

Features & Benefits

Ultra-low noise floor

Proprietary noise-reduction technique delivers an unprecedented $2.4e^-$ read noise @ 1MHz

Deep TE cooling to -55°C

Elimination of darkcurrent from noise floor

-40 °C ‘vibration free’ mode

Excellent thermal management offering passive (fan-off) cooling to a stable -40°C for vibration free operation

UltraVac™¹

Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance, year after year. Andor’s 5 year vacuum warranty.

Rapid Frame Rate

11.6 frames/sec @ 20 MHz readout speed

High Resolution

1.3 megapixel sensor format and 6.45 μm pixels

High Dynamic Range

> 6000:1 standard dynamic range at 1MHz. Higher when binned.

16-bit & 14-bit digitization

16-bit facilitating low noise / high dynamic range performance at slower speeds

Enhanced Baseline Clamp

Essential for quantitative accuracy of dynamic measurements

iCam

Unique innovation that empowers the Clara to operate with market-leading acquisition efficiency through live cell microscopy software

Visual Acquisition

Follow events in real time during data acquisition

USB 2.0²

Universal ‘Plug and Play’ connectivity

OEM friendly

Compact and robust, vacuum longevity, easily accessible SDK, Andor integration support

Comprehensive and Flexible Inputs/Outputs

Communication and synchronization within intricate experimental set-ups

Accurate Timestamp

Generated in camera hardware (FPGA) for absolute temporal accuracy (12.5ns)

Andor’s expertise in scientific camera performance optimization has been harnessed once again. Clara has been designed to deliver the highest sensitivity performance achievable from a high-resolution interline CCD camera.

Based around the popular ICX285 sensor from Sony®, the Clara is ideally suited to high-resolution cell microscopy and OEM applications.

Andor’s proven UltraVac™ process, alongside close attention to thermal management, has resulted in deep air cooling to -55°C for elimination of darkcurrent, complementing a uniquely low read noise of $2.4e^-$ @ 1MHz.

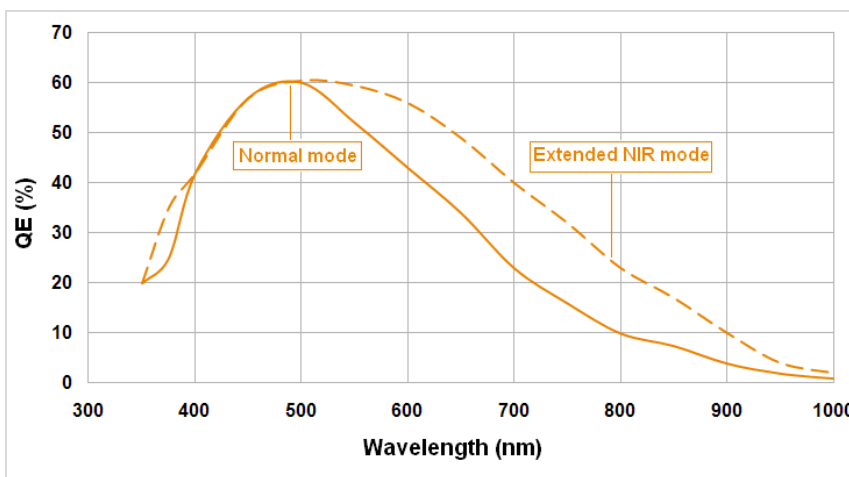
More dynamic events can be followed with outstanding quantitative stability via low noise 10 or 20 MHz readout modes, the data channeled through a trouble-free USB 2.0 interface. Andor’s iCam technology and comprehensive input and output functionality enables market-leading acquisition efficiency through live cell microscopy softwares. The compact, robust design and accessible SDK, renders Clara ideally suited to OEM integration.



Camera overview

Active Pixels	1392 x 1040
Pixel Size (W x H; μm)	6.45 x 6.45
Image Area (W x H; mm)	8.98 x 6.71
Pixel Well Depth (e^- , typical)	18000; (30000 2 x 2 binned)
Readout speeds (MHz)	20, 10, 1
Read Noise (e^-)	2.4 @ 1 MHz (16-bit) 5 @ 10 MHz (14-bit) 6.5 @ 20 MHz (14-bit)
Cooling (°C)	-55 fan on, -40 fan off
Max. Frame Rate	11.6 frames/sec

Quantum efficiency³



QE curves under ‘Normal’ mode operation and ‘Extended NIR’ mode operation

Technical specifications

System characteristics

Pixel Readout Rate (MHz)	20, 10, 1
Digitization	16 bit @ 1 MHz, 14-bit @ 10 MHz & 20 MHz
Frame Rate	11.6 frames/sec @ 20 MHz
Linearity (% , maximum)⁴	1
Triggering (timing I/O)	Arm, External Trigger, Frame Readout, Fire, Interline Shift, Shutter output.
Additional Inputs/Outputs	<ul style="list-style-type: none"> 8 programmable TTL I/Os for control and sensing of up to 8 external devices. 2 precision 16-bit DAC outputs for control of external analogue devices, e.g. Z-stages. Software selectable between 0-5V & 0-10V ranges. Regulated 5V DC output – providing power to external peripheral devices (500mA max.) I²C control of external devices.

