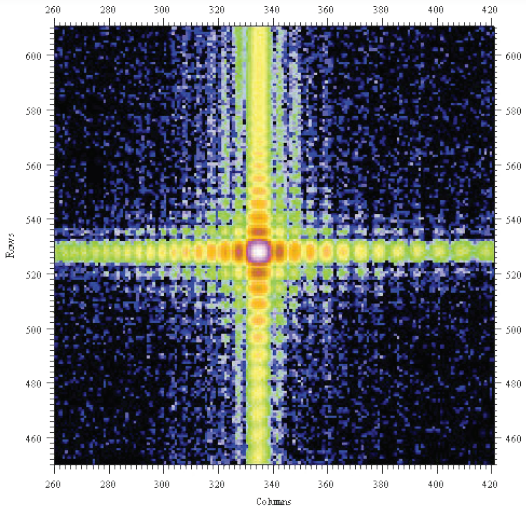
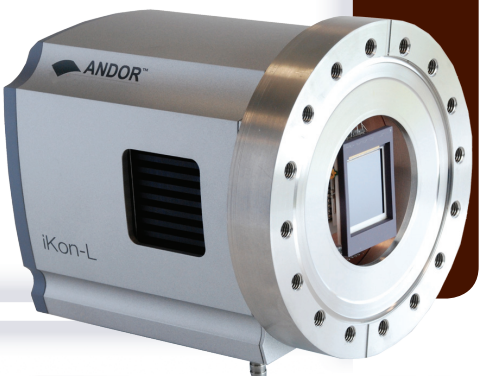
iKon-L 936 DO Series

Direct Detection
X-Ray Imaging Camera

X-Ray Cameras



X-Ray diffraction pattern of
the Synchrotron Soleil,France.
Courtesy of Vincent Jacques



Features and Benefits

- **Open front end** *1
  CF152 flange and knife-edge sealing provided as standard for direct interfacing to vacuum chambers.
- **Peak QE of 95%**
  High detector sensitivity
- **13.5 x 13.5 µm pixel size**
  Optimal balance of dynamic range and resolution
- **Large area 2048 x 2048 sensor**
  Large field of view and high resolution
- **TE cooling to -100°C**
  Minimization of dark current and pixel blemish
- **Quad-speed readout up to 5 MHz**
  Slower readout for low noise, faster speeds for dynamic processes and 5 MHz for focusing mode
- **USB 2.0 connection**
  USB plug and play – no controller box
- **Ultra-low noise readout**
  Intelligent low-noise electronics offer the most 'silent' system noise available
- **Dual output**
  High Sensitivity output for low-light applications, or a High Capacity output for maximum dynamic range with extensive binning
- **Cropped sensor mode**
  Specialised acquisition mode for continuous imaging with fast temporal resolution
- **Enhanced Baseline Clamp**
  Essential for quantitative accuracy of dynamic measurements

Direct Detection X-Ray Imaging

Andor's iKon-L 936 DO is designed with scientific imaging in mind. The 2048 x 2048 array and 13.5 µm x 13.5 µm pixels combine to deliver a 27.6 x 27.6 mm active image area, TE cooled down to -100°C. The iKon-L 936 offers outstanding resolution, field of view, sensitivity and dynamic range performance. Ultimate sensitivity performance is achieved through combination of > 90% QE (back-illuminated sensor), low noise readout electronics and exceptionally deep TE cooling.

iKon-L 936 boasts a proprietary large area 5-stage TE cooler (4-stage optional), enabling cooling of this large area sensor down to an unprecedented -100°C without the aggravation of liquid nitrogen or compressed gas cooling, perfect for the longest of exposure times. USB 2.0 connectivity and multi-MHz readout options provide for ease of integration and operation.

