

## Features and Benefits

- **Peak QE up to 95%**  
Visible-optimized 'BV' & infrared-optimized 'BR-DD' model
- **Extended range dual-AR option**  
Superior UV-NIR broadband QE
- **TE cooling down to -100°C**  
Critical for elimination of dark current detection limit - no inconvenience associated with LN<sub>2</sub>
- **Ultravac™**  
Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance, year after year
- **Single UV-grade silica window**  
Best UV-NIR throughput performance, specific AR coating and wedge options available
- **USB 2.0 connection**  
Universal plug-and-play capability, ideal for laptop operation  
Seamless operation alongside USB-based Shamrock spectrograph family
- **26 x 26 µm pixels**  
Optimized pixel format for high dynamic range and resolution
- **Software-selectable pre-amplifier gain**  
Choice of best SNR performance of dynamic range at the touch of a button
- **Compact and rugged platform**  
Ideal for OEM integration & laboratory setups
- **Solis software for Spectroscopy**  
Comprehensive, user-friendly interface for simultaneous detector & spectrograph control
- **Software Development Kit (SDK)**  
Ease of control integration into complex setups: Matlab, Labview, Visual Basic or C/C++

## Workhorse laboratory and OEM CCD platform

The USB2.0-based iDus series is a compact, yet feature-rich platform suitable for demanding spectroscopy applications such as low-light UV/NIR Photoluminescence or Raman spectroscopy, as well as day-to-day routine laboratory operation and integration into industry-grade systems.

The iDus 420 boasts market-leading deep thermo-electric cooling to -100°C, complemented by Andor's Ultravac™ technology with its un-matched reliability track record in the scientific and industrial community. The iDus low-noise electronics allows seamless access to the best signal-to-noise ratio performance for the widest range of photon detection regimes.

This 1024 x 255 pixel matrix boasts a range of far UV and VIS-optimized back-thinned sensors & NIR-optimized back-illuminated ("fringe-suppressed") sensor options. Its, 26 x 26 µm pixel size is optimized for high dynamic range and high resolution, while its 6.6 mm height is ideally suited to multi-track spectroscopy.

## Specifications Summary

Active pixels	1024 x 255 (1024 x 256 for Bx-DD model)
Pixel size (W x H)	26 x 26 µm
Image area	26.6 x 6.6 mm
Register well depth (typical)	1,000,000 e <sup>-</sup>
Maximum cooling	-100°C
Maximum spectra per sec	88
Read noise	As low as 4 e <sup>-</sup>
Dark current	As low as 0.0005 e <sup>-</sup> /pixel/sec

## Key Specifications \*2

Model number	DV420A	DU420A	DU420A Bx-DD
Sensor options	<ul style="list-style-type: none"> <li>• BU: Back Illuminated CCD, UV-Enhanced, 350 nm optimized</li> <li>• BU2: Back Illuminated CCD, UV-Enhanced, 250 nm optimized</li> <li>• BV: Back Illuminated CCD, VIS optimized</li> <li>• OE: Open Electrode CCD</li> </ul>	<ul style="list-style-type: none"> <li>• BU: Back Illuminated CCD, UV-Enhanced, 350 nm optimized</li> <li>• BU2: Back Illuminated CCD, UV-Enhanced, 250 nm optimized</li> <li>• BV: Back Illuminated CCD, VIS optimized</li> <li>• OE: Open Electrode CCD</li> </ul>	<ul style="list-style-type: none"> <li>• BR-DD: Back Illuminated, Deep Depletion CCD with fringe suppression</li> <li>• BEX2-DD: Back Illuminated, Deep Depletion CCD with fringe suppression, extended range dual AR coating</li> </ul>
Active pixels *3	1024 x 255		1024 x 256
Pixel size	26 x 26 $\mu$ m		
Image area	26.6 x 6.6 mm with 100% fill factor		
Cooler type	DV	DU	DU
Minimum temperatures *4			
Air cooled	-55°C	-80°C	-80°C
Coolant recirculator	-65°C	-95°C	-95°C
Coolant chiller, coolant @ 10 °C, 0.75 l/min	-70°C	-100°C	-100°C
Max spectra per second *5	88 (10 rows crop mode), 75 (Full Vertical Bin), 65 (Open Electrode, Full Vertical Bin)		
System window type	Single quartz window, uncoated. Various AR coatings & MgF <sub>2</sub> options available.	Single quartz window, uncoated. Various AR coatings & MgF <sub>2</sub> options available.	<ul style="list-style-type: none"> <li>• BR-DD: Single quartz window, 1° wedge, AR coated on both sides, optimized at 900 nm</li> <li>• BEX2-DD: Single quartz window, 1° wedge, uncoated</li> </ul>
Blemish specifications	Grade 1 as per sensor manufacturer definition		

