

iKon-XL 230

CCD

VERY LARGE AREA ASTRONOMY CCD

NEW

- ✓ -100 °C TE Cooling (ColdSpace™)
- ✓ NO liquid nitrogen or cryo-cooler
- ✓ 18-bit Extended Dynamic Range



Key Specifications

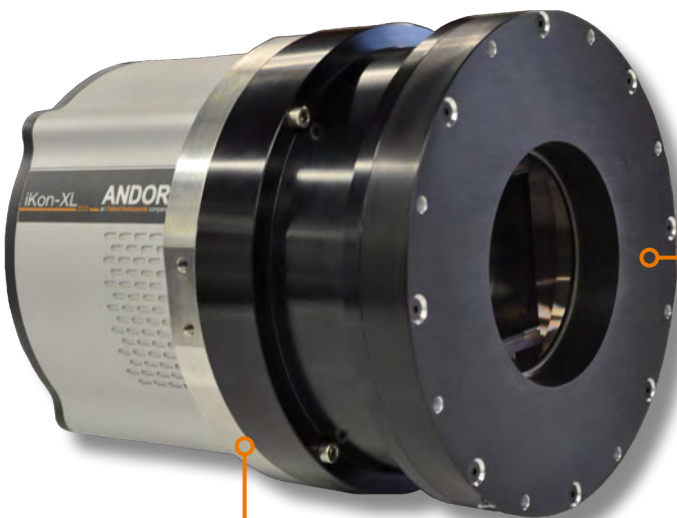
- 16.8 Megapixel sensor (CCD230-84)
- -100 °C TE cooled
- 3.8 e⁻ read noise
- 150,000 e⁻ well depth
- Up to 4 MHz readout (quad port)

INTRODUCING IKON-XL 230

Extreme performance, no hassle...

Andor's iKon-XL is a TE-cooled, very large area CCD camera platform, accommodating large field of view sensors that are ideally suited to long exposure astronomy applications. Patent-pending **ColdSpace™ technology** thermoelectrically cools a **back-illuminated 16.8 Megapixel** sensor (Teledyne e2v) down to **-100 °C**, avoiding the requirement for liquid nitrogen 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, designed to operate with **low maintenance** and exceptional longevity, perfect for remote observing sites.

The iKon-XL 230 model uses the Teledyne e2v **CCD230-84** back-illuminated sensor, offering a very large **61.4 x 61.4 mm** imaging area from a 4096 x 4108 array format and 15 µm pixel size, ideal for applications such as Astronomy or X-ray/Neutron radiography.



Low Maintenance Advantage

- ✓ **NO liquid nitrogen (LN₂)** – LN₂ cooled cameras require ready access to LN₂ supply and routine top up of LN₂ levels in order to hold temperature, as well as carrying an additional safety concern. Many observatories are in remote locations and in some cases unmanned, making LN₂ at best impractical, at worst impossible.
- ✓ **NO cryo cooler** – as many are already painfully aware, cryo coolers are cumbersome and notoriously unreliable. iKon-XL can reach typical cryo-cooled temperatures using only TE cooling and water supply.
- ✓ **No vacuum re-pumping** – the iKon-XL sensor enclosure design is based on Andor's proven, proprietary UltraVac™ process, which carries a Mean Time Between Failure (MTBF) value of > 100 years! Where other very large area CCD cameras require routine re-pumping, expect the iKon-XL to hold firm!
- ✓ **Field replaceable shutter** - No shutter is designed or specified for infinite usage! When it finally fails in a remote observing location, the shutter mounting of the iKon-XL has been purposefully designed such that the shutter can be easily replaced by the user on site.

