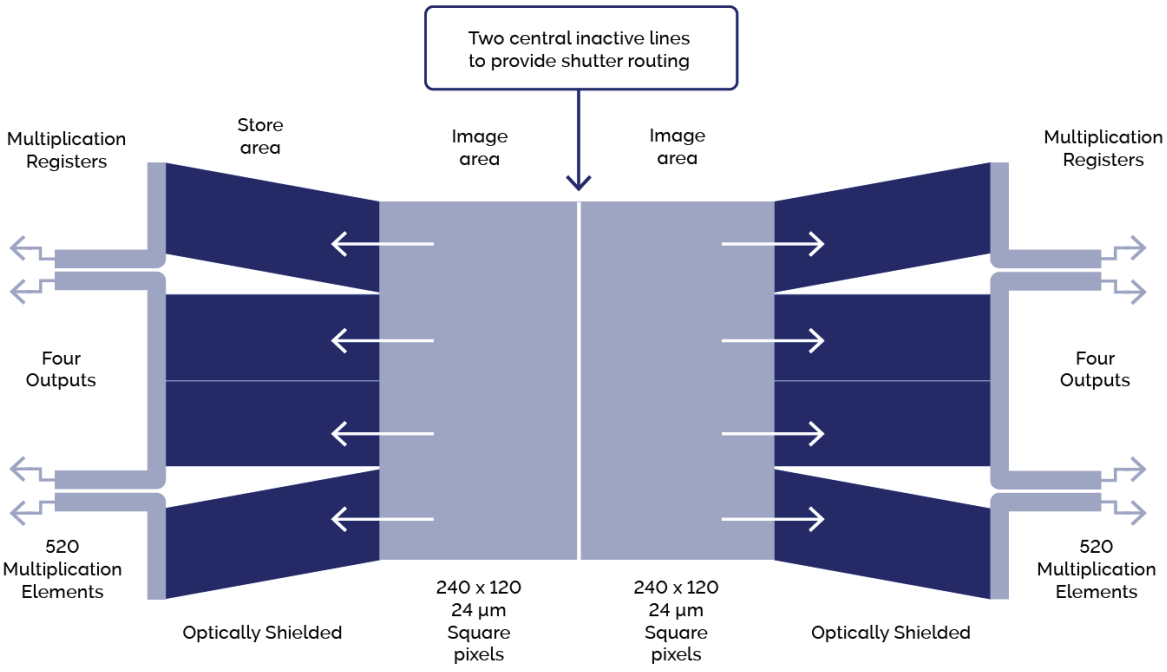


Image credit Astronomy imaging in the visible range. Extreme Adaptive Optics with OCAM²K – image of a pupil with Pyramid wavefront sensor system with a 3.5 kHz binned frame rate and a 0.3e- read-out noise at a gain of 600x. Courtesy of NAOJ / Subaru Coronagraphic Extreme Adaptive Optics SCExAO.