Specifications Summary

Active pixels	**2048 x 2048**
Sensor size	**27.6 x 27.6 mm**
Pixel size (W x H)	**13.5 µm x 13.5 µm**
Active area pixel well depth (typical)	**100,000 e^-**
Maximum readout rate	**5 MHz**
Read noise	**2.9 e^-**
Maximum cooling	**-100°C**
Frame rate	**0.95 fps**

Key Specifications[•2]

Model number	DO936N	
Sensor options	BN: Back Illuminated CCD	FI: Front Illuminated CCD
Active pixels [•3]	2048 x 2048	
Pixel size	13.5 x 13.5	
Image area	27.6 x 27.6 mm with 100% fill factor	
Minimum temperature air cooled [•4] Coolant recirculator Coolant chiller, coolant @ 10ºC, 0.75l/min	4-stage peltier cooler -70ºC -75ºC -80ºC	5-stage peltier cooler -80ºC -95ºC -100ºC
Blemish specification	Grade 1 (or better) sensor (CCD 42-40) as defined by the manufacturer (e2v)	

Advanced Specifications[•2]

Dark current, e^-/pixel/sec [•5] @ -70°C @ -100°C (DZ cooling model only)	0.000425 0.000045	0.000167 0.000022	
Pixel readout rates	5, 3, 1, 0.05 MHz		
Pixel well depth	100,000 e^-		
Read noise (e^-) [•6] High Sensitivity output High Capacity output	@ 50 kHz 2.9 9	@1 MHz 6.4 23	@3 MHz 11.8 42	@5 MHz 27.3 65
Linearity [•7]	Better than 99%		
Digitization	16 bit		
Vertical clock speed	Down to 38 µs (software selectable)		
Bakeout temperature	55°C		
Vacuum compatibility	10^{-8} millibar		

Frame Rates[•8]

50 kHz Precision photometry mode			
Binning	Full Frame	1024 x 1024	512 x 512
1 x 1	0.011	0.023	0.046
2 x 2	0.04	0.059	0.102
4 x 4	0.155	0.138	0.213
8 x 8	0.482	0.293	0.42
16 x 16	1.166	0.572	0.78

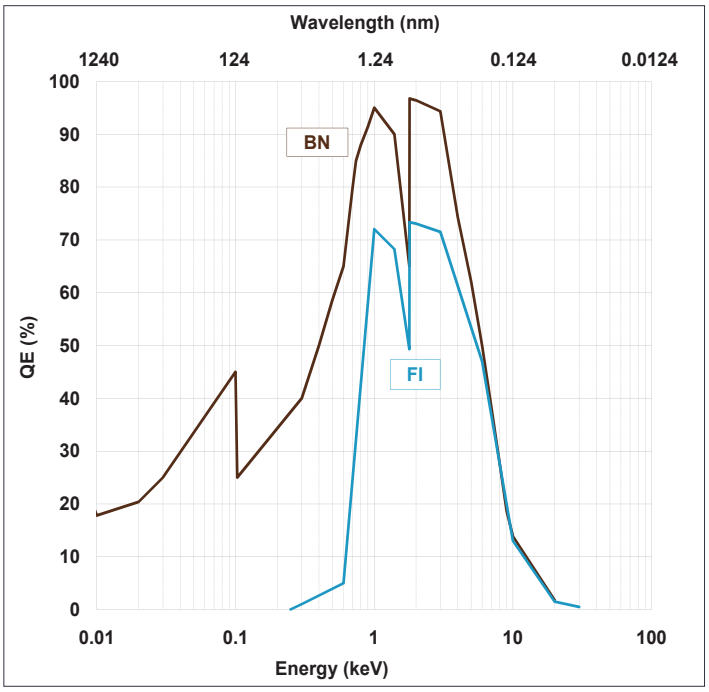
1 MHz			
Binning	Full Frame	1024 x 1024	512 x 512
1 x 1	0.221	0.433	0.835
2 x 2	0.662	0.993	1.67
4 x 4	1.594	1.947	2.951
8 x 8	2.912	3.266	4.571
16 x 16	4.152	4.71	6.204

3 MHz			
Binning	Full Frame	1024 x 1024	512 x 512
1 x 1	0.607	1.157	2.115
2 x 2	1.294	2.175	3.588
4 x 4	2.305	3.545	5.326
8 x 8	3.463	5.017	6.953
16 x 16	4.496	6.27	8.18