## Advanced Specifications \*2

Dark current, e <sup>-</sup> /pixel/sec @ max cooling									
OE	0.002			0.0005			-		
BU / BU2 / BV	0.004			0.002			-		
Bx-DD	-			-			0.008		
Register well depth	1,000,000 e <sup>-</sup>								
Read noise (e <sup>-</sup> ) *6	33 kHz	50 kHz	100 kHz	33 kHz	50 kHz	100 kHz	33 kHz	50 kHz	100 kHz
OE: Typ (Max)	4 (6)	4 (6)	9 (11)	4 (6)	4 (6)	9 (11)	-	-	-
BU, BU2, BV: Typ (Max)	6 (8)	7 (9)	10 (12)	6 (8)	7 (9)	10 (12)	-	-	-
BR-DD: Typ (Max)	-	-	-	-	-	-	4 (6)	5 (7)	9 (13)
Sensitivity (e <sup>-</sup> /count)	33 kHz	50 kHz	100 kHz	33 kHz	50 kHz	100 kHz	33 kHz	50 kHz	100 kHz
High Dynamic Range mode	2	3.5	15	2	3.5	15	2.5	3.5	20
High Sensitivity mode	-	2.5	9	-	2.5	9	-	2.5	14
Linearity *7	Better than 99%								
Digitization	16 bit								
Vertical clock speed *8	8, 16, 32, 64 $\mu$ s (software selectable)								

## Have you found what you are looking for?

**Need a smaller sensor?** The iDus 401 series is similar to the 420 series with 26.6 x 3.3 mm format with 1024 x 127 pixels.

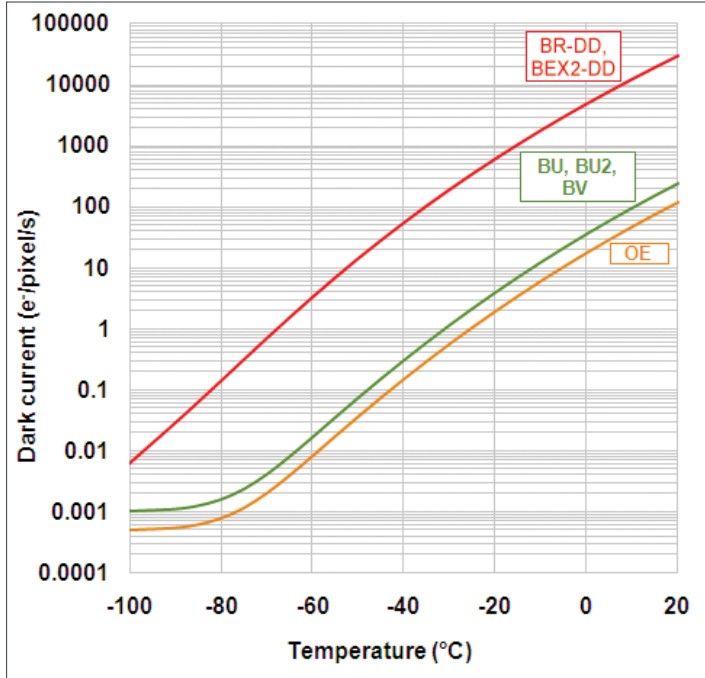
**Need to work further into the NIR?** The iDus InGaAs series, with up to 1024 pixel linear array with transmission to 2.2  $\mu$ m.