System readout noise⁵

Pixel Readout Rate (MHz)	Readout Noise (e ⁻ ; typical)
1	2.4
10	5
20	6.5

Minimum sensor temperatures (typical)

Air cooled with fan-on (ambient air at 25°C)	-55°C
Air cooled with fan-off (ambient air at 25°C)	-40°C

Dark current (typical)⁶

0.0003 e⁻/pixel/sec @ -55°C

Operating & storage conditions

Operating Temperature	0°C to 35°C ambient
Relative Humidity	< 70% (non-condensing)
Storage Temperature	-25°C to 55°C

Input Power requirements

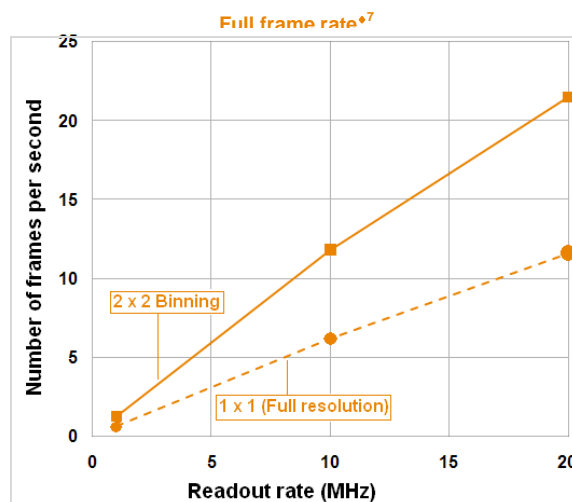
Voltage	+12V ± 5%
Current	Maximum 3A at peak cooling
Ripple & Noise	Maximum 200mV
Total Power	Maximum 36W

Regulatory Compliance

- Compliant with the requirements of the EU EMC and LV Directives through testing to EN 61326-1 and EN 61010-1
- Compliant with the North American Safety Standards: UL 61010-1 and CAN/CSA-C22.2 No. 61010-1-04

Applications

- Widefield Fluorescence Microscopy
- Living and Fixed Cells
- Ion Signalling
- Single Molecule Detection
- Fluorescent Proteins including GFP
- FISH
- Immunofluorescence
- Comet Assay
- High Content Screening
- Spectral Imaging
- Ophthalmic Imaging

Max frames per second⁸

Binning	Array size			
	1392x1040 (Full Frame)	512x512	256x256	128x128
1	11.6	21.8	37.9	60.1
2	21.5	37.9	60.1	84.8
4	34.5	60.1	84.8	106.9
8	59.5	84.8	106.9	122.9

Computer requirements

The following minimum specification is recommended:

- 3.0 GHz single core or 2.4 GHz multi core processor + 2GB RAM
- 100MB free hard disc to install software (at least 1GB recommended for data spooling)
- USB 2.0 High Speed Host Controller capable of sustained rate of 40MB/s⁹
- Windows (XP, Vista and 7) or Linux

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Chinese Office

Phone: +86 (10) 5129 4977

Fax: +86 (10) 6445 5401



Rear view showing connectors

Ordering & contact information and notes

To order the Clara, please quote the following model number:

DR - 328G - C01 – SIL

Clara is supplied with the following:

ACZ-03452 Multi I/O timing cable, offering Fire, External Trigger, Shutter and Arm

Clara also requires one of the following software options:

Andor Solis (i)

Windows compatible software application with rich functionality for data acquisition and processing. Available for 32-bit and 64-bit Windows (XP, Vista and 7).

Andor iQ

A comprehensive multi-dimensional imaging software package.

Offers tight synchronization of camera with a comprehensive range of microscopy hardware, along with comprehensive rendering and analysis functionality.

Modular architecture for best price/performance package on the market.

Andor SDK

A software development kit that allows you to control the Andor range of cameras from your own application. Available for 32-bit and 64-bit Windows (XP, Vista and 7) and Linux.

Third party software compatibility

Drivers are available so that the Clara can be operated through a large variety of third party imaging packages.

