

# iKon-L HF

## Large Area Indirect Detection Fibre Optic CCD

### Key Specifications

- ✓ 4 MP high resolution CCD
- ✓ 95 % peak sensor QE at 550 nm
- ✓ High throughput fibre-optic coupling
- ✓ Deep-TE cooling to  $-35^{\circ}\text{C}$
- ✓  $>15$  lp/mm resolution with YAG:Ce or LuAG:Ce scintillators

### Key Applications

- ✓ X-ray Tomography
- ✓ Neutron Tomography
- ✓ X-ray Plasma Diagnostics
- ✓ X-ray Imaging
- ✓ Phase Contrast Imaging
- ✓ X-ray Crystallography
- ✓ X-ray Diffraction



# Introducing the iKon-L HF



Andor's iKon-L HF outstanding design is built for scientific imaging! The outstanding design brings together the key elements in a single optimized format; the highest QE (95%) Back-illuminated sensor and a single directly bonded FOP. This design delivers the highest optical transmission and spatial resolution performance alongside Andor's trademark ultra-low noise Electronics platform.

The iKon-L HF 936 TE-cooler enables cooling of this large area sensor without the inconvenience of liquid nitrogen (LN<sub>2</sub>) or compressed gas cooling, perfect for the longest of exposure times. USB 2.0 connectivity, multiple mounting points and modular fibre-optic taper, scintillators and filters enable seamless integration into customer's experiments.

## Features & Benefits

Feature	Benefit
2048 x 2048 sensor matrix	Provides a large field of view without the need for optical tapers
Peak QE of 95% @ 550 nm	Back-illuminated sensor offers optimum detection performance at key scintillators emission wavelengths
13.5 x 13.5 µm pixel size	Optimal balance of dynamic range and resolution
Single fibre optic plate coupling	High throughput, low distortion bonded fibre optic 1:1 as standard Other options available on request
Modular input interface	Seamless integration of a wide range of scintillators, filters or fibre-optic tapers
TE cooling to -35°C	Effective minimization of dark current and pixel 'hot' blemish, maintenance-free
Up to 5 MHz pixel readout	Slower readout for low noise, faster speeds for dynamic processes Intelligent low-noise electronics offer the most 'silent' system noise available
Dual readout mode	High Sensitivity option for low-light applications, or a High Capacity option for maximum dynamic range with extensive binning
Cropped sensor mode	Specialized acquisition mode for continuous imaging with fast temporal resolution
Enhanced baseline clamp	Essential for quantitative accuracy of dynamic measurements
USB 2.0 interface	Plug-and-play, user-friendly interface – optical extenders available for operation up to 100 m
High resolution scintillator options	Fibre-optic coupled YAG:Ce or LuAG:Ce scintillators for high resolution imaging > 15 lp/mm CsI:TL options for high throughput requirements
Integrated in EPICS	Ease of operation in EPICS software-based facilities such as partner particle accelerators and other large scientific experiments

# Technical Specifications

## Sensor Specifications<sup>\*1</sup>

Sensor type	FB: Back Illuminated CCD with FOP
Sensor matrix <sup>*2</sup>	2048 x 2048 pixels, 13.5 µm pixel size
Image area	27.6 x 27.6 mm with 100% fill factor
Blemish specification	Grade 1 sensor from supplier. Camera blemishes as defined by Andor Grade A: <a href="http://andor.oxinst.com/learning/view/article/ccd-blemishes-and-non-uniformities">andor.oxinst.com/learning/view/article/ccd-blemishes-and-non-uniformities</a>

## Advanced Performance Specifications<sup>\*3</sup>

Minimum temperature <sup>*4</sup> Coolant chiller, coolant @ 10°C, 0.75 l/min	-35°C	
Dark current @ minimum temperature <sup>*5</sup>	0.09 e <sup>-</sup> /pixel/sec	
Pixel readout rates	5 <sup>*6</sup> , 3, 1, 0.05 MHz	
Pixel well depth	100,000 e <sup>-</sup>	
Output node capacity	250,000 e <sup>-</sup>	
Read noise <sup>*7</sup>	High Sensitivity output (e <sup>-</sup> )	High Capacity output (e <sup>-</sup> )
0.05 MHz	4.9	12
1 MHz	8	22
3 MHz	12	36
5 MHz <sup>*2</sup>	35	90
Linearity <sup>*8</sup>	Better than 99%	
Digitization	16-bit	
Vertical clock speed	38.55 or 76.95 µs (software selectable)	