**Need a faster or more sensitive CCD?** The Newton series offers over 1,600 spectra per second and EM technology.

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

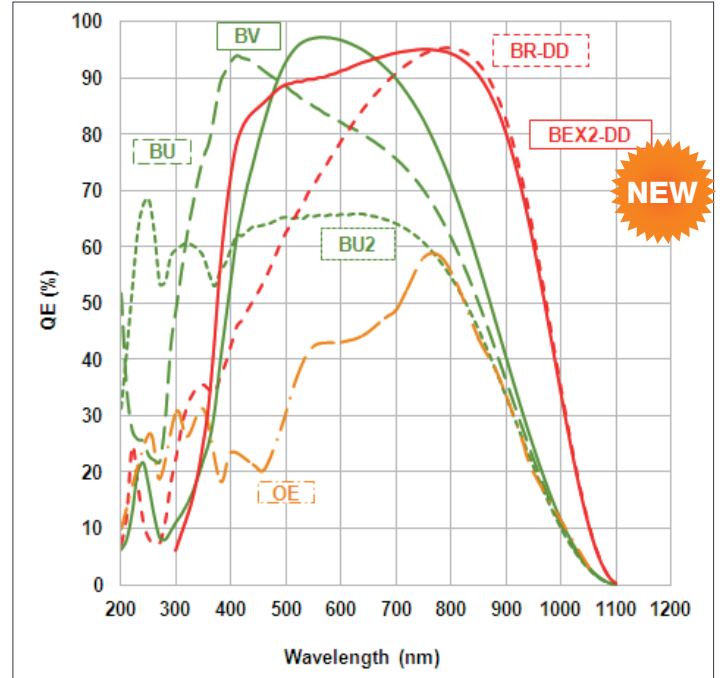
The iDus series combines seamlessly with Andor's research grade Czerny-Turner and echelle spectrographs.