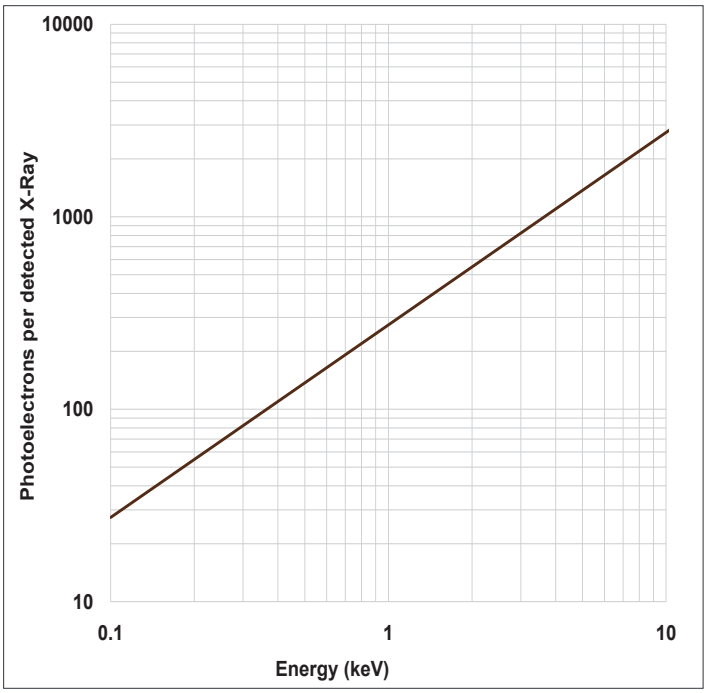
5 MHz Visualization mode			
Binning	Full Frame	1024 x 1024	512 x 512
1 x 1	0.953	1.771	3.1
2 x 2	1.655	2.922	4.733
4 x 4	2.619	4.329	6.424
8 x 8	3.697	5.7	7.822
16 x 16	4.654	6.776	8.777

Quantum Efficiency Curves [9]

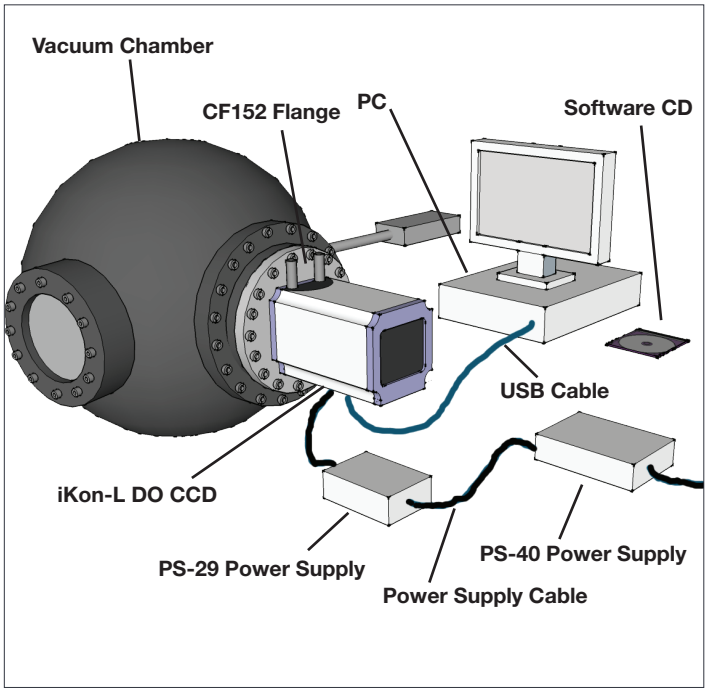
20°C



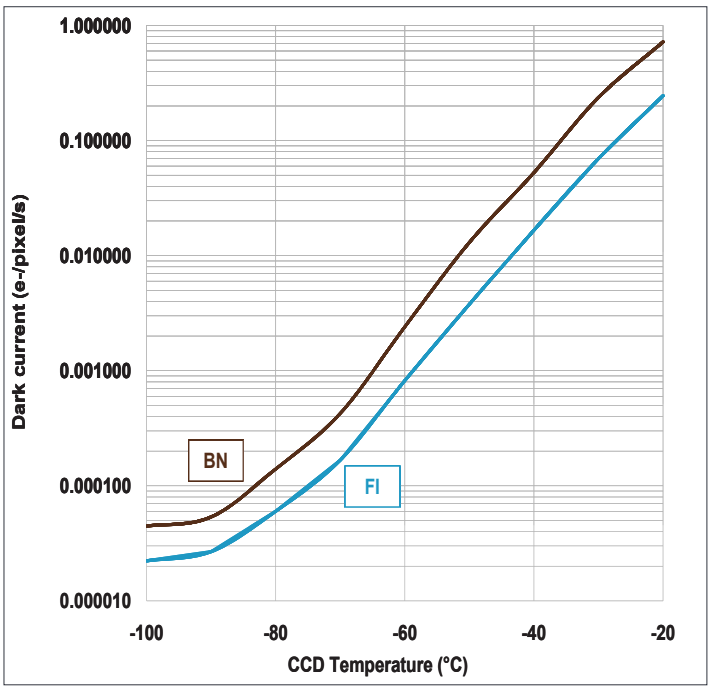
Photoelectrons v Incident X-rays [10]



Typical Setup



Dark Current [5]



Creating The Optimum Product for You

How to customise the iKon-L DO :

Step 1.