Extended Dynamic Range Technology

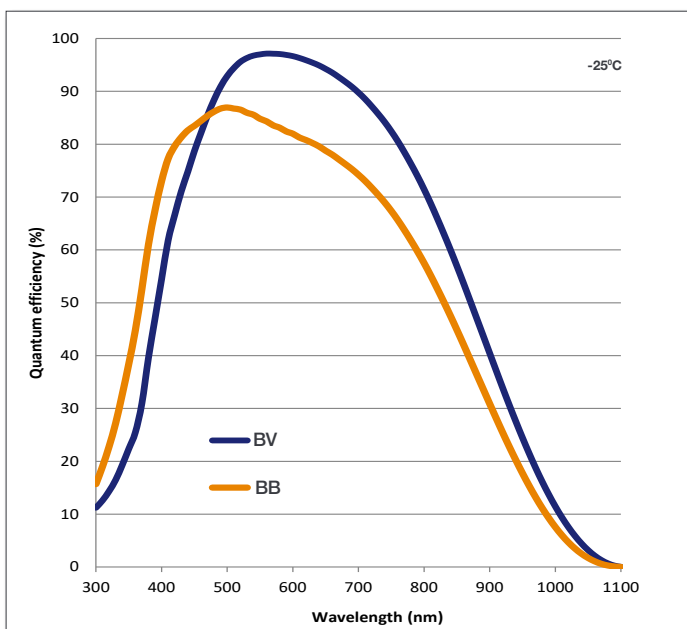
CCD cameras always require software selection of amplifier gain to optimize either for low noise (weak signal) OR high well depth (bright signal). **Not both...**

...until now! iKon-XL utilizes proprietary Andor CCD expertise to offer **low read noise AND high well depth in one image**, with only one gain setting.

FEATURES & BENEFITS

Feature	Benefit
Thermoelectric Cooling to -100°C (Liquid/Water)	Patent-pending ColdSpace™ very large area TE cooling technology avoids need for liquid nitrogen or unreliable cryo coolers. Minimization of dark current to below the zodiacal background.
61.4 x 61.4 mm sensor	Very large field of view from 16.8 Megapixel, 15 µm pixel pitch sensor
Extended Dynamic Range (18-bit)	Unique method to achieve low noise and high well depth within one scan. Supplemented by up to 18-bit digitization.
Peak QE over 95%*1	High photon collection efficiency for maximizing SNR.
Low noise readout	Intelligent low-noise electronics offer the most 'silent' system noise available from the 230-84 sensor.
Ultravac™*2	Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance, year after year (5 year vacuum warranty).
'Deep Cooled' and 'Flexi' versions	'Deep Cooled' for -100°C water/liquid (no air cooling). 'Flexi' for combined -80°C water/liquid or -60°C air cooled.
Fibre-optic or USB 3.0 interface flexibility	Built-in robust plug and play interface options as standard. Fibre optic for long distance solution.
Balanced Quad-port readout	Tracking stability to ensure all readout circuits experience same temperature and operating conditions.
Multiple readout speeds, up to 4 MHz	Slower readout for lowest noise, faster speeds for more rapid readout and focusing.
Field replaceable shutter	No shutter is designed or specified for infinite usage! When it finally fails in a remote observing location, it can be easily replaced on site.
IRIG-B GPS timestamp	Image GPS timestamp with 10ms resolution for network integration.
Fully Enclosed Casing (Deep Cooled model)	Reduced thermal bloom; minimal effect on nearby optics.
Easy reference column access	Easy and flexible software access to dark (shielded) reference columns.
Windows, Linux & Labview	Andor's user-friendly SDK supports both Windows and Linux OS. LabView VI package available.
ASTRO.control compatibility	Redlogix ASTRO.control is a dedicated platform for control of astronomical telescopes and instrumentation http://www.andor.com/astrocontrol.aspx

Quantum Efficiency Curve *1



The iKon-XL 230 is available with 2 sensor options:

- **BV**: Mid-band AR coating (providing exceptionally high QE in the visible range)
- **BB**: Broadband AR coating (providing enhanced sensitivity in the blue region)

TECHNICAL DATA

System Specifications *3

Sensor Options	BV: CCD230-84 sensor, mid band AR coating BB: CCD230-84 sensor, broadband AR coating (blue optimized)		
Pixels	4096 (H) x 4108 (V)		
Pixel size	15 x 15 µm		
Image area	61.4 x 61.4 mm with 100% fill factor		
Minimum temperatures *4 @ coolant temperature of 10°C @ coolant temperature of 16°C air cooled	Deep Cooled Model -100°C -95°C N/A	Flexi Model -80°C -75°C -60°C	
Blemish specification	Grade 1 sensor from supplier.		
System window type	Single AR coated UV grade fused silica window (>98% transmission)		