## Dark Current <sup>\*9</sup>

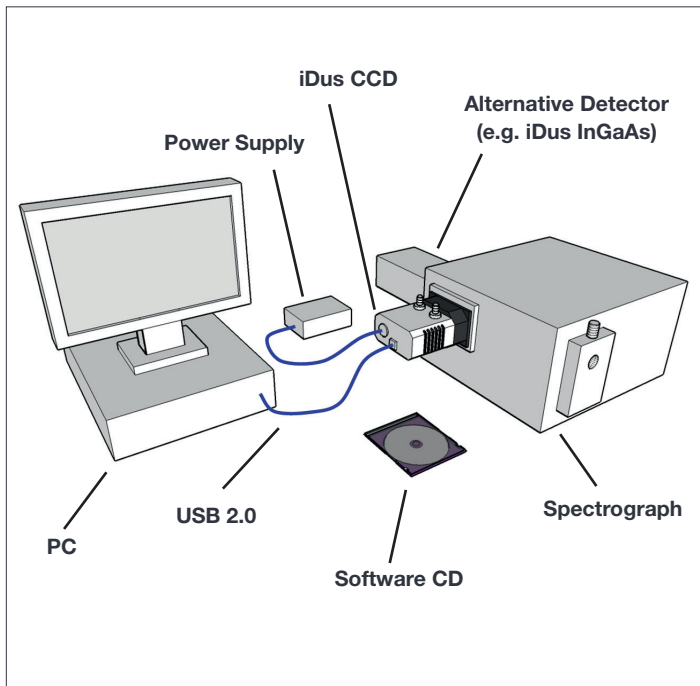


## Quantum Efficiency Curves <sup>\*10</sup>

25°C

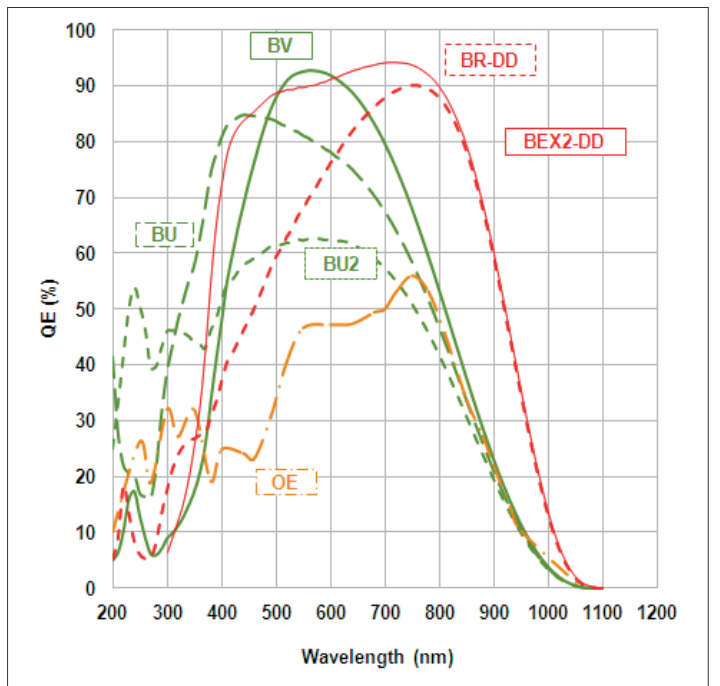


## Typical Setup



## Quantum Efficiency Curves <sup>\*10</sup>

-100°C



## Creating The Optimum Product for You

How to customize the iDus 420A :

### Step 1.

Simply select from the 2 cooler types that best suit your needs from the selection opposite.

### Step 2.

The iDus 420A comes with 6 options for sensor types. Please select the sensor which best suits your needs.

### Step 3.

Please indicate if you wish to select an alternative window and which software you require.

### Step 4.

For compatibility, please indicate which accessories are required.



iDus CCD mounted on a Shamrock 500 mm triple grating imaging spectrograph, ideal for high resolution spectroscopy.



### Step 1.

#### Choose cooler type

- DV:** Standard cooling, to -75°C (not a valid option with the Bx-DD model)
- DU:** Deep cooling, to -100°C

### Step 2.

#### Choose sensor type

- BEX2-DD:** Back Illuminated, Deep Depletion CCD with fringe suppression and extended range dual AR coating
- BR-DD:** Back Illuminated, Deep Depletion CCD with fringe suppression
- BU:** Back Illuminated CCD, Blue optimized AR coating for Spectroscopy
- BU2:** Back Illuminated CCD, AR coated for optimized performance in the 250 nm region
- BV:** Back Illuminated CCD, Vis optimized
- OE:** Open Electrode CCD

### Step 3.

**The 420 OE & BU, BU2, BV, BEX2-DD models are supplied with an uncoated Quartz window as standard. BR-DD models are provided with an NIR optimized AR coating. The following alternative window choices are available and must be ordered at time of build (if selected):**

- OPTION-C1-AR1** AR coated quartz window (optimized broadband visible 400-900nm). 50% transmission at 180 nm
- OPTION-C1-MGF2** Magnesium Fluoride window for transmission in the VUV. 50% transmission at 120 nm

#### The iDus CCD also requires at least one of the following software options:

**Solis for Spectroscopy** A 32-bit application compatible with 32 and 64-bit 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. Control of Andor Shamrock spectrographs and a very wide range of 3<sup>rd</sup> party spectrographs is also available, see list below.