The iKon-L DO flange has 3 mounting flange options. Please select the type of fitting for your installation.

Step 2.

The iKon-L DO has 2 options for peltier cooling. Please select the type of cooler required.

Step 3.

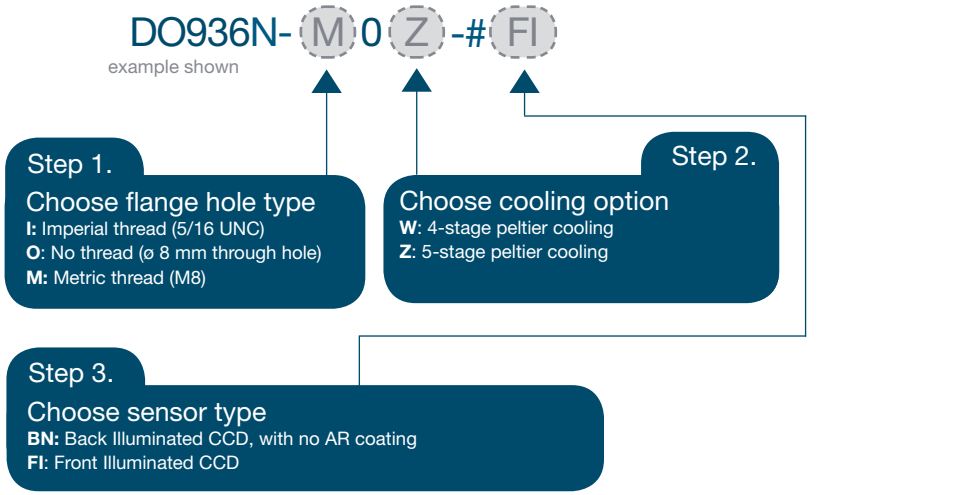
The iKon-L DO CCD comes with 2 options for sensor types. Please select the sensor which best suits your needs.

Step 4.

Please indicate which software you require.

Step 5.

For compatibility, please indicate which accessories are required.



Step 4.

The iKon-L DO also requires at least one of the following software options:

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

Andor SDK Andor's Software Developers Kit DLL 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).

Step 5.

The following accessories are available:

XW-RECR Re-circulator for enhanced cooling performance

ACC-XW-CHIL-160 Oasis 160 Ultra compact chiller unit

XU-RECR/TRANS USB 2.0 - Transmitter and Receiver, including 2 power supplies

XF-FILTER_HOLDER Filter holder

Have you found what you are looking for?

Need to get even closer to the action? Andor's range of DX cameras are designed for use inside vacuum chambers.

Need to detect harder x-rays? Andor offers a range of Indirect Detection cameras (DH/DF) which are compatible with with industry-standard scintillators.

Need a standalone camera for X-ray? A custom built Beryllium window is fitted as standard to our DY range of cameras to block visible light, making these the ideal solution.

