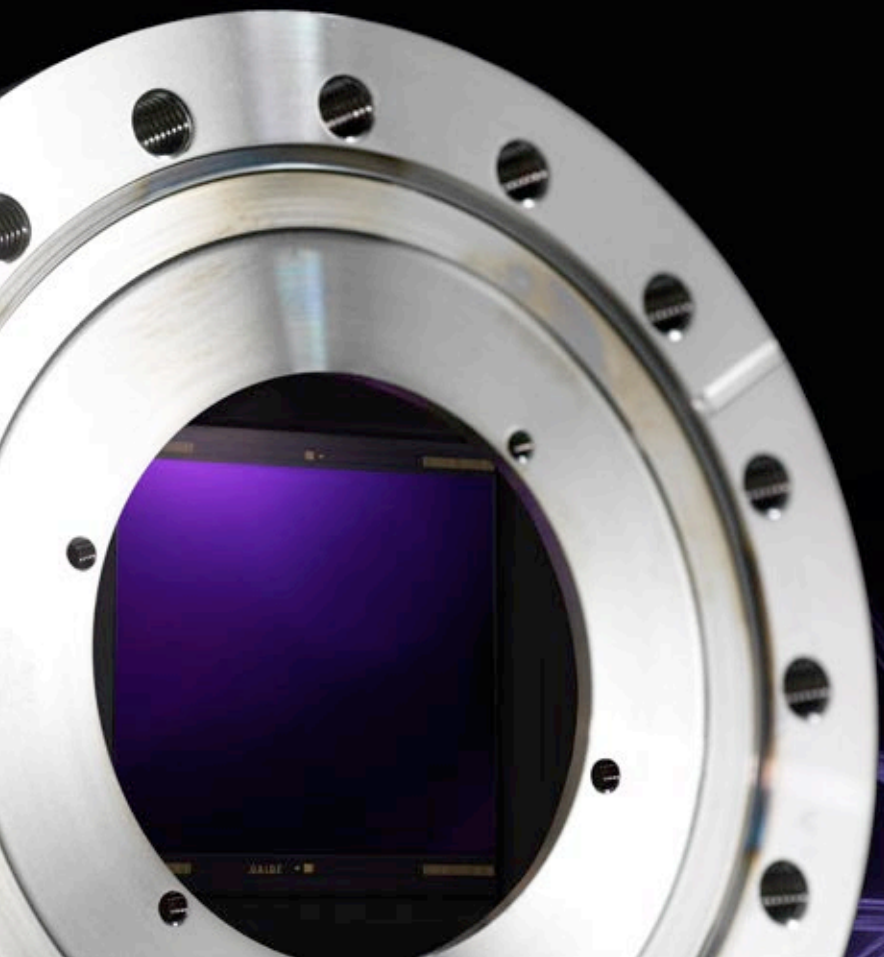
ANDOR
an Oxford Instruments company

iKon-XL SO

OPEN-FRONT CCD

NEW VERY LARGE AREA DIRECT DETECTION CCD



Key Specifications

- 16.8 Megapixel sensors
- Down to 2.1 e^- read noise
- -75°C TE cooled
- Up to 350,000 e^- well depth
- 18-bit Extended Dynamic Range
- USB 3.0 and direct long distance fibre optic connection

Key Applications

- ✓ VUV/EUV/XUV Imaging
- ✓ X-Ray Microscopy
- ✓ Phase Contrast Imaging
- ✓ X-Ray Diffraction (XRD)
- ✓ X-Ray Plasma Imaging

INTRODUCING IKON-XL SO

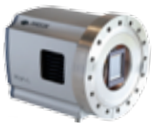
Very Large Area Open-front CCD for Direct Detection

Andor's iKon-XL 'SO' is a TE-cooled, very large area CCD camera platform, accommodating big field of view sensors that are ideally suited to low light X-Ray imaging applications. It thermoelectrically cools **back-illuminated 16.8 Megapixel** sensors (e2v) down to -75°C, avoiding inconvenient maintenance-intensive LN_2 cooling interface or unreliable cryo coolers. Extended Dynamic Range technology is complemented by up to **18-bit digitization**. Flexible connectivity is standard through either **USB 3.0** or a **long distance direct fibre optic** interface. **iKon-XL is a high quality, robust and 'hassle-free' detector solution**.