The following accessories are available for use with Clara:

ACZ-03453 Multi I/O timing cable, offering Fire, External Trigger, Shutter, Arm and I²C

ACZ-03454 Advanced multi I/O cable offering all available timing and I/Os (except I²C)

XU-RECR/TRANS USB 2.0 Extender kit comprising Transmitter, Receiver & Power Supplies

OA-CCFM C-mount to Canon F-mount adapter

OA-CNAF C-mount to Nikon F-mount adapter

OA-COFM C-mount to Olympus F-mount adapter

OA-CTOT C-mount to T-mount adapter

OA-ECAF Auto ext. tubes (set of 3) for Canon AF

OA-ECMT Auto ext. tubes (set of 3) for C-mount

OA-ENAF Auto ext. tubes (set of 3) for Nikon AF

Specifications are subject to change without notice

- ◆1 Assembled in a state-of-the-art Class 1000 cleanroom facility, Andor's UltraVac™ vacuum process combines a permanent hermetic vacuum seal (no o-rings), with a stringent protocol to minimize outgassing, including use of proprietary materials. Outgassing is the release of trapped gases that would otherwise prove highly problematic for high-vacuum systems.
- ◆2 USB 2.0 is truly universal to all PCs, in contrast to a Firewire interface which often requires an internal interface card for PC compatibility.
- ◆3 In Extended NIR mode, the sensor cannot be clocked in 'Overlap Mode', reducing the achievable frame rate of the camera.
- ◆4 Linearity is measured from a plot of Signal vs. Exposure Time over the full dynamic range. Non-linearity is expressed as a percentage deviation from a straight line fit.
- ◆5 System Readout noise is for the entire system. It is a combination of CCD readout noise and A/D noise. Measurement is for Single Pixel readout with the CCD at a temperature of -45°C and minimum exposure time under dark conditions
- ◆6 The dark current value is obtained using the traditional method of measuring dark current, as for any CCD camera, i.e. taking a long integration time to get a dark signal that is well above the read noise. The dark current measurement is averaged over the CCD area excluding any regions of blemishes.
- ◆7 The graph shows the frame rates possible when reading out the complete sensor at 20, 10 and 1 MHz pixel readout rates and using either 1x1 'full resolution' or 2x2 pixel binning
- ◆8 The max frames / second table for Clara indicates the maximum speed at which the device can acquire images in a standard system. Shown are the frame rates at 20 MHz pixel readout rates for a range of binning or array size combinations. It also assumes internal trigger mode of operation.
- ◆9 This will depend on PC specification, USB chipset and any other devices sharing the USB bandwidth. If in doubt, please contact your PC manufacturer.

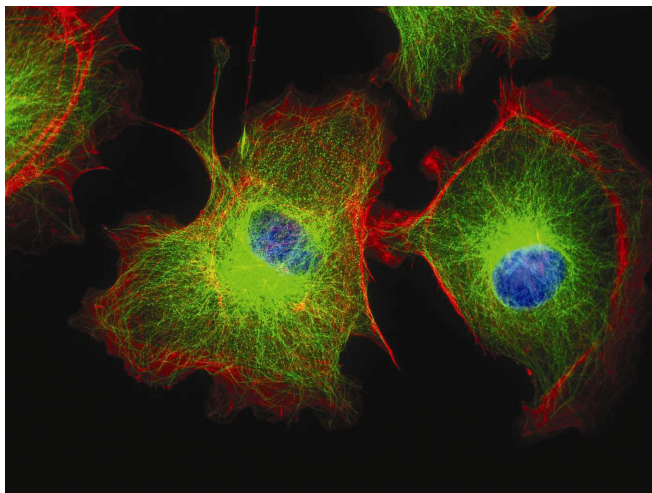
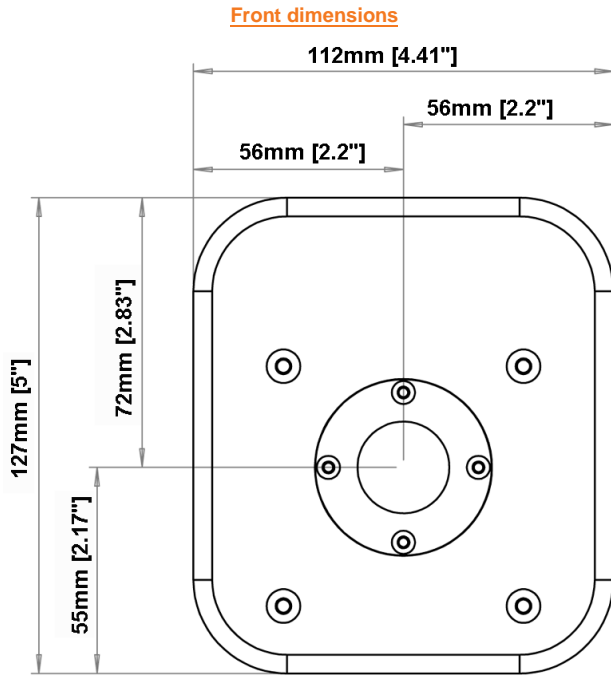


