

IMAGING



Andor's iXon^{EM+} 885 EMCCD camera has been designed to deliver high-end vacuum cooled, yet versatile, EMCCD performance at a distinctly affordable price - the ultimate workhorse camera with which to upgrade your set-up!

EMCCD technology enables single photon detection capability at rapid frame rates, without an image intensifier. The 885 contains a 1004 x 1002 ImpactronTM Frame Transfer CCD sensor from Texas Instruments, enabling charge to be multiplied on the sensor before it is read out, while utilizing the full QE performance of the CCD sensor.

The absolute EMCCD gain of the camera can be varied linearly from unity up to a thousand times directly through the software, via Andor's exclusive quantitative EM gain scale – RealGainTM. When more light is available, the EMCCD gain can be completely switched off and the camera operated as a 'standard' CCD camera at either slow or fast speeds.

The 885 offers up to 35 MHz pixel readout rate and fastest parallel shift speeds available, which combined, enable 31.4 frames/sec @ full resolution; 60.5 frames/sec @ 2x2 binning. The 885 also benefits from exceptionally low dark current with unequalled vacuum thermoelectric cooling down to -95°C.

- EMCCD Technology
 - Ultimate in Sensitivity from EMCCD gain – even single photon signals are amplified above the noise floor. Full QE of CCD chip is harnessed (no intensifier).
- RealGainTM
 - Absolute EMCCD gain selectable directly from a linear and quantitative scale.
- TE cooling to -95 °C
 - Unparalleled elimination of EM-amplified darkcurrent noise.
- > 65% QE from virtual phase sensor
 - Highly efficient photon collection. One window design (double AR-coated).
- Variable readout rates up to 35 MHz
 - Quantitative accuracy at all speeds.
- 8 x 8 μm pixel size (fully binnable)
 - Excellent balance of NyQuist resolution and photon collection.
- UltraVacTM ♦1
 - Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance, year after year.
- Minimal Clock-Induced Charge
 - Unique pixel clocking parameters, yielding minimized spurious noise floor.
- Enhanced Baseline Clamp
 - Essential for quantitative accuracy of dynamic measurements.
- Negligible EM Gain ageing
 - No requirement for gain recalibration.
- Built-in C-mount compatible shutter (optional)
 - Easy means to record control dark images – excellent for optimization of experimental set-up.

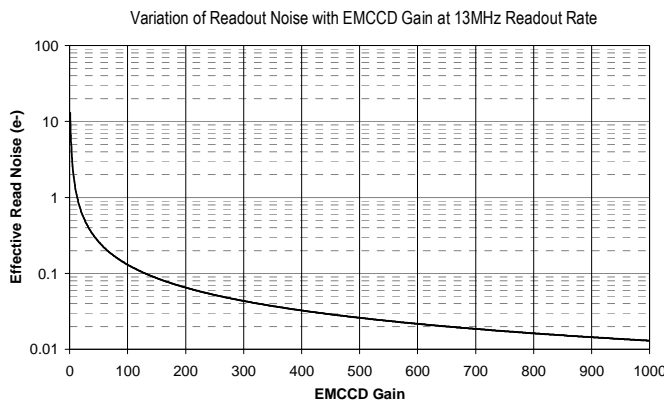
● Camera Overview	Active Pixels	1004 x 1002
	Pixel Size (WxH; μm)	8 x 8
	Image Area (mm)	8 x 8
	Active Area pixel well depth (e ⁻ , typical)	40,000
	Gain Register pixel well depth (e ⁻ , typical)	80,000
	Max Readout Rate (MHz)	35
	Frame Rate @ full resolution (frames per sec)	31.4
	Frame Rate @ 2x2 binning (frames per sec)	60.5
	Read Noise (e ⁻)	25 @ 35MHz; < 1 with EM Gain



● System Characteristics	Pixel Readout Rate (MHz)	35, 27, 13
	Linearity (% maximum) *2	1
	Vertical Clock Speed (µs)	0.5 to 1.9 (variable)
	Electron Multiplier Gain (software controlled)	1 – 1000 times via RealGain™ control with temperature compensation
	Digitization @ 35, 27 & 13 MHz readout rate	14-bit
	Dark Current @ -70 °C (e-/pix/sec) *3	0.028
	@ -85 °C (e-/pix/sec)	0.012
	@ -95 °C (e-/pix/sec)	0.005
	Camera window type	Single window with double-sided AR coating