## Frame Rates<sup>\*9</sup>

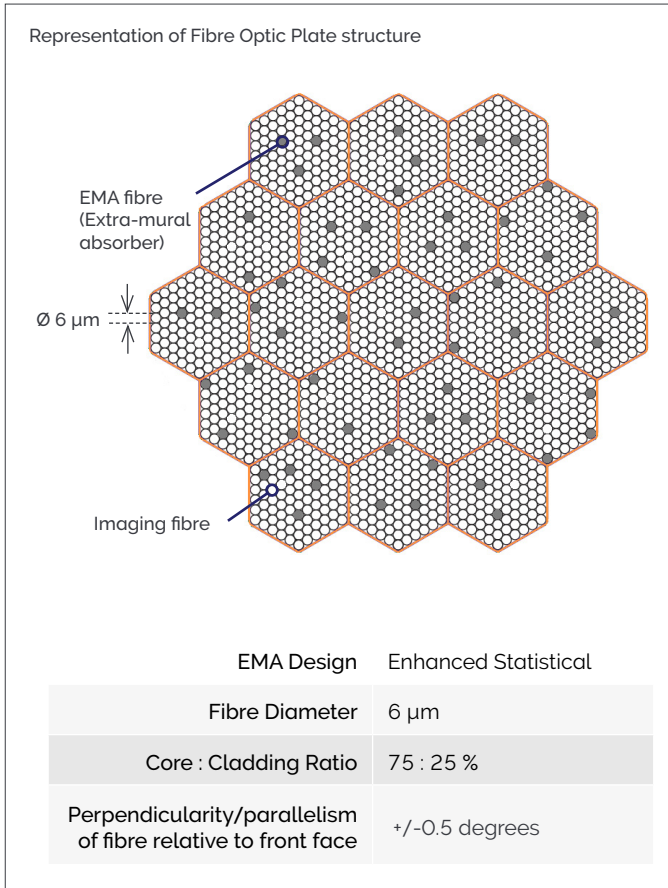
50 kHz Precision Photometry Mode			
Binning	Full Frame	1024 x 1024	512 x 512
1 x 1	0.011	0.023	0.046
2 x 2	0.040	0.059	0.102
4 x 4	0.155	0.138	0.213
8 x 8	0.482	0.293	0.420
16 x 16	1.166	0.572	0.780

1 MHz Photometry Mode			
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	1.670
4 x 4	1.594	1.947	2.951
8 x 8	2.912	3.266	4.571
16 x 16	4.152	4.710	6.204

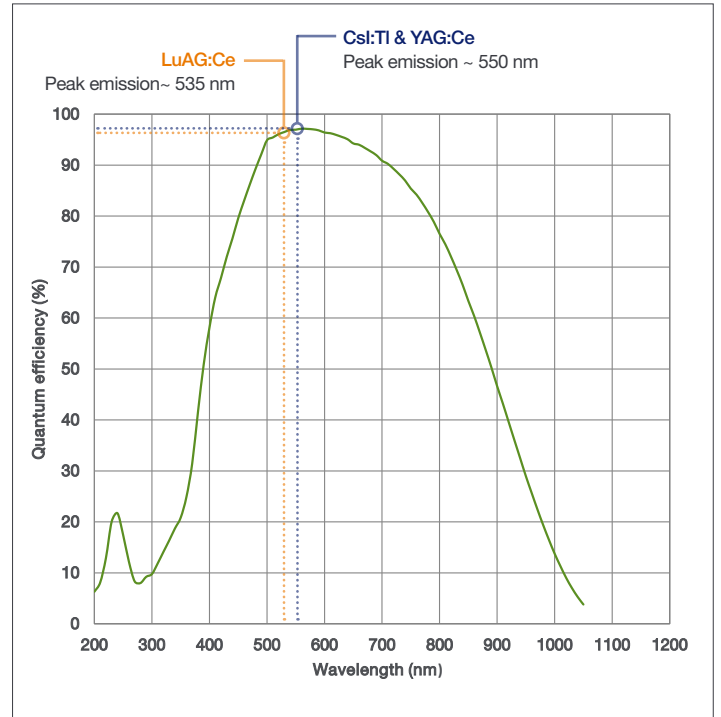
3 MHz Photometry Mode			
Binning	Full Frame	1024 x 1024	512 x 512
1 x 1	0.607	1.157	2.115
2 x 2	1.294	2.175	3.588
4 x 4	2.305	3.545	5.326
8 x 8	3.463	5.017	6.953
16 x 16	4.496	6.270	8.180