CCD 220 Detector Geometry



CCD 219 Detector Geometry



Technical Specifications

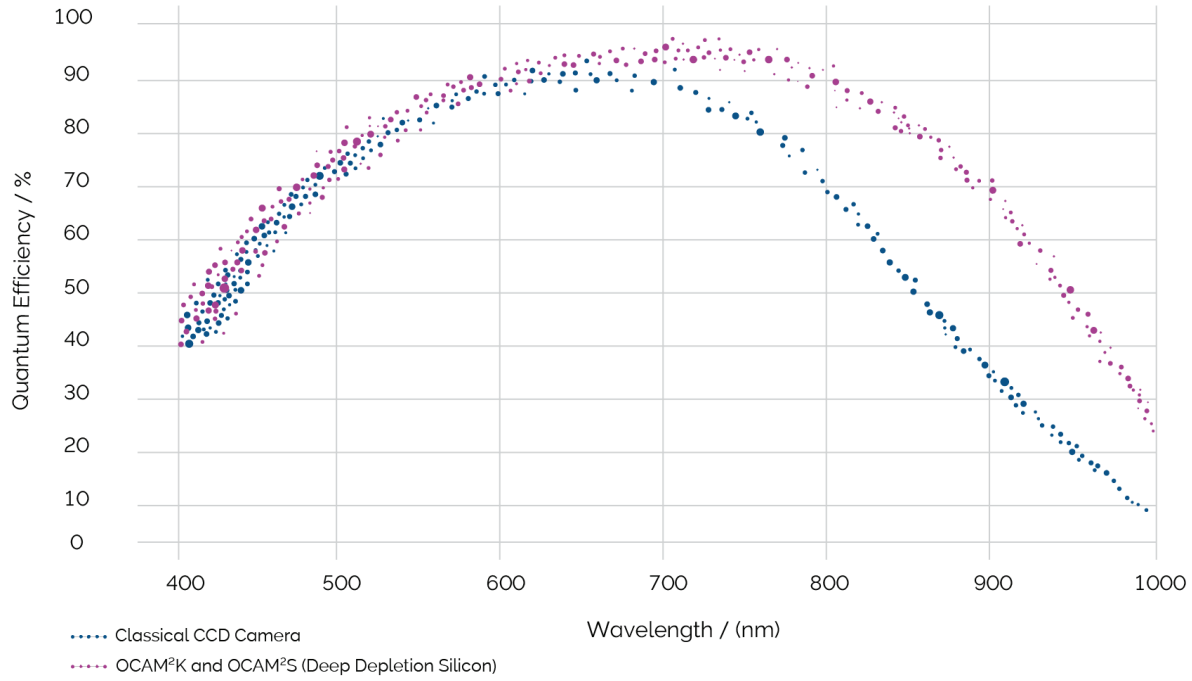
Model Specific Specifications

Sensor Specifications	OCAM²S	OCAM²K
Maximum speed Full Frame	2067 fps	
Mean readout noise at 2000 FPS and multiplication gain ~600	0.4 e-	
Dark signal at 2000 FPS at -45°C	<0.01 e- $pixel^{-1}$ $frame^{-1}$	
Quantization	14 bit	
Detector Operating Temperature	-45°C	
Peak Quantum Efficiency at 650 nm	>90%	
Linearity at gain x1000 from 10 e- to 150 e-	<3.5%	
Linearity at gain x1 from 15,000 e- to 150,000 e-	<3.5%	
Image Full Well capacity at gain x1	80 000 e-	270 000 e-
Parallel CTE at gain x1, 750 FPS	NA	min 99.99%
Serial CTE at gain x1, 750 FPS	NA	min 99.95%
Ultra low latency Camera Link® Full interface	43 µs	
Maximum speed in 2 x 2 binning mode	3700 fps	
Shutter resolution	<0.05 µs	NA

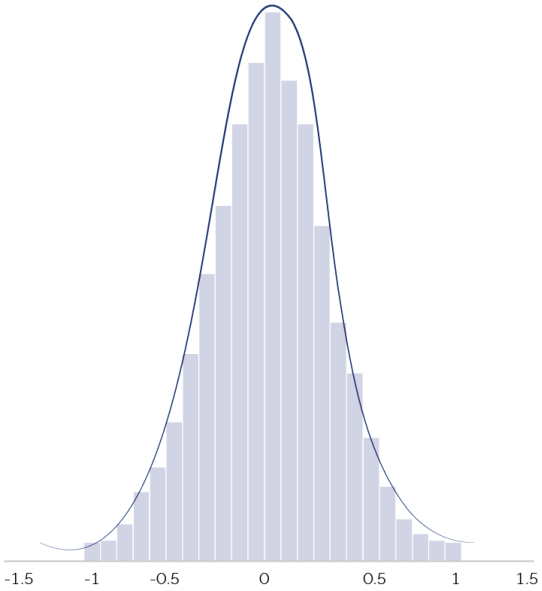
Features	All models
Output	Camera Link® Full
Optical interface	C-Mount
	14 bits precision A/D converter
	Integrated cooling temperature controller
	Fully sealed resistant aluminium body with low thermal gradient
	Custom design and Read Out modes available upon request
	Clock & Trigger input/output for synchronous operation
OCAM²S (shutter modes)	Internal or External Trigger modes Single, Burst, Sweep triggering
Operating temperature	-35°C to 50°C
Software	Software Development Kit: (C, C++, C#, Python, MatLab) / LabVIEW / µManager

