

Features and Benefits

- **Extended range Dual-AR option**
Superior UV-NIR broadband back-illuminated QE
- **TE cooling to -100°C**
Critical for elimination of dark current
- **Fringe Suppression Technology™**
NIR etaloning greatly reduced (BR-DD and BEX2-DD sensor types)
- **Up to 5 MHz pixel readout**
High frame rates achievable
- **Ultra low noise readout**
Intelligent low-noise electronics offer the most 'silent' system noise performance available
- **UltraVac™ *1**
Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance, year after year
- **13 x 13 µm pixel size**
Optimal balance of dynamic range and resolution
- **Integrated shutter**
C-mount shutter as standard. Closed during readout to avoid vertical smear
- **Cropped Sensor Mode**
Specialised acquisition mode for continuous imaging with fastest possible temporal resolution
- **Enhanced Baseline Clamp**
Quantitative accuracy of dynamic measurements
- **USB 2.0 connection**
Simple Plug & Play connection

Industry-Leading Ultra-Sensitive Imaging Technology

Andor's iKon-M 934 series cameras are designed to offer the ultimate in high-sensitivity, low noise performance, ideal for demanding imaging applications. These high resolution 1024 x 1024 CCD cameras boast up to 95% QE_{max}, high dynamic range, 13 µm pixels and exceptionally low readout noise. The iKon-M benefits from negligible dark current with industry-leading thermoelectric cooling down to -100°C.

The 'Deep Depletion' sensor option offers ultimate performance for NIR applications, the new Dual AR coating extends the QE performance significantly across the UV/visible region of the spectrum for the broadest possible spectral coverage from one sensor. Fringe Suppression Technology™ radically minimizes etaloning effects in the NIR. Rapid vertical shifts combined with fast kinetics acquisition mode, comprehensive trigger modes and custom coated wedge window options, render the deep Depletion models ideal for NIR optimized Bose Einstein Condensation applications.

Specifications Summary

Active pixels	1024 x 1024
Sensor size	13.3 x 13.3 mm
Pixel size (W x H)	13 µm x 13 µm
Active area pixel well depth	100,000 e ⁻
Pixel readout rates (MHz)	5, 3, 1, 0.05
Read noise	2.9 e ⁻
Maximum cooling	-100°C
Frame rate	4.4 fps (full frame)

System Specifications^{*2}

Model number	DU934P	DU934P (Deep Depletion)
Sensor options	BU2: Back Illuminated CCD, UV-Enhanced, 250 nm optimized BV: Back Illuminated CCD, Vis optimized FI: Front Illuminated CCD	BR-DD: Back Illuminated CCD, Deep Depletion with fringe suppression. Optimum sensor for Near IR applications. BEX2-DD: Back Illuminated CCD, Deep Depletion with fringe suppression, extended range dual AR coating
Active pixels	1024 x 1024	
Pixel size	13 x 13 μm	
Image area	13.3 x 13.3 mm with 100% fill factor	
Minimum temperatures ^{*3}		
Air cooled	-80°C	
Coolant recirculator	-95°C	
Coolant chiller, coolant @ 10°C, 0.75 l/min	-100°C	
Digitization	16-bit	
Blemish specifications	Grade 1 as per sensor manufacturer definition	
System window type	Single UV-grade fused silica window; AR coated on both sides for BV & FI models. Custom coated windows can be ordered on request, e.g. 780 nm optimized for Rb BEC experiments	
Interface	USB 2.0	
Lens mount	C-mount	

Advanced Performance Specifications^{*2}

Dark current, e ⁻ /pixel/sec ^{*4}		
@ -80°C	0.00030	0.01700
@ -100°C	0.00012	0.00047
Pixel readout rates	5, 3, 1, 0.05 MHz	
Pixel well depth	100,000 e ⁻	
Read noise (e ⁻) ^{*5}		
0.05 MHz	2.9	3.3
1 MHz	6.6	6.2
3 MHz	11.6	9.2
5 MHz	18.0	13.6
Linearity ^{*6}	Better than 99%	
Vertical clock speed	11.3 to 67.3 μs (software selectable)	4.25 to 64.25 μs (software selectable)