● Noise	System Readout Noise (typical; e-) *4	Typical	with Electron Multiplication
	35MHz through EMCCD amplifier	25	<1
	27MHz through EMCCD amplifier	22	<1
	13MHz through EMCCD amplifier	12	<1

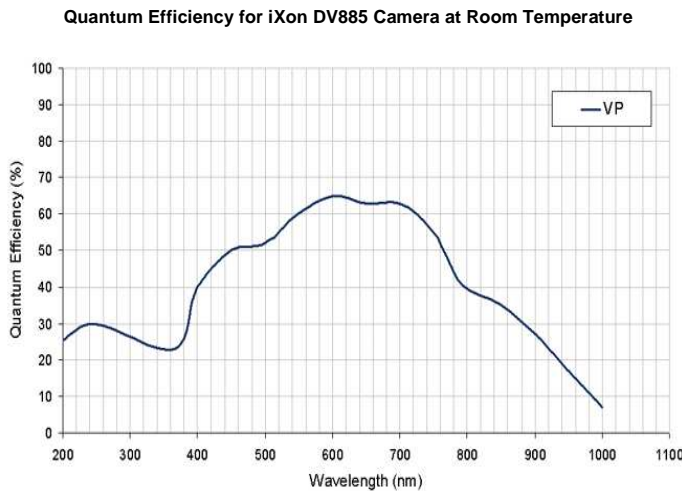
● Noise & EMCCD Gain



● Minimum Temperature (°C) *5

	'DV' option	'DU' option
Air-cooled (ambient air @ 20°C)	-70	-80
Re-circulator (XW-RECR) (ambient air @ 20°C)	-80	-90
Water-cooled (@ 10°C, 0.75 l / min)	-85	-95

● Quantum Efficiency

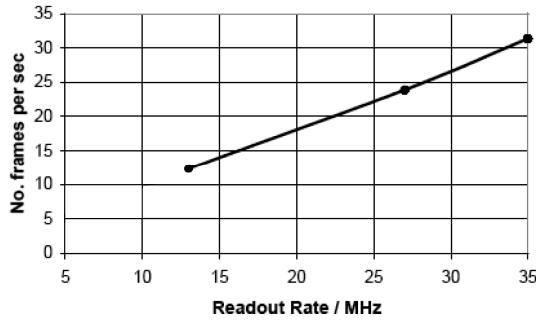


Peak Quantum Efficiency at room temperature (%) *6

CCD Type	Typical
VP @ 600 nm	65

● Max Frames per sec ^{*7}	Binning	Array size			
		1004 x 1002 (full frame)	512 x 512	256 x 256	128 x 128
	1x1	31.4	60.3	113	213.7
	2x2	60.5	113.6	201.6	367.7
	4x4	112.6	204.1	331.0	568.2

