Features and Benefits

- **Peak QE up to 95%**
  Visible-optimized ‘BVF’ & infrared-optimized ‘BR-DD’ model
- **Fringe suppression technology as standard**
  Fringing greatly eliminated (Deep-Depletion) or minimized (Back-Thinned ‘BVF’)  
- **TE cooling down to -100°C**
  Critical for elimination of dark current detection limit - no inconvenience associated with LN$_2$ 
- **Ultravac™**
  Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance, year after year  
- **Single UV-grade fused silica window**
  Best UV-NIR throughput performance, specific AR coating and wedge options available  
- **26 x 26 μm pixels**
  Optimized format for high dynamic range and resolution  
- **Software-selectable pre-amplifier gain**
  Choice of best SNR performance or dynamic range at the touch of a button  
- **USB 2.0 connection**
  Ideal for laptop operation  
  Seamless operation alongside USB-based Kymera and Shamrock spectrographs  
- **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++  
- **Integrated in EPICS**
  Platform is fully integrated into the EPICS control software  

Workhorse laboratory and OEM CCD platform

The USB 2.0-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 401 boasts market-leading deep thermo-electric cooling to -100°C, complemented by Andor’s Ultravac™ technology with its unmatched 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. **Antifringing comes as standard** on back-illuminated sensors for this 1024 x 127, 26 μm pixels array optimized for high dynamic range and high resolution acquisitions from far UV to NIR.

Specifications Summary *

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active pixels</td>
<td>1024 x 127</td>
</tr>
<tr>
<td>Pixel size (W x H)</td>
<td>26 x 26 μm</td>
</tr>
<tr>
<td>Image area</td>
<td>26.6 x 3.3 mm</td>
</tr>
<tr>
<td>Register well depth (typical)</td>
<td>1,000,000 e⁻</td>
</tr>
<tr>
<td>Maximum cooling</td>
<td>-100°C</td>
</tr>
<tr>
<td>Maximum spectra per sec</td>
<td>88</td>
</tr>
<tr>
<td>Read noise</td>
<td>As low as 3 e⁻</td>
</tr>
<tr>
<td>Dark current</td>
<td>As low as 0.0005 e⁻/pixel/sec</td>
</tr>
</tbody>
</table>
# iDus 401 Series

**26.6 x 3.3 mm / 1024 x 127 pixel Spectroscopy CCD**

## Key Specifications

<table>
<thead>
<tr>
<th>Model number</th>
<th>DV401A</th>
<th>DU401A</th>
<th>DU401A BR-DD</th>
</tr>
</thead>
</table>
| Sensor options | • BVF: Back Illuminated CCD, Vis-optimized and anti-fringing  
• FI: Front Illuminated CCD  
• BR-DD: Back Illuminated CCD, Deep Depletion with anti-fringing  
Optimum sensor for Near IR applications | • BVF: Back Illuminated CCD, Vis-optimized and anti-fringing  
• FI: Front Illuminated CCD | |

### Active pixels

- 1024 x 127

### Pixel size

- 26 x 26 μm

### Image area

- 26.6 x 3.3 mm with 100% fill factor

### Minimum temperatures

<table>
<thead>
<tr>
<th>Air cooled</th>
<th>BVF: Back Illuminated CCD, Vis-optimized and anti-fringing</th>
<th>FI: Front Illuminated CCD</th>
<th>BR-DD: Back Illuminated CCD, Deep Depletion with anti-fringing</th>
</tr>
</thead>
<tbody>
<tr>
<td>-55°C</td>
<td>-80°C</td>
<td>-80°C</td>
<td>-80°C</td>
</tr>
<tr>
<td>-65°C</td>
<td>-95°C</td>
<td>-95°C</td>
<td>-95°C</td>
</tr>
<tr>
<td>-70°C</td>
<td>-100°C</td>
<td>-100°C</td>
<td>-100°C</td>
</tr>
</tbody>
</table>

### Max spectra per second

- 88 (10 row crop mode), 81 (Full Vertical Bin)

### System window type

- BVF, FI sensors: UV-grade fused silica, ‘Broadband VUV-NIR’, unwedged  
- BR-DD sensor: UV-grade fused silica, ‘VIS-NIR enhanced’, wedged  
(Various AR coatings & MgF<sub>2</sub> options available)