Frame Rates^{*7}

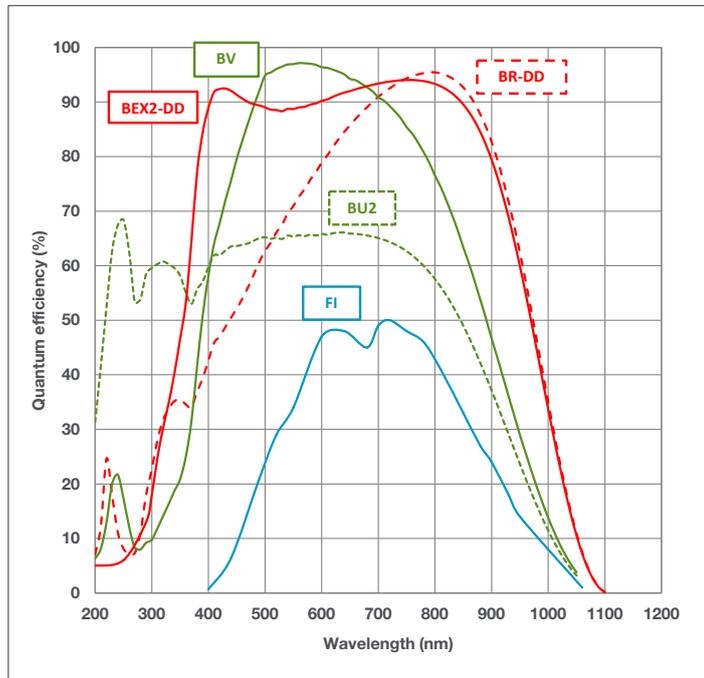
50 kHz				
Binning	Full Frame	512 x 512	256 x 256	128 x 128
1 x 1	0.04	0.1	0.2	0.4
2 x 2	0.2	0.2	0.4	0.8
4 x 4	0.6	0.6	0.9	1.5
8 x 8	2	1.2	1.7	2.8
16 x 16	5.1	2.3	3.2	5

1 MHz				
Binning	Full Frame	512 x 512	256 x 256	128 x 128
1 x 1	0.9	1.8	3.5	6.9
2 x 2	2.9	4.3	7.5	13.5
4 x 4	7.9	9.4	14.8	24.6
8 x 8	18	18.2	26.6	40.7
16 x 16	33.4	31.6	43	59.8

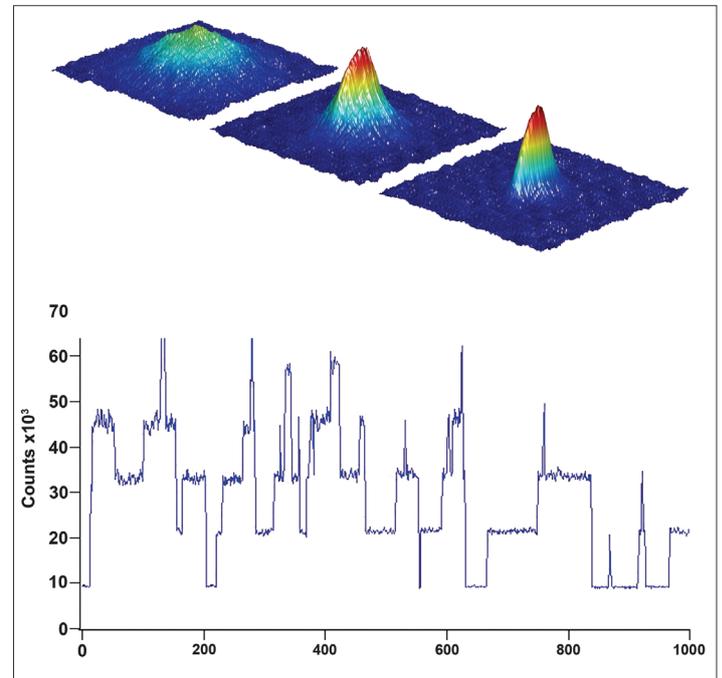
3 MHz				
Binning	Full Frame	512 x 512	256 x 256	128 x 128
1 x 1	2.6	5.2	10	18.6
2 x 2	6.3	10.9	19.3	33.2
4 x 4	13.4	20.9	34.2	53.5
8 x 8	25.1	36.3	54.4	76.5
16 x 16	41.5	56.1	76.5	97.1

5 MHz Visualization mode				
Binning	Full Frame	512 x 512	256 x 256	128 x 128
1 x 1	4.4	8.5	16	28.8
2 x 2	8.4	15.9	28.5	47.6
4 x 4	15.6	28.1	47	70.8
8 x 8	27.3	45.8	69.4	93.5
16 x 16	43.6	66.9	91.2	111.5

Quantum Efficiency Curves ^{*8}



Application Image



The top image shows surface plots of the transition from a thermal gas (left) to a Bose-Einstein condensate. The sharp, bimodal peak in the right figure is a signature of BEC. The graph below it shows fluorescence from a few-atom MOT against time, showing the discrete steps characteristic of single atoms entering and leaving the trap.

Courtesy of Prof. Michael Chapman, Georgia Institute of Technology, USA.

Have you found what you are looking for?