Advanced Performance Specifications *3

Dark Current, e⁻/pixel/sec *5 @ -60°C @ -80°C @ -100°C (Deep Cooled Model only)	0.0009 0.00009 0.00006			
Active area pixel well depth (typical)	150,000 e ⁻			
Pixel readout rates	0.1, 1, 2, 4 MHz			
Read Noise (e⁻)	100 kHz 3.8	1 MHz 8.5	2 MHz 12.0	4 MHz 23.0
Peak QE *1	>95% for BV models >87% for BB models			
Binning	User definable			
Region of Interest (windowing mode)	User definable (centred in 4-output mode)			
Linearity	Better than 99%			
Digitization	16-bit (all speeds) 18-bit (100 kHz and 1 MHz)			
Outputs	Quad or Single			
Timestamp	IRIG-B GPS with 10 ms resolution			

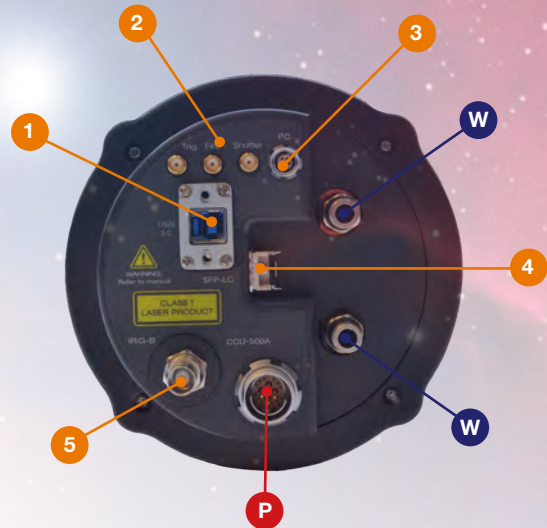
Frame Rates *6

Readout Rate (Mhz)	Array size			
	4096 x 4112	2048 x 2048	1024 x 1024	512 x 512
4	0.437	0.658	0.877	1.050
2	0.288	0.474	0.695	0.909
1	0.181	0.319	0.512	0.736
0.1	0.023	0.044	0.086	0.160

Binning	Readout rate (MHz)			
	4	2	1	0.1
1x1	0.44	0.29	0.18	0.02
2x2	0.66	0.55	0.43	0.04
4x4	0.88	0.82	0.73	0.09
8x8	1.05	1.03	0.99	0.16
16x16	1.17	1.16	1.14	0.28

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 Camera Control Unit (supplied) refer to power requirements on page 8



Notes:

Minimum cable clearance required at rear of camera 150 mm

Sensor Cosmetic Specifications

Sensor Grade 1	Guaranteed Specifications	Typical Values
Column defect (black or white)	10	<3
White spots	800	<400
Total (black & white) spots	1500	<750
Traps > 200e ⁻	15	<10

Definitions

White spots	A defect is counted as a white spot if the dark generation rate is ≥ 5 e ⁻ /pixel/s at 173 K (also equivalent to ≥ 100 e ⁻ /hour at 153 K). The temperature dependence is the same for the mean dark signal
Black spots	A black spot defect is a pixel with a photo-response less than 50% of the local mean
Column defects	A column is counted as a defect if it contains at least 100 white or dark single pixel defects
Traps	A trap causes charge to be temporarily held in a pixel and these are counted as defects if the quantity of trapped charge is greater than 200 e ⁻
Defect exclusion zone	Defect measurements are excluded from the outer two rows and columns of the sensor

*Sensor specifications provided by Teledyne-e2v

CREATING THE OPTIMUM PRODUCT FOR YOU



XL- EA01 - D S example shown

Step 1. Choose the sensor type option



Sensor Type

Description	Code
16.8 Megapixel CCD230-84 Back Illuminated Sensor. BV: Mid-band AR coating	EA01
16.8 Megapixel CCD230-84 Back Illuminated Sensor. BB: Broadband AR coating	EA02