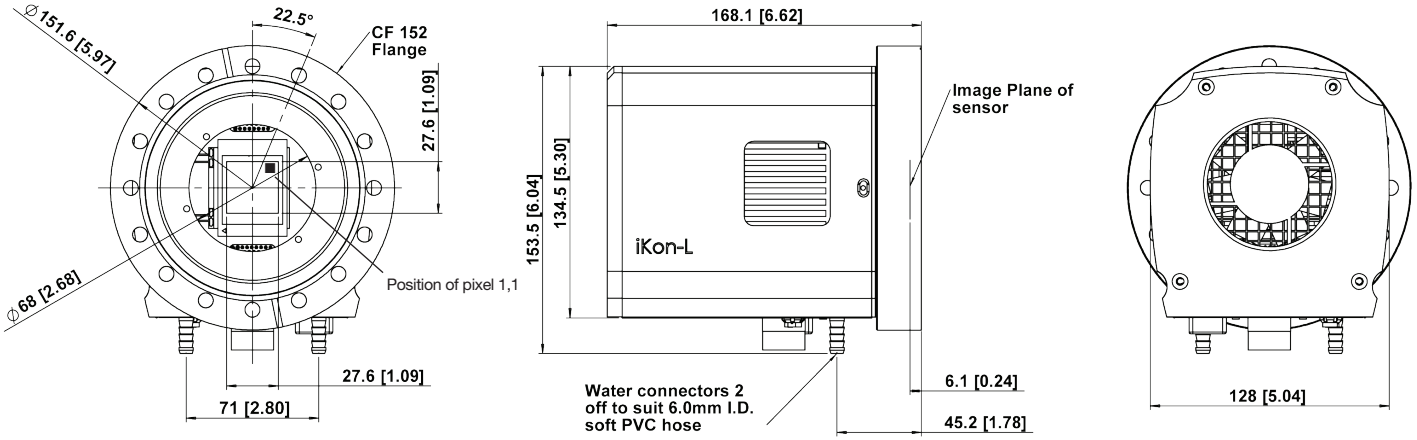
Need a specific mounting? Contact our experienced design team so we can make the perfect fit.

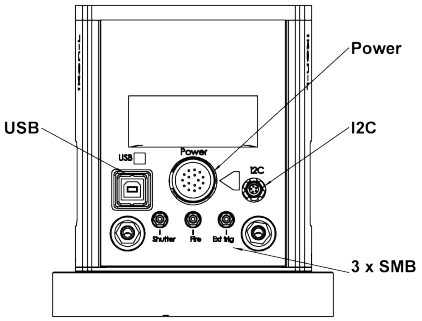
Need a camera for VUV spectroscopy? Andor's specialist spectrographic cameras (DO920 or DO940) are ideally suited for vacuum spectrographs.

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

Product Drawings

Dimensions in mm [inches]





Connector panel

Weight: 5.5 kg [12 lb 2 oz]

Best Practices Guide

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	1 - When not in use the sensor chamber should be covered and sealed. 2 - 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. 3 - If due to accident or misuse the sensor becomes contaminated, 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

Connecting to the iKon-L DO

Camera Control
Connector type: USB 2.0

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 bottom of camera
90 mm

Applications Guide

X-Ray Laser Development
Lithography EUV
X-Ray Plasma Diagnostics
Soft X-Ray Imaging
X-Ray Diffraction (XRD)
X-Ray Fluorescence (XRF)
Crystallography
Phase Contrast Imaging
High Harmonic Generation

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

Items shipped with your camera:

1x 2m BNC - SMB connection cable
1x 3m USB 2.0 cable Type A → Type B
2x Power supplies (PS-29 & PS-40) with associated cables
1x CD containing Andor user guides
1x Individual system performance booklet
1x Protective cover plate
4x fixing screws for cover plate •[11]

Footnotes: Specifications are subject to change without notice

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 DO 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. Edge pixels may exhibit a partial response.
4. Stabilized cooling temperatures are given for slowest readout speed. Use of faster readout speeds (in order to achieve faster frame rates) may require a higher cooling temperature to be selected. Specified minimum air cooled temperature assumes ambient temperature of 25°C. Specified minimum temperature with coolant assumes coolant temperature of 10°C. All cooling performance can be compromised by the environment to which the sensor is exposed
5. Dark current measurement is averaged over the CCD area excluding any regions of blemishes.
6. System Readout noise is for the entire system and is taken as a mean over the sensor area excluding any regions of blemishes. It is a combination of sensor readout noise and A/D noise
7. Linearity is measured from a plot of Signal vs. Exposure Time over the full dynamic range.
8. Typical binning or array size combinations. All measurements are made with 38 µs vertical shift speed. It also assumes internal trigger mode of operation and minimum exposure time. Note: 5 MHz = Visualization mode only.
9. Quantum efficiency of the sensor as measured by the manufacturer.
10. The graph shows photoelectrons generated as a function of photon energy of incident X-ray, assuming event fully captured by a single pixel.
11. Fixing screws for mounting the flange to a vacuum chamber are not included.

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 and 7) 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
Bakeout Temperature 55°C

Power Requirements

110 - 240 VAC, 50/60 Hz

XIKONL936DOSS 0311 R1