Microlens Array Specifications (standard proposal, customizable on request)	
Focal length (distance to maximum intensity) @ 633 nm	22 mm
Number of sub-apertures	20 x 20
Lens shape	Square
Lens pitch	288 µm
Lens clear aperture	>286 µm
Lens array position on substrate	Centered
Fill factor	>98%

Quantum Efficiency (QE) Curve

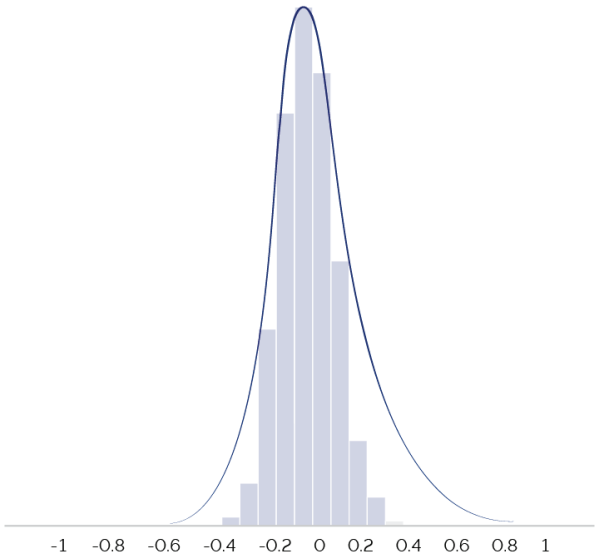


OCAM²K Noise Histogram for gain (x1000)



Pixel Value Input Referred (e-)

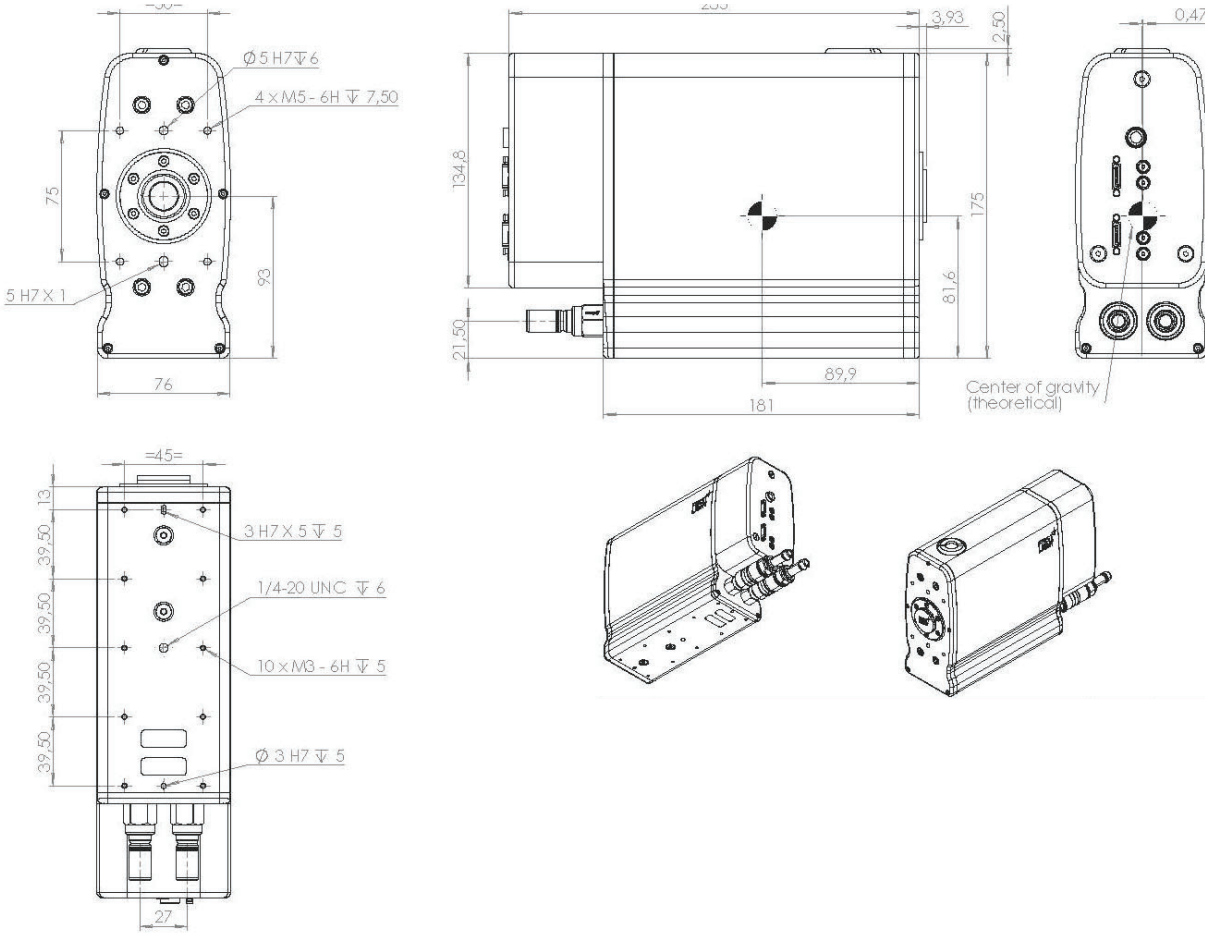
OCAM²S Noise Histogram for gain (x1000)