### Blemish specifications

- Grade 1 sensor from supplier. Camera blemishes as defined by Andor Grade A

## Advanced Specifications

### Dark current, e/pixel/sec @ max cooling

<table>
<thead>
<tr>
<th>Model number</th>
<th>FI</th>
<th>BVF</th>
<th>BR-DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 kHz</td>
<td>0.0005</td>
<td>0.006</td>
<td>-</td>
</tr>
<tr>
<td>50 kHz</td>
<td>0.0005</td>
<td>0.003</td>
<td>-</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-</td>
<td>-</td>
<td>0.013</td>
</tr>
</tbody>
</table>

### Register well depth

- 1,000,000 e-

### Read noise (e-)

<table>
<thead>
<tr>
<th>Model number</th>
<th>FI (Typ Max)</th>
<th>BVF (Typ Max)</th>
<th>BR-DD (Typ Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 kHz</td>
<td>3 (5)</td>
<td>7 (8)</td>
<td>-</td>
</tr>
<tr>
<td>50 kHz</td>
<td>4 (6)</td>
<td>10 (12)</td>
<td>-</td>
</tr>
<tr>
<td>100 kHz</td>
<td>9 (12)</td>
<td>12 (15)</td>
<td>-</td>
</tr>
</tbody>
</table>

### Sensitivity (e-/count)

<table>
<thead>
<tr>
<th>Model number</th>
<th>High Dynamic Range mode</th>
<th>High Sensitivity mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 kHz</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>50 kHz</td>
<td>3.5</td>
<td>2.5</td>
</tr>
<tr>
<td>100 kHz</td>
<td>14</td>
<td>9</td>
</tr>
</tbody>
</table>

### Linearity

- Better than 99%

### Digitization

- 16 bit

### Vertical clock speed

- 8, 16, 32, 64 μs (software selectable)

## Applications Guide

<table>
<thead>
<tr>
<th>Model number</th>
<th>DV 401 FI</th>
<th>DV 401 BVF</th>
<th>DU 401 FI</th>
<th>DU 401 BVF</th>
<th>DU 401 BR-DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption/Transmittance/Reflection</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>•</td>
<td>o</td>
</tr>
<tr>
<td>Atomic Emission Spectroscopy</td>
<td></td>
<td></td>
<td></td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Fluorescence &amp; Luminescence</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>•</td>
<td>o</td>
</tr>
<tr>
<td>NIR Spectroscopy</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Raman Spectroscopy (244 – 488 nm)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Raman Spectroscopy (514, 532, 633 nm)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Raman Spectroscopy (785, 830 nm)</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>•</td>
<td></td>
</tr>
</tbody>
</table>

o = Suitable  
• = Optimum
**Dark Current**

![Graph showing dark current vs. temperature for different detectors: BF, FI, BR-DD.](image1)

**Quantum Efficiency Curves**

- **25°C**
  ![Graph showing quantum efficiency vs. wavelength at 25°C for BF, FI, BR-DD.](image2)

- **-100°C**
  ![Graph showing quantum efficiency vs. wavelength at -100°C for BF, FI, BR-DD.](image3)

**Typical Setup**

- **PC**
- **USB 2.0**
- **Software CD**
- **Power Supply**
- **Alternative Detector (e.g. iDus InGaAs)**
- **iDus CCD**
- **Spectrograph**
iDus 401 Series

26.6 x 3.3 mm / 1024 x 127 pixel
Spectroscopy CCD

Creating the Optimum Product for you

Step 1. Choose the cooling option

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard cooling: (Air cooled: -55°C, coolant recirculator: -65°C, coolant chiller, coolant @ 10°C, 0.75 l/min: -70°C)</td>
<td>DV</td>
</tr>
<tr>
<td>Deep cooling: (Air cooled: -80°C, coolant recirculator: -95°C, Coolant chiller, coolant @ 10°C, 0.75 l/min: -100°C)</td>
<td>DU</td>
</tr>
</tbody>
</table>

Step 2. Choose the sensor type option

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Illuminated CCD</td>
<td>FI</td>
</tr>
<tr>
<td>Back Illuminated CCD, Vis-optimized with anti-fringing</td>
<td>BVF</td>
</tr>
<tr>
<td>Back Illuminated, Deep Depletion CCD with anti-fringing</td>
<td>BR-DD</td>
</tr>
</tbody>
</table>

Step 3. Select an alternative camera window (optional)

The standard window has been selected to satisfy most applications. However, other options are available. The alternative camera window code must be specified at time of ordering.