Both the 230 and 231 series use e2v back-illuminated sensors (CCD 230-84 and CCD 231-84 respectively), offering a **very large 61.4 x 61.7 mm imaging area** from a 4096 x 4112 array format and 15 µm pixel size, ideal for applications such as large field-of-view VUV/EUV/XUV X-ray Imaging and X-ray plasma.

The iKon-XL 'SO' 231 offers the absolute best CCD performance available, combining exceptionally **low read noise** of 2.1 e^- with a **very large well depth** of 350,000 e^-.

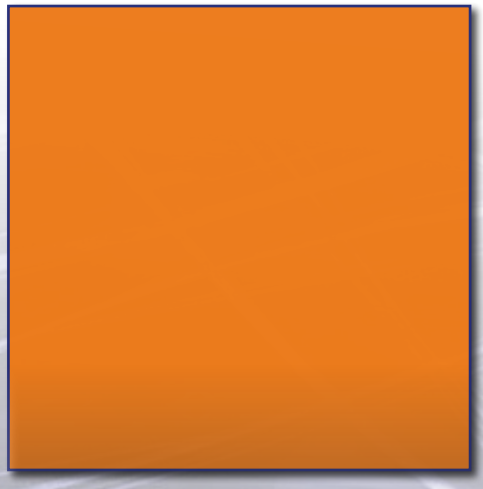
Meet the family



	iKon-M SO	iKon-L SO	NEW iKon-XL SO
Sensor	• **1 MP** (13 µm pixels)	• **4.2 MP** (13.5 µm pixels)	• **16.8 MP** (15 µm pixels)
Cooling	• **-100°C** TE cooling	• **-100°C** TE cooling	• **-75°C** TE cooling
Peak QE	• **>95%**	• **>95%**	• **>95%**
Read Noise	• Down to **2.9 e^-**	• Down to **2.9 e^-**	• Down to **2.1 e^-**
Pixel Well Depth	• Up to **100 000 e^-**	• Up to **150 000 e^-**	• Up to **350 000 e^-**
Frame Rate	• 4.4 fps	• 0.953 fps	• up to 0.5 fps (full frame)
Mounting	• DN100CF / 6" CF / CF-152 rotatable flange and knife-edge	• DN100CF / 6" CF / CF-152 rotatable flange and knife-edge	• DN160CF / 8" CF / CF-203 rotatable flange and knife-edge

13.3 x 13.3 mm

27.6 x 27.6 mm



61.4 x 61.7 mm

Right: Comparison of the sensor size of the iKon family (actual size).

FEATURES & BENEFITS

Feature	Benefit
Open-front end	DN160CF / 8" CF / CF-203 rotatable flange and knife-edge sealing provided as standard for direct interfacing to vacuum chambers
61.4 x 61.7 mm sensor	Very large field of view for extended imaging capabilities
15 x 15 µm pixel size	Ideal balance of dynamic range and resolution
Peak QE over 95%•[5]	High photon collection efficiency for maximising SNR
Thermo-electric cooling down to -75°C	Effective dark current and pixel blemish without the inconvenience of liquid nitrogen (LN_2)
Low noise readout	Intelligent low-noise electronics offer the most 'silent' system noise
Fibre-optic or USB 3.0 interface flexibility	Built-in robust plug and play interface options as standard. Fibre optic for long distance solution
Extended Dynamic Range (18-bit)	Unique method to achieve lowest noise and maximum well depth within one scan. Supplemented by up to 18-bit digitization
Balanced Quad-port readout	Tracking stability to ensure all readout circuits experience same temperature and operating conditions
Multiple readout speeds, up to 3 or 4 MHz	Slower readout for lowest noise, faster speeds for more rapid readout and focusing
Windows, Linux & Labview	Andor's user-friendly SDK supports both Windows and Linux OS. LabView VI package available.
EPICS software control	Seamless integration and operation at EPICS-based particle accelerators and major telescopes

Extended Dynamic Range Technology

CCD cameras always require software selection of amplifier gain to optimize either for low noise (weak signal) OR max well depth (bright signal). **Not both…**

…until now. iKon-XL utilizes proprietary Andor CCD know-how to offer **lowest read noise** AND **maximum well depth** *in one image*, with only one gain setting.