● Full Frame Rate ^{*8}

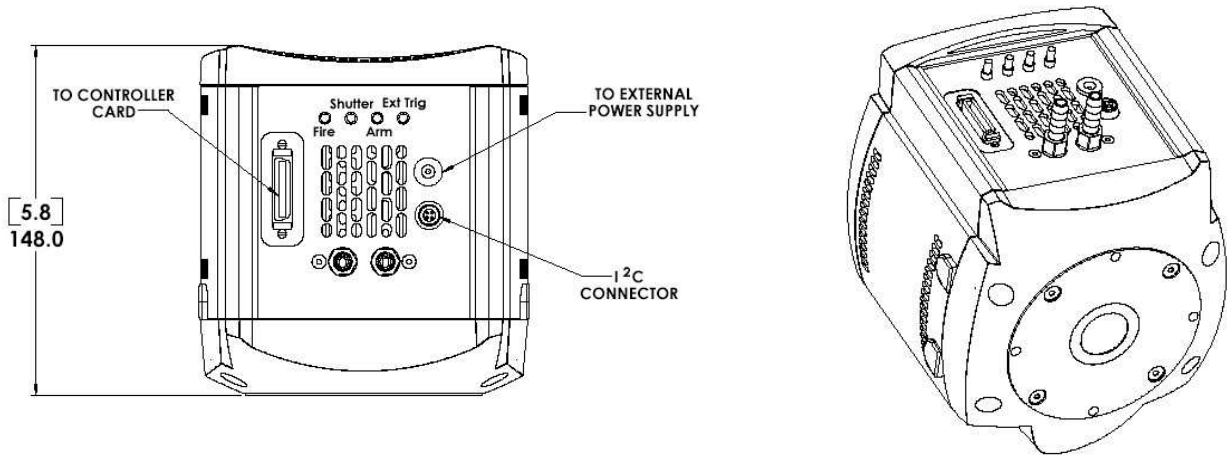


● Power Requirements ^{*9}

1A	@ +12V
0.3A	@ -12V
3.0A	@ +5V

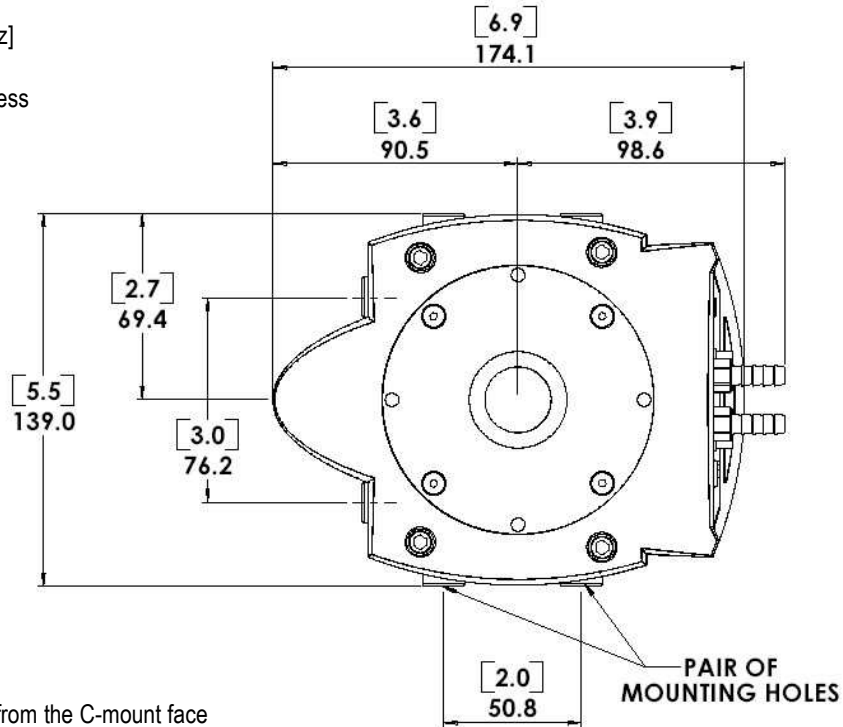
● Operating & Storage Conditions	Operating Temperature	0°C to 30°C ambient
	Relative Humidity	< 70% (non-condensing)
	Storage Temperature	-25°C to 55°C

● Computer Requirements	Minimum:	Also:
		Windows 2000 or XP operating system
	Recommended:	
	3.2 GHz Pentium (or better) + 1 GB RAM	
	SATA RAID 0 hard disc	
	– Seagate Barracuda, WD Caviar RE	
	WD Raptor	
	In all cases the operating system should be on a separate hard drive and the hardware controller should be on a separate PCI bus.	



Weight: 3.1 Kg [7 lb 1 oz]