To view and select other window options please refer to the ‘Camera Windows Supplementary Specification Sheet’ which gives the transmission characteristics, product codes and procedure for entering the order. Further detailed information on the windows can be found in the Technical note – ‘Camera Windows: Optimizing for Different Spectral Regions’.

Step 4. Select the required accessories and adapters

<table>
<thead>
<tr>
<th>Description</th>
<th>Order Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant re-circulator for enhanced cooling performance</td>
<td>XW-RECR</td>
</tr>
<tr>
<td>Oasis 160 Ultra Compact Chiller Unit (tubing to be ordered separately)</td>
<td>ACC-XW-CHIL-160</td>
</tr>
<tr>
<td>6 mm tubing options for ACC-XW-CHIL-160</td>
<td>ACC-6MM-TUBING-2X2.5/ACC-6MM-TUBING-2X5M</td>
</tr>
<tr>
<td>C-mount lens adaptor</td>
<td>LM-C</td>
</tr>
<tr>
<td>F-mount lens adaptor</td>
<td>LM-NIKON-F</td>
</tr>
<tr>
<td>Nikon F-mount lens adaptor with shutter</td>
<td>LMS-NIKON-F-NS25B</td>
</tr>
<tr>
<td>Shutter Driver for NS25B Bistable Shutter (not needed for Kymera/Shamrock spectrographs)</td>
<td>ACC-SD-VED24</td>
</tr>
<tr>
<td>Bistable Shutter, Standalone (not needed for Kymera/Shamrock spectrographs)</td>
<td>ACC-SHT-NS25B</td>
</tr>
</tbody>
</table>

Spectrograph Compatibility

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

Step 5. Select the required software

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

Solis for Spectroscopy A 32-bit and fully 64-bit enabled application for Windows (7, 8, 8.1 and 10) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export. Control of Andor Kymera and Shamrock spectrographs and a very wide range of 3rd party spectrographs is also available, see list in step 4 above.

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 (7, 8, 8.1 and 10) and Linux. Compatible with C/C++, C#, Delphi, VB.NET, LabVIEW and Matlab.
### iDus 401 Series

**Dimensions in mm [inches]**

- **Weight:** 2 kg [4 lb 8 oz]

---

### Product Drawings

#### Third-angle projection

#### Mounting hole locations

---

### 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)

**I²C connector**

Compatible with Fischer SC102A054-130

1 = Shutter (TTL), 2 = I²C Clock, 3 = I²C Data, 4 = +5 Vdc, 5 = Ground

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

90 mm

---

### Have you found what you are looking for?

- **Need a larger sensor?** The iDus 420 series is similar to the 401 series with 26.6 x 6.6 mm format and 1024 x 255 pixels.
- **Need to work further into the NIR?** The iDus InGaAs series, with up to 1024 pixel linear array with transmission to 2.2 µm.
- **Need a faster or more sensitive CCD?** The Newton series offers over 1,600 spectra per second and EM technology.
- **Need more UV sensitivity?** The iDus 420 series is similar to the 401 series with a range of UV optimized sensors.
- **Need a customized version?** Please contact us to discuss our Customer Special Request options.

The iDus series combines seamlessly with Andor’s research grade Kymera and Shamrock Czerny-Turner spectrographs.
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.com/contact

Our regional headquarters are:

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Fax +44 (28) 9031 0792

**Japan**
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Fax +81 (3) 6732 8939

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

**China**
Beijing
Phone +86 (10) 8271 9066
Fax +86 (10) 8271 9055

Items shipped with your camera:
- 1x 2m BNC - SMB conection cable
- 1x 3m USB 2.0 cable Type A to Type B
- 1x Set of hex keys (7/64" & 3/32")
- 1x Power supply with mains cable
- 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 25°C.

5. Based on a Horizontal Pixel Readout of 100 kHz and a vertical pixel shift of 8 μs.

6. System 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 (BR-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, 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 supplied 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 (7, 8, 8.1 and 10) 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:
- 100 - 240 VAC, 50 - 60 Hz
- Power consumption: 42W (max)