TECHNICAL DATA

System Specifications •2

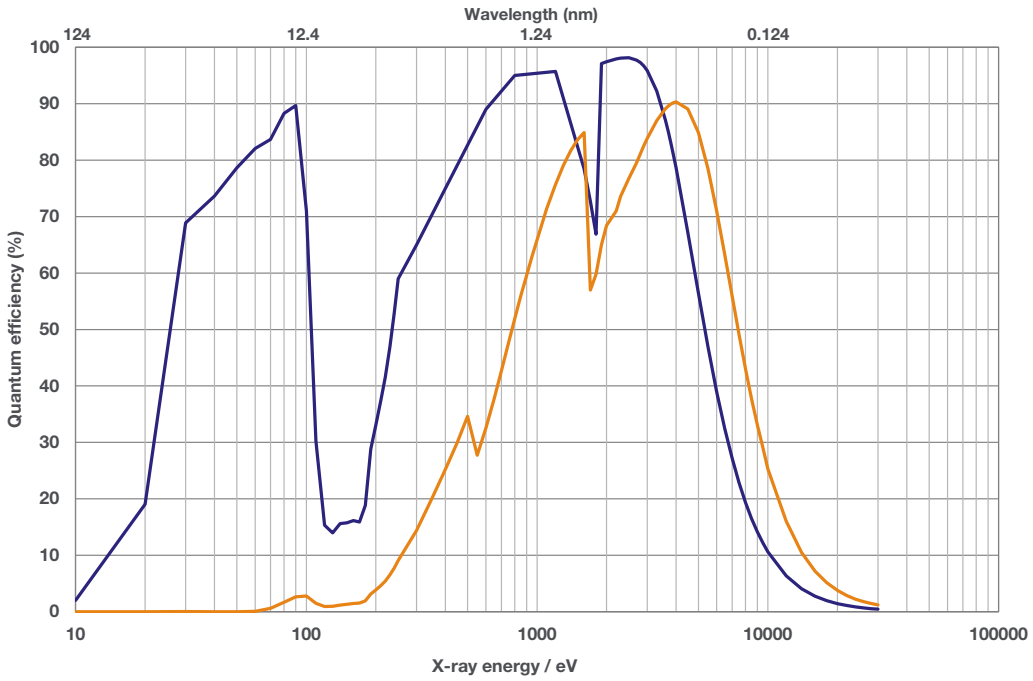
	iKon XL 'SO' 230	iKon XL 'SO' 231
Sensor Options	**BN**: back-illuminated, uncoated	**BN**: back-illuminated uncoated **BR-DD**: back-illuminated deep-depletion
Pixels	4096 (H) x 4112 (V)	
Pixel size	15 x 15 µm	
Image area	61.4 x 61.7 mm with 100% fill factor	
Minimum temperatures •3 **@ coolant temperature of 10°C** **@ coolant temperature of 16°C** **air cooled (@22°C ambient)**	 -75ºC -70ºC -55ºC	
Blemish specification	Grade 1 or higher, as per manufacturers definition	