**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 and 7) and Linux. Compatible with C/C++, C#, Delphi, VB6, VB.NET, LabVIEW and Matlab.

### Step 4.

#### The following accessories are available:

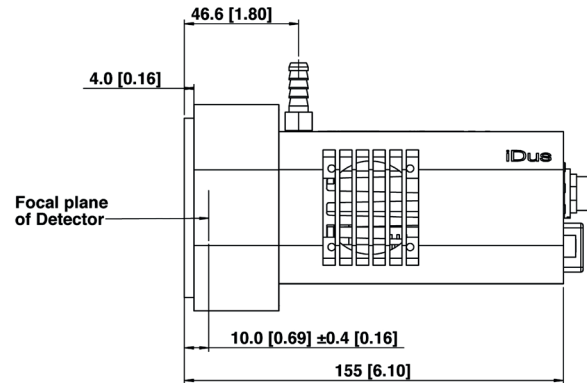
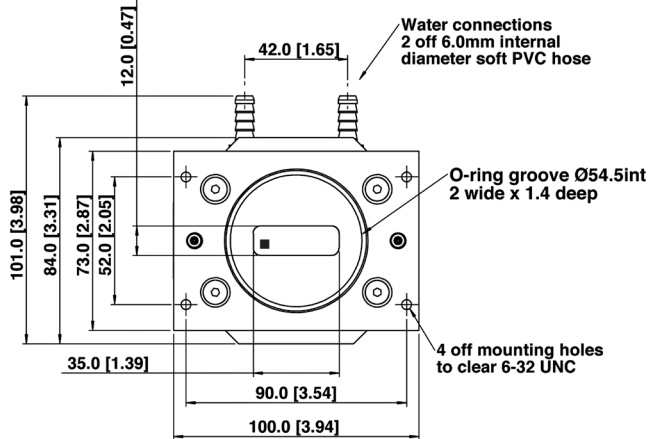
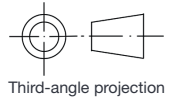
- XW-RECR** Coolant re-circulator for enhanced cooling performance
- ACC-XW-CHIL-160** Oasis 160 Ultra Compact Chiller Unit (tubing to be ordered separately)
- ACC-6MM-TUBING-2xxxxM** 6 mm tubing option for ACC-XW-CHIL-160
- LM-C** C-mount lens adaptor
- LM-NIKON-F** C-mount lens adaptor
- LMS-NIKON-F-NS25B** Nikon F-mount lens adaptor with shutter
- ACC-SD-VDM1000** Shutter Driver for NS25B Bistable Shutter (not needed for Shamrock spectrographs)
- ACC-SHT-NS25B** Bistable Shutter, Standalone (not needed for Shamrock spectrographs)

#### Spectrograph Compatibility

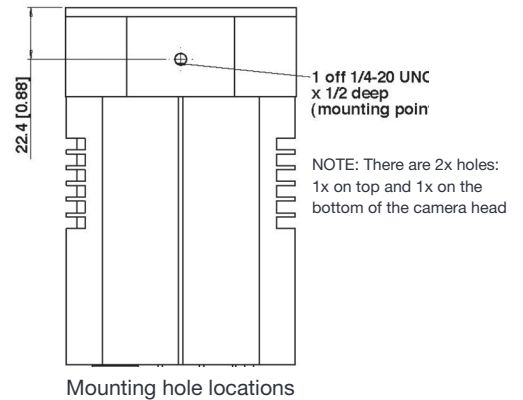
The iDus series is fully compatible with Andor's Shamrock spectrograph (163 - 750 nm focal lengths) family. Spectrograph mounting flanges and software control are available for a wide variety of 3<sup>rd</sup> party spectrographs including, McPherson (including 1 m and greater focal length option), JY/Horiba (excluding USB models), PI/Acton, Chromex/Bruker, Oriol/Newport, Photon Design, Dongwoo, Bentham, Solar TII and others.