5 MHz Visualization mode <sup>*6</sup>			
Binning	Full Frame	1024 x 1024	512 x 512
1 x 1	0.953	1.771	3.100
2 x 2	1.655	2.922	4.733
4 x 4	2.619	4.329	6.424
8 x 8	3.697	5.700	7.822
16 x 16	4.654	6.776	8.777

## Fibre Optic Plate (FOP) <sup>10</sup>



## Sensor Quantum Efficiency Curve <sup>11</sup>



## Scintillator Specifications <sup>12</sup>

Best Resolution			Best Throughput		
Scintillator characteristics	Spatial resolution *	Energy range	Scintillator characteristics	Spatial resolution *	Energy Range
YAG:Ce 40 µm thick on 3 mm FOP	> 15 lp/mm	Best suited for broad 2 - 100 keV range	CsI:Tl 150 µm thick on 3 mm FOP	~ 10 lp/mm	Best suited for broad 10 - 100 keV range
SCT- YAGCE-45-040-00					
LuAG:Ce 40 µm thick on 3 mm FOP	> 15 lp/mm	Best suited for 10 - 100 keV range	SCT- CSITLT-50-150-00		
SCT- LUAGCE-45-040-00					

\*Spatial resolution is given at 10% MTF for the entire system iKon-L HF, 1:1 fibre-optic plate and scintillator at 40 keV. Please note that spatial resolution will decrease at lower energies.



For more information about scintillator options please refer to the technical note: [Scintillators for Andor high energy detection cameras](#).

# Creating the optimum product for you



DF936N- FB-T2

## Step 1. Sensor type



CCD

Sensor Type

There is one sensor option for the iKon-L HF:

Description
Back Illuminated CCD, with AR coating and FOP (FB)

## Step 2. Interface type



Interface Type

There is one standard interface type:

Description
Fibre optic input (no scintillator)

## Step 3. Select the required accessories and adapters



Accessories & Adapters

Description	Order Code
Re-circulator for enhanced cooling performance	XW-RECR
Oasis 160 Ultra compact chiller unit (tubing to be ordered separately)	ACC-XW-CHIL-160
6 mm tubing options for ACC-XW-CHIL-160 (2x2.5 m or 2x5 m lengths)	ACC-6MM-TUBING-2X2.5/ ACC-6MM-TUBING-2X5M
Ø 60 mm filter and Ø45 x 3 mm scintillator holder for iKon-L HF	SCT-FLT_HLD-C045IKL
Ø 60 mm filter and 50 x 50 x 3 mm scintillator holder for iKon-L HF	SCT-FLT_HLD-H050IKL
Beryllium filter Ø 60 mm, 200 µm thick	ACC-OPT-03838

For further information about high resolution / high throughput scintillators characteristics and ordering information for iKon-L HF, please refer to the technical note [Scintillators for Andor high energy detection cameras](#)

## Step 4. Select the required software



Software

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

**Solis Imaging** A 32-bit and fully 64-bit enabled application for Windows (8.1 and 10) 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/ 64-bit libraries for Windows (8.1 and 10) and Linux. Compatible with C/C++, C#, Delphi, VB.NET, LabVIEW, MATLAB and Python.

**Third party software compatibility**

Drivers are available so that the iKon-L range can be operated through a large variety of third party imaging packages. See Andor website for detail: [andor.oxinst.com/third-party-software-matrix](http://andor.oxinst.com/third-party-software-matrix)

## Have you found what you are looking for?

**Need a faster frame rate?** Andor's Zyla-HF sCMOS platform achieves up to 100 fps full frame

**Need a standalone camera for X-ray?** A custom built beryllium window is fitted as standard to our SY/HY range of cameras to block visible light.