Advanced Performance Specifications •2

	iKon-XL 'SO' 230				iKon-XL 'SO' 231		
Peak QE •5	>95% (BN), >90% (BR-DD)						
Active area pixel well depth (typical)	150,000 e^-				350,000 e^-		
Output node capacity	450,000 e^- (High sensitivity) 900,000 e^- (High capacity)				600,000 e^-		
Pixel readout rates	0.1, 1, 2 and 4 MHz				0.1, 1 and 3 MHz		
Read Noise (e^-) **(BN, BR-DD and BN-DD)**	**100 kHz** 4.5	**1 MHz** 8.5	**2 MHz** 14.0	**4 MHz** 23	**100 kHz** 2.1	**1 MHz** 4.8	**3 MHz** 8
Dark Current, e^-/pixel/sec •4 **@ -55°C** **@ -75°C**	**BN** 0.001 0.0001				**BN** 0.05 0.006	**BR-DD** 2.835 0.34	
Frame rate (full frame)	Greater than 0.5 fps				Greater than 0.35 fps		
Binning	User definable						
Region of Interest (windowing mode)	User definable (centred in 4-output mode)						
Linearity •7	Better than 99%						
Digitization	16-bit (all speeds) 18-bit (100 kHz and 1 MHz)						
Outputs	Quad or Single						
Mounting flange	DN160CF / 8" CF / CF-203, rotatable*						
Maximum bake-out temperature	+55ºC						
Vacuum compatibility	>10^{-8} millibar						

* Please refer to the Andor Technical Note: ***Open-front camera flanges*** for further details.

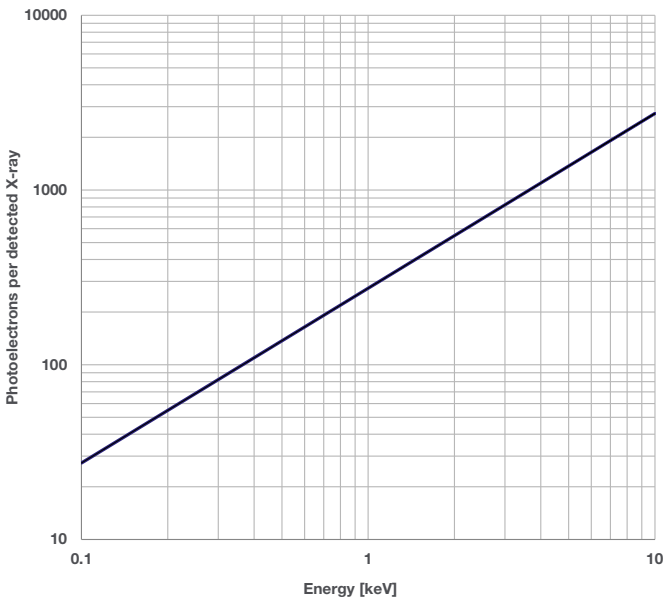
Quantum Efficiency Curves[•5]



The iKon-XL SO is available with 2 sensor options:

- **BN: Back-Illuminated uncoated**
- **BR-DD: Back-illuminated deep-depletion**

Photoelectrons v Incident X-rays [•6]



Best Practice Guidelines

Condensation
It is strongly advised that the camera should not be used in a condensing atmosphere. If used in a condensing atmosphere the sensor MUST be protected and the use of a cold finger is strongly recommended.

Contamination & Damage
When not in use, the sensor chamber should be covered and sealed.

Due to the exposed nature of the sensor, extreme care should be taken with the camera, as damage can easily occur through mishandling or by contamination.

If the sensor becomes contaminated, due to accident or misuse, please contact Andor immediately for advice on cleaning.

Vacuum Operations
Ensure that the vacuum environment to which the camera is fitted is free of water vapour and other contaminants. Care should also be taken to control pressure change, as sudden pressure changes can potentially cause damage to the sensor assembly.

CREATING THE OPTIMUM PRODUCT FOR YOU

XLO- EA11 - C0

example shown

Step 1. Choose the sensor type

Sensor Type

Description	Code
16.8 Megapixel CCD230-84 Back-Illuminated uncoated Sensor (BN)	EA10
16.8 Megapixel CCD231-84 Back-Illuminated uncoated Sensor (BN)	EA11
16.8 Megapixel CCD231-84 Back-Illuminated Deep-Depletion Sensor (BR-DD)	EA12

Step 2. Select the required accessories

Accessories

Description	Code
Filter holder for iKon-XL SO, minimum recommended Beryllium window thickness is 250 µm (not included).	SO-FILTER-MNT-IKONXL
Beryllium filter, Ø105 mm, 250 µm thick	ACC-OPT-10395

Please contact your local sales representative regarding other options such as different mounting types, or other customizations you may require for system integration or your specific application.