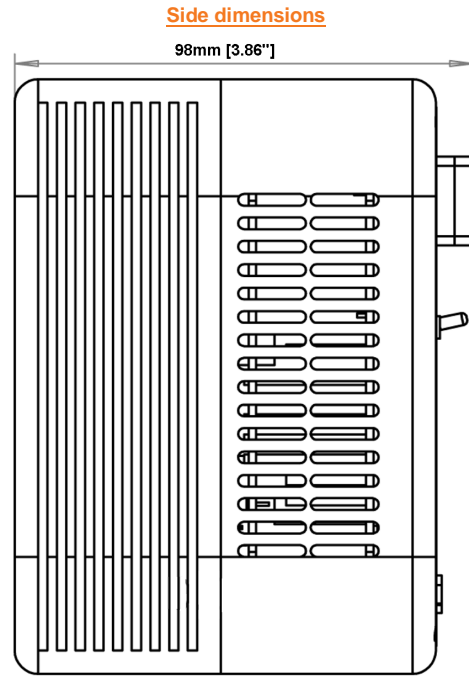
Image showing BPAE (bovine pulmonary arterial endothelial) cells stained with red-fluorescent Texas Red @-X phalloidin for labelling F-actin, mouse monoclonal anti-tubulin in conjunction with green-fluorescent BODIPY FL goat anti-mouse IgG for labelling microtubules and blue-fluorescent DAPI for labelling the nuclei.

Dimensions

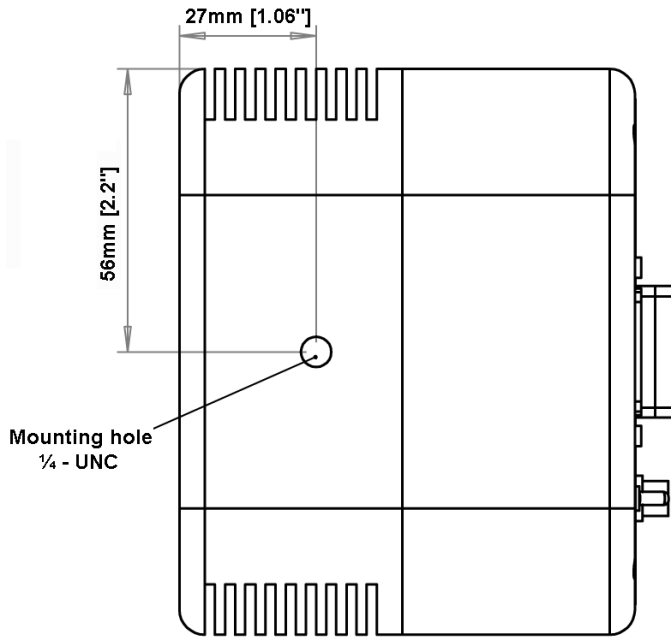
Weight: 2.2kg (4.85lb)



Mounting hole location

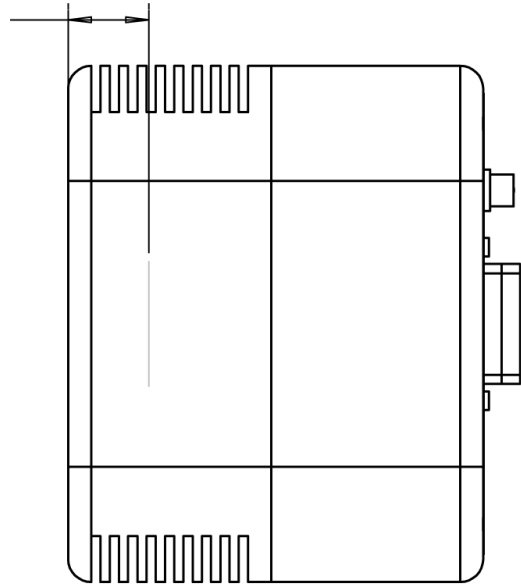


Focal Plane Distance

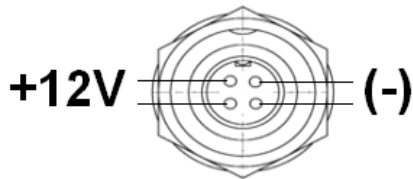


Camera Header Pin

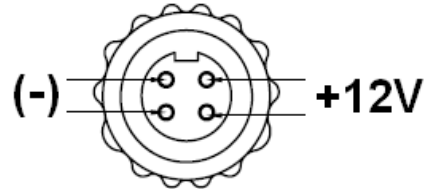
17.5mm [0.69"] Focal plane
C-mount



Matching Connector Socket



Tyco Electronics
6-1437719-4



Tyco Electronics
3-1437719-3