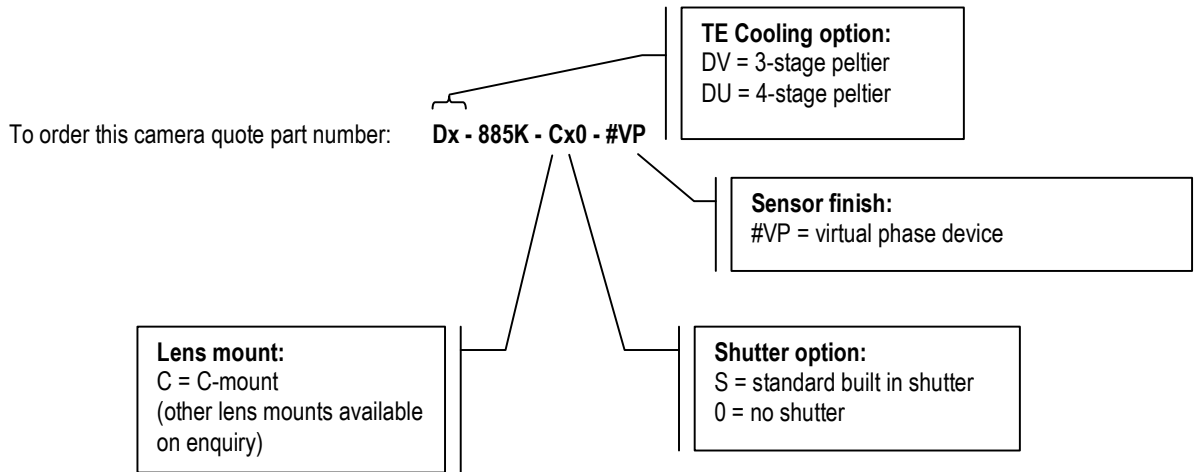
Dimensions in mm unless otherwise indicated.



Note: The clearance from the C-mount face plate to the shutter is 6mm. Please ensure that when fitting a lens, to a system with a built in shutter, that it does not extend into the housing by more than 5mm.

Note: There are mounting holes (1/4-20UNC) located on three sides of the camera. They are positioned centrally at a distance of 40mm from the front of the front face.

● **Ordering Information**



e.g. DV-885K-C00-#VP is an iXon^{EM}+ 885 camera with 3-stage peltier vacuum cooling and without internal shutter.

The iXon^{EM}+ 885 requires the following controller card:

CCI-23 PCI controller card

The iXon^{EM}+ 885 also requires one of the following software options:

Andor Solis – a ready-to-run Windows 2000 or XP -based package with rich functionality for data acquisition and processing.

Andor-SDK-CCD – a DLL driver and software development kit that let you create your own applications for the Andor Camera. Available for Windows 2000 or XP and Linux.

Andor-iQ– a comprehensive multi-dimensional imaging software package. Offers tight synchronization of EMCCD with a comprehensive range of microscopy hardware, along with comprehensive rendering and analysis functionality. Modular architecture for best price/performance package on the market.

Third party software compatibility – drivers are available so that the iXon^{EM}+ range can be operated through a large variety of third party imaging packages. Contact Andor for further details

The iXon^{EM}+ 885 may be used with the following accessories:

XW-RECR Recirculator for enhanced cooling performance

XW-CHIL-150 Ultra-compact chiller unit for ultimate cooling performance

Contact Andor for any of your other requirements. (Contact details on back page)

NOTE - Specifications are subject to change without notice.

- ◆1 Assembled in a state-of-the-art Class 10,000 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 Linearity is measured from a plot of Counts vs. Signal up to the saturation point of the system. Linearity is expressed as a percentage deviation from a straight line fit.
- ◆3 The dark current measurement is averaged over the CCD area excluding any regions of blemishes.
- ◆4 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 -75°C and minimum exposure time under dark conditions. Under Electron Multiplying conditions, the effective system readout noise is reduced to sub 1e⁻ levels. Noise values will change with pre-amplifier gain (PAG) selection. Values quoted are measured with highest available PAG setting.
- ◆5 The iXon^{EM}+ 885 can be ordered either with 3-stage or 4-stage peltier vacuum cooling, the 'DV' or 'DU' options respectively.
- ◆6 Quantum efficiency of the CCD sensor as measured by the CCD Manufacturer.
- ◆7 The max frames / second for iXon^{EM}+ imaging CCDs is the maximum speed at which the device can acquire images in a standard system. Shown are the frame rates at 35MHz digitization rates for a range of binning or array size combinations. Measurements are shown for 0.5μs per row vertical clock speed. It also assumes internal trigger mode of operation.
- ◆8 The graph shows the full frame rates possible when reading out the sensor at 35, 27 and 13 MHz pixel readout rates, and using 0.5μs per row vertical clock speed.
- ◆9 These power requirements are the maximum load that will be drawn from the computer for the camera head and controller card combined.

Need more information? Contact us on:

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