Step 3. Select the required software

Software

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

Solis for Imaging A 32-bit and fully 64-bit enabled application for Windows (XP, Vista, 7 and 8) Linux and Labview, 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++.

Third party software compatibility Drivers are available so that the iKon-XL can be operated through a large variety of third party imaging packages including EPICS (16-bit). See Andor web site for detail: **http://www.andor.com/software/**

Have you found what you are looking for?

Need a faster frame rate? Andor's iKon-M SO 934 and iKon-L SO 936 achieve 4.4 and 0.95 fps (full frame) respectively.

Need to detect harder X-rays? Andor offers a range of Indirect Detection cameras (DH/HF range) including the Zyla HF and iKon-M & L HF that are compatible with industry-standard scintillators.

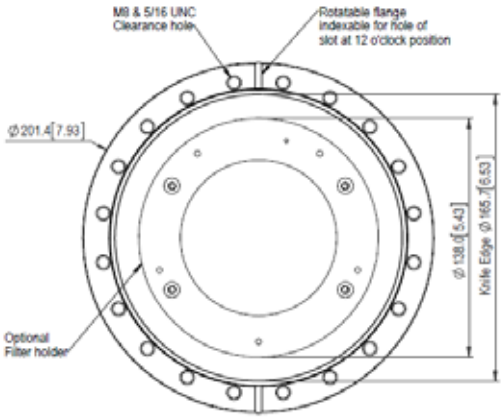
Need a specific mounting? Contact our experienced design team so we can make the perfect fit.

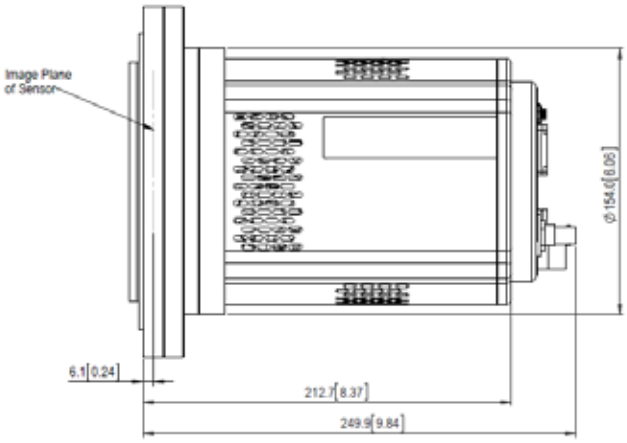
Need a camera for VUV/ X-ray spectroscopy? Andor's specialist spectrographic cameras (Newton 920 and 940 SO series) are ideally suited for vacuum spectrographs.

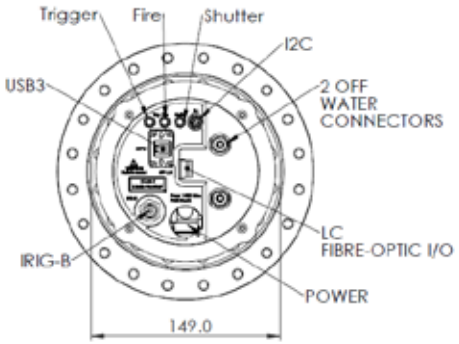
Need a customized version? Please contact us to discuss your design.

MECHANICAL DRAWINGS

Third-angle projection







Dimensions in mm [inches]

Weight (approx): 9.5 kg [20lbs 15oz], (9.7 kg [21lbs 6oz] with filter holder)

Please consult the open-front camera flanges technical note at andor.com for further technical details on flange configurations

Refer to Best Practice Guidelines on page 5 for information on handling open fronted camera models.