Need a larger sensor? The iKon-L 936 houses a 4 megapixel, back-illuminated CCD sensor (27.6 mm x 27.6 mm), cooling to -100°C, low noise performance and up to 5 MHz readout.

Need the ultimate in sensitivity? The iXon back-illuminated EMCCD series offers > 90% QE and single photon sensitivity, combined with fast frame rate performance.

Need faster frame rates? The Neo and Zyla sCMOS deliver up to 100 frames/sec (full frame).

Need smaller pixels? Check out the Luca^{EM} EMCCDs, the Clara Interline CCD and the Neo and Zyla sCMOS.

Need a price/performance EMCCD? The Luca^{EM} R is a compact 1 megapixel EMCCD USB 2.0 camera, offering high resolution and ultra-sensitivity at 12.4 frames/sec.

Need a customised version? Please contact us to discuss our Customer Special Request options.

Check out Andor's New Neo and Zyla sCMOS. *Simultaneously* offering, ultra-sensitivity, high speed, high-resolution, large field of view & high dynamic range!

Creating The Optimum Product for You

How to customise the iKon-M 934:

Step 1.

The iKon-M 934 comes with 5 options for sensor types. Please select the sensor which best suits your needs.

Step 2.

Please indicate which software you require.

Step 3.

For compatibility, please indicate which accessories are required.

DU934P-**BV**
example shown



Step 1.

Choose sensor type

BR-DD: Back Illuminated, Deep Depletion CCD with fringe suppression
BEX2-DD: Back Illuminated, Deep Depletion CCD, dual AR coated with fringe suppression
BU2: Back Illuminated CCD, AR coated for optimised performance in the 250 nm region
BV: Back Illuminated CCD, Vis optimised
FI: Standard front illuminated device

Step 2.

The iKon-M requires at least one of the following software options:

Solis Imaging A 32-bit application compatible with 32 and 64-bit Windows (XP, Vista, 7 and 8) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

Andor SDK A software development kit that allows you to control the Andor range of cameras from your own application. Available as 32 and 64-bit libraries for Windows (XP, Vista, 7 and 8), compatible with C/C++, C#, Delphi, VB6, VB.NET, LabVIEW and Matlab. Linux SDK compatible with C/C++.

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 iKon-M 934 range can be operated through a large variety of third party imaging packages. See Andor web site for detail: <http://www.andor.com/software/>

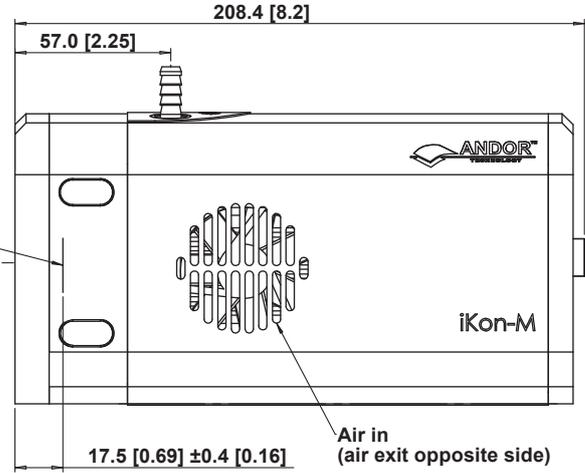
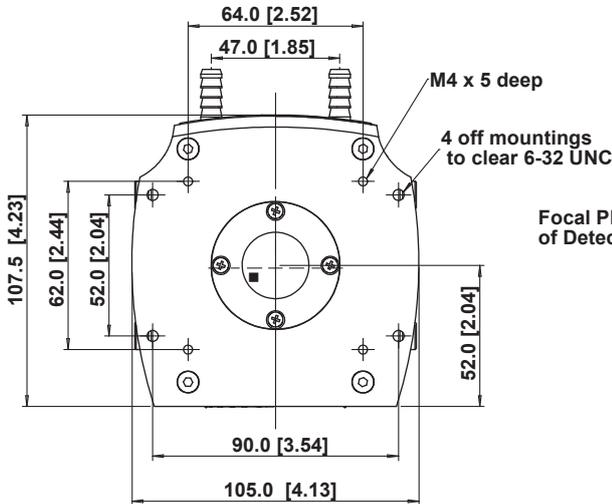
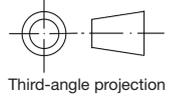
Step 3.