Step 2. Choose the cooling option



Cooling

Description	Code
Flexi Cooling model (max. cooling -80°C @ coolant temp of 10°C; -60°C max. with air cooling)	C
Deep Cooled model (max. cooling -100°C @ coolant temp of 10°C)	D

Step 3. Select shutter option



Shutter

Description	Code
With Standard Shutter (For use between 0°C and +30°C ambient temperatures)	S
With Extended Range Shutter (For use between -30°C and +30°C ambient temperatures)	S-EXT
Without Shutter	0

Step 4. Select the required accessories



Accessories

Description	Code
Replacement 'standard' shutter unit for the iKon-XL. For use between 0°C and +30°C ambient temperatures.	XL-SH-STD
Replacement 'extended temperature range' shutter unit for the iKon-XL. For use between -30°C and +30°C ambient temperatures.	XL-SH-EXT
15 m camera cable with straight attachment for the CCU-500A (iKon-XL Flexi model) If this is ordered it will be provided <i>instead</i> of the standard 5 m cable.	XL-F-CAB-ST-15M
15 m camera cable with straight attachment for the CCU-500B (iKon-XL Deep Cooled model) If this is ordered it will be provided <i>instead</i> of the standard 5 m cable.	XL-DC-CAB-ST-15M
25 m fibre optic cable, LC-LC patch lead OM2 (Standard supplied fibre is 15 m).	FIBR-25M
100 m fibre optic cable, LC-LC patch lead OM3 (Standard supplied fibre is 15 m).	FIBR-100M
Hard shell protective transport case for the iKon-XL Flexi model. Tailored to dimensions of the iKon-XL Flexi model for secure transport to and from observing sites.	XL-F-TRANS-CASE
Hard shell protective transport case for the iKon-XL Deep Cooled model. Tailored to dimensions of the iKon-XL Deep Cooled model for secure transport to and from observing sites.	XL-DC-TRANS-CASE

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

Step 5. Select the required software



Software

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

Solis for Imaging A 32-bit and fully 64-bit enabled application for Windows (8, 8.1 and 10) offering complete functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

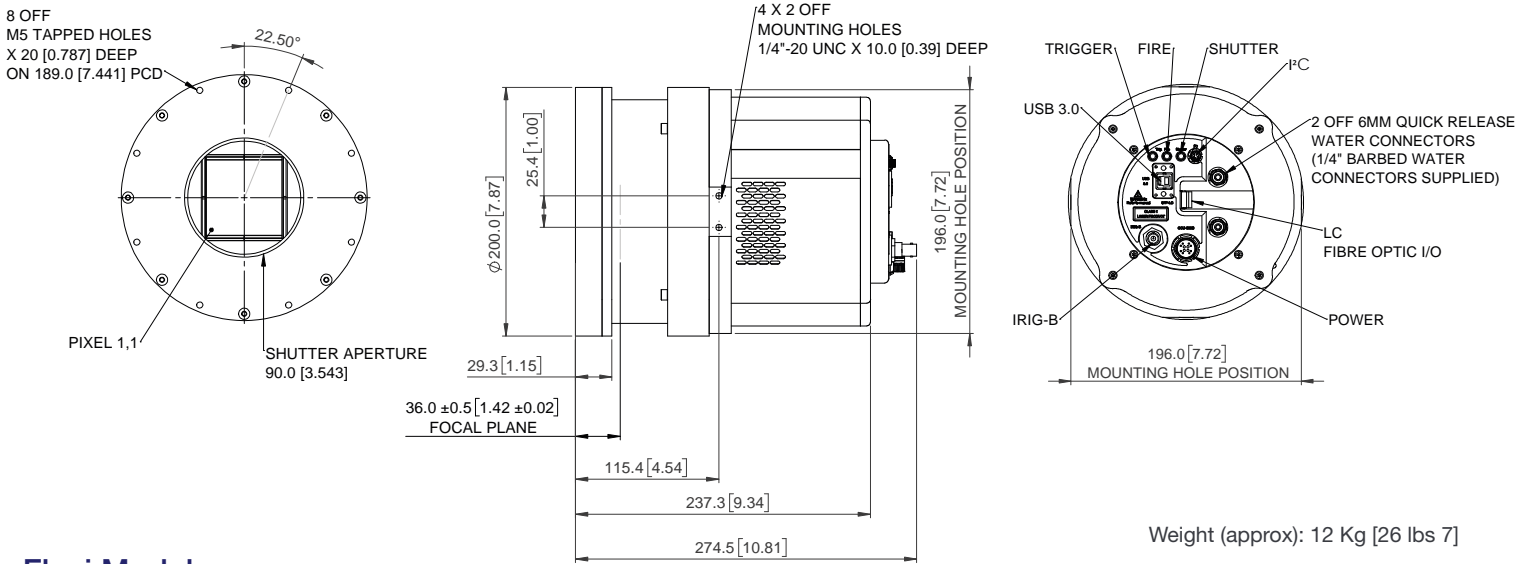
Andor SDK A software development kit that allows you to control the Andor range of cameras from your own application. Available as 32/64-bit libraries for Windows (8, 8.1 and 10), compatible with C/C++, C#, Delphi, VB.NET, LabVIEW and Matlab. Linux SDK compatible with C/C++.