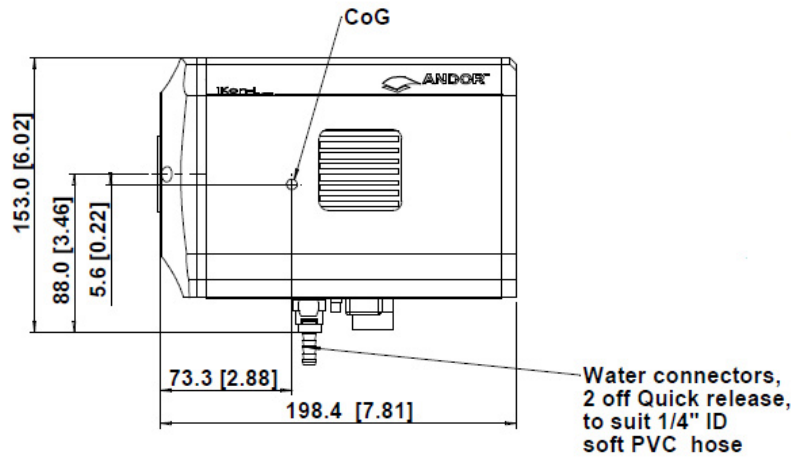
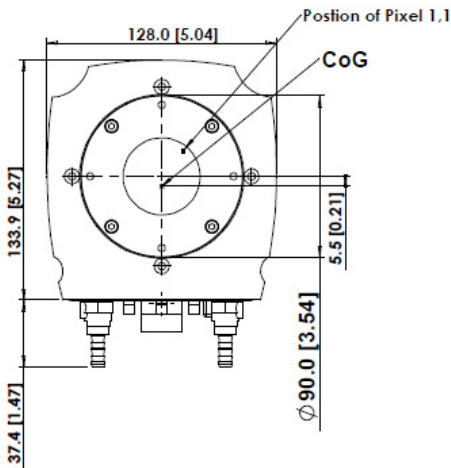
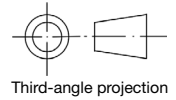
**Need a specific mounting?** Contact our experienced design team so we can make the perfect fit.

**Need a camera for VUV / X-ray spectroscopy?** Andor's specialist spectrographic cameras (SO 920 or SO 940) 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]



Weight: ~4.5 kg [9 lb 15 oz]

## Notes

- Fibre Optic Plate is on a spring loaded design. If required to move, can apply approx 253 N to move FOP 1 mm max towards camera.
- Protective cap MEC-04028 not shown
- CoG: center of gravity

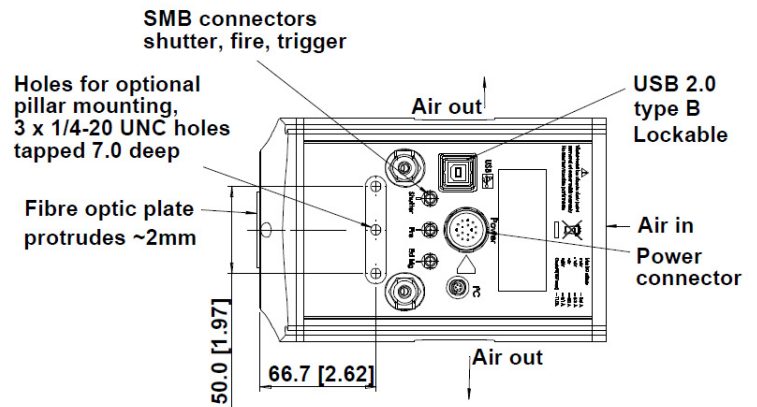
## Connecting to the iKon-L HF

Camera Control  
Connector type: USB 2.0

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

I<sup>2</sup>C connector  
Compatible with Fischer SC102A054-130  
Shutter (TTL), I<sup>2</sup>C Clock, I<sup>2</sup>C Data, +5 Vdc, Ground

Minimum cable clearance required at bottom of camera  
90 mm



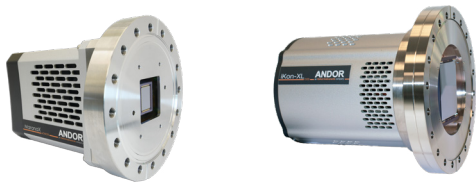
## Best Practice Guidelines

- ✓ Camera is susceptible to shock damage. Protective plate should always be fitted when camera is not in use.
- ✓ The FOP should always be protected when mounting to another surface, both surfaces must be free of contamination to avoid damage.
- ✓ Dust or contamination can be removed by drop and drag optical cleaning technique. For cleaning use lens tissue with a suitable solvent e.g. spectroscopic grade solvent.
- ✓ Do not use abrasives, corrosive solvents, avoid impact or point contact.
- ✓ The beryllium foil is very brittle in nature therefore extreme care should be taken to avoid shock damage. If the foil is broken there is a health risk. Please contact Andor for further information if required.