## Product Drawings

Dimensions in mm [inches]



■ = position of pixel 1,1  
Weight: 2 kg [4 lb 8 oz]



## Connecting to the iDus

### Camera Control

Connector type: USB 2.0

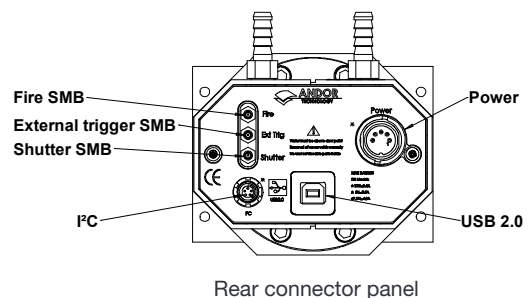
### TTL / Logic

Connector type: SMB, provided with SMB - BNC cable  
1 = Fire (Output), 2 = External Trigger (Input), 3 = Shutter (Output)

### I<sup>2</sup>C connector

Compatible with Fischer SC102A054-130  
1 = Shutter (TTL), 2 = I<sup>2</sup>C Clock, 3 = I<sup>2</sup>C Data, 4 = +5 Vdc, 5 = Ground

**Minimum cable clearance required at rear of camera**  
90 mm



Rear connector panel

## Applications Guide

	BU / BU2 models	BV models	BR-DD models	BEX2-DD models	OE models
Absorption/Transmittance/Reflection	✓	✓	✓	✓	✓
Atomic Emission Spectroscopy	✓	✓	✓	✓	✓
Fluorescence & Luminescence	✓	✓	✓	✓	✓
NIR Spectroscopy			✓	✓	✓
Raman Spectroscopy (244 – 488 nm)	✓	✓			✓
Raman Spectroscopy (514, 531, 633 nm)	✓	✓	✓	✓	✓
Raman Spectroscopy (785, 830 nm)			✓	✓	✓
UV-VIS-NIR Broadband Spectroscopy				✓	✓

✓ = Suitable  
✓ = Optimum



## Order Today

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### Items shipped with your camera:

- 1x 2m BNC - SMB connection cable
- 1x 3m USB 2.0 cable Type A → Type B
- 1x Set of Allen keys (7/64" & 3/32")
- 1x Power supply with mains cable
- 1x Quick launch guide
- 1x CD containing Andor user guides
- 1x Individual system performance booklet
- 1x CD containing either Solis software or SDK (if ordered)

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

1. 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.
2. Figures are typical unless otherwise stated.
3. Edge pixels may exhibit a partial response.
4. Minimum temperatures listed are typical values with ambient temperature of 20°C.
5. Based on a Horizontal Pixel Readout of 100 kHz and a vertical pixel shift of 8 μs. Due to the nature of the Open Electrode sensor, the minimum Vertical Shift Speed (VSS) available is 32 μs, which will produce a lower maximum spectral rate compared to other models in the series.
6. Readout Noise is for the entire system. It is a combination of CCD readout noise and A/D noise. Measurement is for Single Pixel readout with the CCD at a temperature of -50°C (Bx-DD models tested at -80°C) and minimum exposure time under dark conditions. Noise is measured at the highest available pre-amplifier gain for each speed.
7. Linearity is measured from a plot of counts vs exposure time under constant photon flux up to the saturation point of the system.
8. Vertical speeds are software selectable. All sensors are designed to give optimum Charge Transfer Efficiency (CTE) at 16 μs vertical pixel shift (32 μs for Open Electrode model), some decrease in CTE may be observed at faster shift speeds.
9. The graph shows typical dark current level as a function of temperature. The dark current measurement is averaged over the CCD area excluding any regions of blemishes.
10. Quantum efficiency of the sensor as measured 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 1 GB recommended for data spooling)
- USB 2.0 High Speed Host Controller capable of sustained rate of 40 MB/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

### 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.

SiDus420SS 0912 R1