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

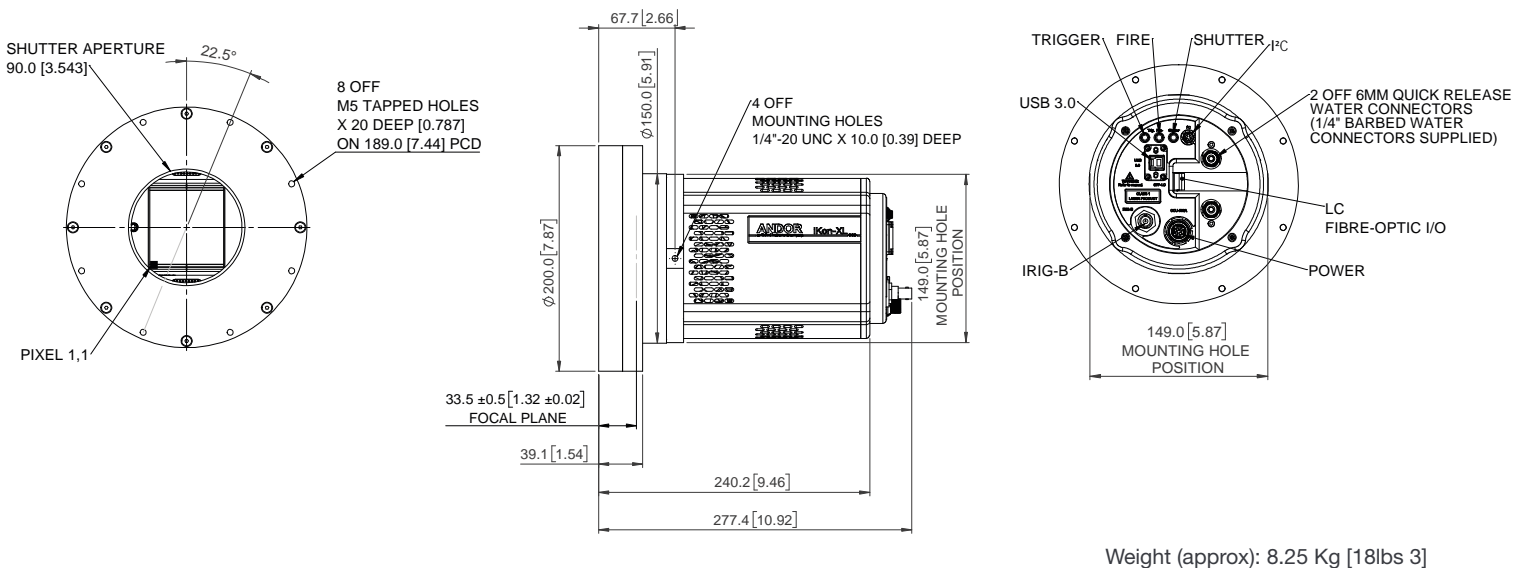
MECHANICAL DRAWINGS

Dimensions in mm

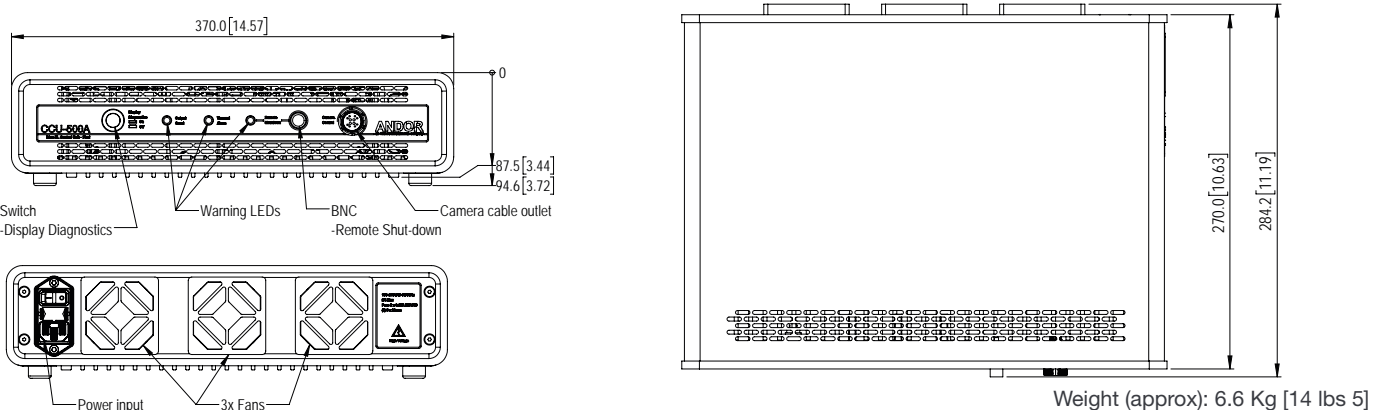
Deep Cooled Model



Flexi Model



Camera Control Unit CCU-500 *7



Note: Product drawings of models without shutter can be found at <http://andor.oxinst.com/xl-product-drawings>



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Items shipped with your camera

- 1x Fibre Optic PCIe card
 - 1x USB 3 PCIe card
 - 1x iKon-XL camera control unit *
 - 1x Camera power lead (5m)
 - 3x BNC-SMA cable (2m)
 - 1x USB 3.0 cable (3m)
 - 1x Fibre Optic lead (15m)
 - 1x QuickStart Guide
 - 1x Individual system performance booklet
- (Note: PC requires 1x slot for installation of a PCIe card)

Footnotes

1. Quantum efficiency as supplied by the sensor manufacturer.
2. Assembled in a state-of-the-art facility, Andor's UltraVac™ vacuum process combines a permanent hermetic vacuum seal (no o-rings), with a stringent protocol and proprietary materials to minimize outgassing. Outgassing is the release of trapped gases that would otherwise degrade cooling performance and potentially cause sensor failure.
3. Figures are typical, unless otherwise stated.
4. Specified minimum temperature with coolant assumes coolant temperature of 10°C or 16°C, measured at camera head. Note that cooling performance may be affected by distance between camera head and cooler.
5. Dark current measurement is averaged over the CCD area, excluding any regions with blemishes.
6. The frame rates shown are for a range of binning or array size combinations. All measurements are made with 179 µs vertical shift speed and using the quad output. It also assumes internal trigger mode of operation and minimum exposure time
7. Camera Control Unit (CCU-500) supplied with brackets for 19 inch rack mounting and mounting lugs for securing to optical tables.



Minimum Computer Requirements:

- 3.0 GHz single core or 2.4 GHz dual or quad core processor
- 2 GB RAM
- 250 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, 8, 8.1 and 10) or Linux

Operating & Storage Conditions:

- Operating Temperature: 0°C to +30°C ambient (-30°C to +30°C using extended range shutter)
- 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:
Flexi models: Camera Head (inc.External Power Supply) 240V/100V (Typ.): 165/180 W
Deep Cooled models: Camera Head (inc. External Power Supply) 240V/100V (Typ): 465/480 W



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