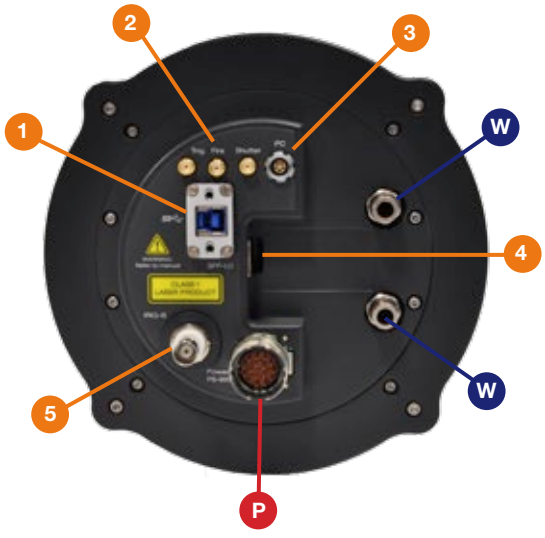
Flexible Connectivity

1. **USB 3.0**
   USB 3.0 offers a robust high speed plug and play data interface
2. **TTL / Logic**
   Connector type: SMB, provided with SMB - BNC cable
   Fire (Output), External Trigger (Input), Shutter (Output)
3. **I²C**
   Compatible with Fischer SC102A054-130
   Shutter (TTL), I²C Clock, I²C Data, +5 Vdc, Ground
4. **Fibre Optic**
   Long distance connection via LC Fibre-optic I/O connection
5. **IRIG-B**
   Compatible with IRIG-B standard (GPS with 10 ms resolution)

W **Water Cooling**
Connection to recirculator or other water/liquid cooling system

P **Power**
Connection to external PSU (supplied) refer to power requirements on page 8

Notes: Minimum cable clearance required at rear of camera 100 mm



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

Our regional headquarters are:

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Phone +1 (860) 290 9211
Fax +1 (860) 290 9566

China
Beijing
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Fax +86 (10) 8271 9055

Items shipped with your camera

1x Fibre Optic PCIe Card (note: PC requires 1x slot for installation of the Fibre Optic PCIe Card)
1x iKon-XL Power Supply
1x Country specific power Cord
1x Camera power lead (5 m)
1x BNC-SMA Cable
1x USB 3.0 Cable
1x Fibre Optic Patch Lead LC-LC OM3 (15 m)

Footnotes

1. IMPORTANT - Due to the sensor being exposed to environments outside of Andor's control there is no warranty on the sensor. For full details of Andor's Warranty Policy please refer to our webpage at http://www.andor.com/contact_us/support_request/. For key information on handling precautions for SO/HO open front end systems, please refer to the best practice guidelines on page 5. Note permanent damage can easily occur due to misuse.
2. Figures are typical unless otherwise stated.
3. Specified minimum temperature with coolant assumes coolant temperature of 10°C, measured at camera head. Note that cooling performance may be affected by distance between camera head and cooler.
4. Dark current measurement is averaged over the CCD area excluding any regions of blemishes.
5. Quantum efficiency data as supplied by the sensor manufacturer.
6. The graph shows photoelectrons generated as a function of photon energy of incident X-ray.
7. Linearity is measured from a plot of counts vs exposure time under constant photon flux up to the saturation point of the system.

Minimum Computer Requirements:

- 3.0 GHz single core or 2.4 GHz dual or quad core processor
- 2 GB RAM
- 100 MB free hard disc to install software (at least 1 GB recommended for data spooling)
- USB 3.0 High Speed host Controller capable of sustained rate of 60 MB/s
- Windows (7 and 8) or Linux

Operating & Storage Conditions:

- Operating Temperature: 0°C to +30°C ambient (-30°C to +30°C ambient on request)
- Operating Altitude: up to 6000m
- Relative Humidity: <70% (non-condensing)
- Storage Temperature: -30°C to 50°C

Power Requirements:

- 100 - 240 VAC, 50 - 60 Hz
- Power consumption: 500W max