The following accessories are available:

XW-RECR Re-circulator for enhanced cooling performance
ACC-XW-CHIL-160 Oasis 160 Ultra compact chiller unit
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
XU-RECR/TRANS USB 2.0 - Transmitter and Receiver, including 2 power supplies

Product Drawings

Dimensions in mm [inches]



■ = position of pixel 1,1

Weight: 2.2 kg [4 lb 13 oz]

Connecting to the iKon-M

Camera Control

Connector type: USB 2.0 with optional lockable connector

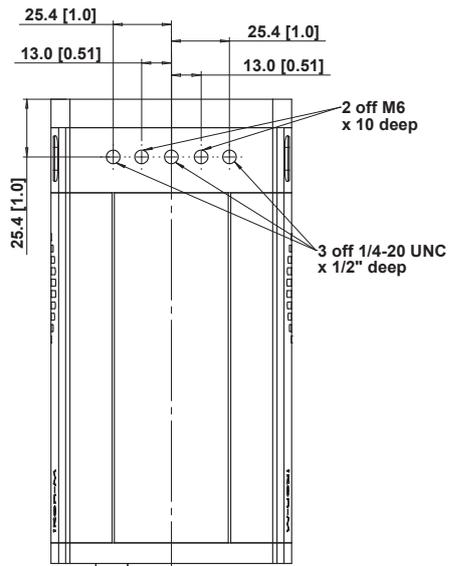
TTL / Logic

Connector type: SMB, provided with SMB - BNC cable
Fire (Output), External Trigger (Input), Shutter (Output)

I²C connector

Compatible with Fischer SC102A054-130
Shutter (TTL), I²C Clock, I²C Data, +5 Vdc, Ground

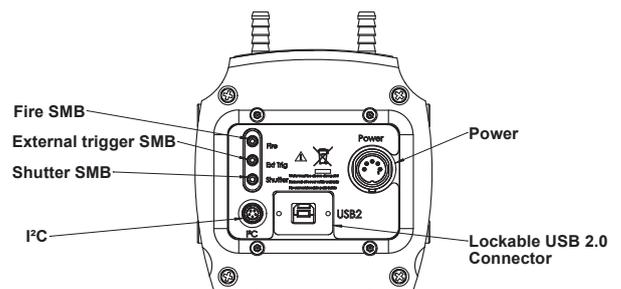
Minimum cable clearance required at rear of camera
90 mm



Mounting hole locations

Typical Applications

Bose-Einstein Condensation (BEC)
Astronomy
Bioluminescence/Chemiluminescence
In-Vivo Imaging
Photovoltaic Inspection (see the iKon-M PV Inspector Specification Sheet)
Semiconductor Analysis
Biochip Reading



Rear connector panel



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 regional sales offices, please see: www.andor.com/contact

Our regional headquarters are:

Europe

Belfast, Northern Ireland
Phone +44 (28) 9023 7126
Fax +44 (28) 9031 0792

Japan

Tokyo
Phone +81 (3) 3518 6488
Fax +81 (3) 3518 6489

North America

Connecticut, USA
Phone +1 (860) 290 9211
Fax +1 (860) 290 9566

China

Beijing
Phone +86 (10) 5129 4977
Fax +86 (10) 6445 5401

Items shipped with your camera

- 1x 2 m BNC - SMB connection cable
- 1x 3 m USB 2.0 cable Type A to Type B
- 1x Power supply with mains cable
- 1x Quick launch guide
- 1x CD containing Andor user guides
- 1x Individual system performance booklet

Footnotes:

Specifications are subject to change without notice

1. Assembled in a state-of-the-art 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 material.
2. Figures are typical unless otherwise stated.
3. Specified minimum air cooled temperature assumes ambient temperature of 25°C. Specified minimum temperature with coolant assumes coolant temperature of 10°C.
4. The dark current measurement is averaged over the sensor area excluding any regions of blemishes.
5. Readout noise is for the entire system. It is a combination of sensor readout noise and A/D noise. Measurement is for Single Pixel readout with the sensor at a temperature of -80°C and minimum exposure time under dark conditions.
6. Linearity is measured from a plot of counts vs exposure time under constant photon flux up to the saturation point of the system.
7. The frame rates shown are for the BR-DD model, for a range of binning or array size combinations. All measurements are made with 4.25 μs vertical shift speed. It also assumes internal trigger mode of operation and minimum exposure time. Note: 5 MHz = Visualization mode only.
8. Quantum efficiency of the sensor at 20°C as supplied by the sensor manufacturer.

Minimum Computer 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 sustained rate of 40MB/s
- Windows (XP, Vista, 7 and 8) or Linux

Operating & Storage Conditions

- Operating Temperature: 0°C to 30°C ambient
- Relative Humidity: < 70% (non-condensing)
- Storage Temperature: -25°C to 50°C

Power Requirements

- 110 - 240 VAC, 50 - 60 Hz



Windows is a registered trademark of Microsoft Corporation.
Labview is a registered trademark of National Instruments.
Matlab is a registered trademark of The MathWorks Inc.

LiKonM934SS 0713 R2