Pixel Value Input Referred (e-)

Product Drawings

Dimensions in mm [inches]
Weight: 4.2 kg



Creating The Optimum Product for You

Step 1. Select the camera type

Camera Type

Description	Code
OCAM²K: 240x240 EMCCD camera, 2067 FPS, <1 e- RON	**PAC-OCA-V2K**
OCAM²S: 240x240 shuttered EMCCD camera, 2067 FPS, <1 e- RON	**PAC-OCA-V2S**
OCAM²K WFS 20x20: 240x240 EMCCD camera, 2067 FPS, <1 e- RON + 20x20 wavefront sensor	**PAC-OCA-V2K-W20**
OCAM²S WFS 20x20: 240x240 shuttered EMCCD camera, 2067 FPS, <1 eRON + 20x20 wavefront sensor	**PAC-OCA-V2S-W20**

Step 2. Select the required accessories

Accessories

Description	Order Code
Cooling pack	**PAC-COO-200-004**
Synchro cables 1 m	**ACC-CAB-SYN-000**
Synchro cables 3 m	**ACC-CAB-SYN-001**
Camera Link® cables 5 m	**ACC-CAB-CLF-000**
Camera Link® cables 10 m	**ACC-CAB-CLF-001**
Matrix Grabber CL RAD EV 1G CLSF	**ACC-GRA-CLF-000**

Step 3. Software

Software

Your product is provided with the following software options:

Graphical User Interface: First Light Vision

Software Development Kit: (C, C++, C#, Python, MatLab) / LabVIEW / µManager

Order Today

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.oxinst.com/contact

Your regional sales partner:

Quantum Design

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+49 6157 80710-0
germany@qd-europe.com
www.qd-europe.com

Items shipped with your camera:
Camera (model as ordered)
Power supply & power cord
2x Synchro cables
1x Quick coupling set (cooling connectors)

Footnotes: Specifications are subject to change without notice

Minimum Computer Requirements:
RAM: 8 GB minimum
Processor: Intel® Core™ i5 or higher
Screen resolution: at least 1920 x 1080
See system requirements for more information.

Operating and Storage Conditions
- Operating Temperature: -35°C to 50°C
- Relative Humidity: < 80% (non-condensing)
- Storage Temperature: -30°C to +80°C

Power Requirements
- 100 - 240 VAC 50 - 60 Hz
- Max. power consumption: 140 W

CE

OCAM2SS 1224 R1