# Our Cameras for High Energy Detection

Andor's portfolio of CCD, sCMOS and EMCCD cameras provide a wide range of high sensitivity, high dynamic range and fast detection solutions for table-top laboratory and beamline experiments. These detectors benefit especially applications in the field of EUV, X-ray, neutron or electron detection for material science, plasma studies, bio-samples analysis or beam/source characterisation.

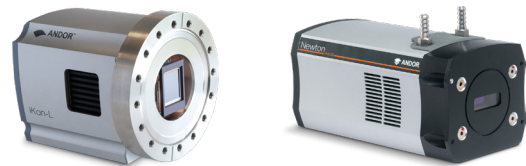
## Open fronted direct X-ray detection cameras



- ✓ Long exposure
- ✓ Deep cooling
- ✓ Direct detection
- ✓ Large pixel well depths
- ✓ Imaging and spectroscopy

iKon & Newton CCD & Marana-X SO ranges

## Beryllium windowed direct soft X-ray detection cameras



- ✓ Long exposure
- ✓ Direct detection
- ✓ Permanent vacuum
- ✓ Imaging and spectroscopy

iKon CCD, Newton CCD & iVac CCD SY ranges

## Fibre-optic coupling hard X-ray detection cameras



- ✓ Fast
- ✓ Low noise
- ✓ High throughput
- ✓ Modular scintillator options

Zyla-HF sCMOS & iKon-L-HF CCD cameras

## Windowed lens coupled hard X-ray & neutron detection cameras



- ✓ Fast
- ✓ Low noise
- ✓ Large area
- ✓ Deep cooled

iKon CCDs, Balor sCMOS, Zyla sCMOS, Neo sCMOS, Marana sCMOS, iXon EMCCDs

Learn more about our detector range [here](#).

# 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 local sales offices, please see: [andor.oxinst.com/contact](http://andor.oxinst.com/contact)

Our regional headquarters are:

## Europe

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

## North America

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

## Japan

Tokyo  
Phone +81 (3) 6732 8968  
Fax +81 (3) 6732 8939

## China

Beijing  
Phone +86 (10) 5884 7900  
Fax +86 (10) 5884 7901



### Items shipped with your camera:

- 1 x 2 m BNC to SMB connection cable
- 1 x 3 m USB 2.0 cable Type A to Type B
- 2 x Power supplies with associated cables
- 1 x Individual system performance booklet
- 1 x Protective cover shipping plate

### 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

- 100 - 240 VAC, 50 - 60 Hz
- Power consumption: 142 W (max), 80 W (typical).

### 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 40 MB/s
- Windows (8.1 and 10) or Linux

### Footnotes: Specifications are subject to change without notice

1. IMPORTANT-Due to the sensor/ fibre optic 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 [andor.oxinst.com/service-and-support](http://andor.oxinst.com/service-and-support). Please see the best practice guidelines on page 6.
2. Edge pixels may exhibit a partial response.
3. Figures are typical unless otherwise stated.
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.
5. Dark current measurement is averaged over the CCD area excluding any regions of blemishes.
6. 5 MHz is for focusing/visualization mode only.
7. 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.
8. Linearity is measured from a plot of counts vs exposure time under set photon flux up to the saturation point of the system.
9. Typical binning or array size combinations. All measurements are made with 38.55 µs vertical shift speed. It also assumes internal trigger mode of operation and minimum exposure time.
10. Data as supplied by the fibre optic plate manufacturer.
11. Quantum efficiency of the sensor at 25°C as supplied by the sensor manufacturer.
12. Data as supplied by the scintillator manufacturer. Scintillator peak emission at 550 nm. Please contact your local Andor representative to inquire about other scintillator options.



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MATLAB is a registered trademark of The MathWorks Inc.