30 x 3.8 mm / 2000 x 256 pixel
NIR Spectroscopy CCD

ANDOR
an **Oxford Instruments** company

Spectroscopy

New

Low Noise
Back-illuminated
Deep-Depletion
Technology

Features and Benefits

- **Low dark current**

  10x better than Back-Illuminated Deep-Depletion NIMO sensors, best SNR in the NIR

- **Peak QE up to 95%**

  Best detection capability in the NIR

- **15 µm pixels**

  Ideal for high resolution spectroscopy

- **30 mm wide sensor**

  Superior simultaneous band-pass capture

- **Fringe suppression technology as standard**

  Optical etalonning virtually eliminated

- **TE cooling down to -95ºC**

  Critical for elimination of dark current detection limit - no inconvenience associated with LN_2

- **Ultravac™•1**

  Critical for sustained vacuum integrity and to maintain unequalled cooling and QE performance year after year

- **USB 2.0 connection**

  Ideal for laptop operation

  Seamless operation alongside USB-based Shamrock spectrograph family

- **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++

The most sensitive NIR CCD platform on the market

Andor's new iDus 416 platform boasts a unique combination of very low dark noise and very high QE, offering unrivalled sensitivity in the near-infrared. This makes it the ideal detector for NIR Raman and Photoluminescence, reducing greatly acquisition times and removing the need for inconvenient LN_2 cooling.

The unique 2000 x 256, 15 µm pixel array allows extended, broadband and high resolution spectral acquisition, while the fringe suppression technology virtually eliminates the optical etalonning at the higher wavelengths.

With its compact form factor and USB 2.0 connectivity, the iDus 416 can be seamlessly integrated to Shamrock USB 2.0 spectrographs and controlled from a laptop. Andor's UltraVac™ technology carries a unique track record when it comes to performance and reliability, maintaining superb performance year after year for both Research users and industrial integrators.

Specifications Summary

Active pixels	**2000 x 256**
Pixel size (W x H)	**15 x 15 µm**
Image area	**30 x 3.8 mm**
Register well depth (typical)	**300,000 e-**
Maximum cooling	**-95ºC**
Maximum spectra per sec	**30**
Read noise	**As low as 4 e-**
Dark current	**As low as 0.0006 e-/pixel/sec**

iDus 416 Series

30 x 3.8 mm / 2000 x 256 pixel
NIR Spectroscopy CCD

ANDOR
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Key Specifications •2

Model number	DV416A-LDC-DD	DU416A-LDC-DD
Sensor options	LDC-DD: Back-Illuminated CCD, Deep-Depletion with anti-fringing, low dark current	
Active pixels •3	2000 x 256	
Pixel size	15 x 15 µm	
Image area	30 x 3.8 mm with 100% fill factor	
Minimum temperatures •4 Air cooled Coolant recirculator Coolant chiller, coolant @ 10 ºC, 0.75 l/min	 -55ºC -65ºC -70ºC	 -80ºC -90ºC -95ºC
Dark Current e$^-$/pixel/sec @ max cooling	0.025	0.0006
Max spectra per second •5	30 (Full Vertical Binning)	
System window type	Fused silica window, 'VIS-NIR Enhanced', wedged (AR coated on both sides, optimized at 900 nm) Other broadband UV-NIR options available on request.	
Blemish specifications	Grade 1 sensor from supplier. Camera blemishes as defined by Andor Grade A http://www.andor.com/learning-academy/ccd-blemishes-and-non-uniformities-black-pixels-and-hot-pixels-on-a-ccd-sensor	

Advanced Specifications •2

Image well depth	150,000 e$^-$		
Register well depth	300,000 e$^-$		
Read noise (e$^-$) •6	33 kHz 4	50 kHz 4.5	100 kHz 5
Sensitivity (e$^-$/count) Pre-amplifier Gain PAG 0 Pre-amplifier Gain PAG 1	33 kHz 0.7 -	50 kHz 1.5 0.85	100 kHz 5.0 3.4
Linearity •7	Better than 99%		
Digitization	16 bit		
Vertical clock speed •8	32 and 64 µs (software selectable)		

Have you found what you are looking for?

Need a larger sensor for multi-track spectroscopy? The iDus 420 series is available 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.
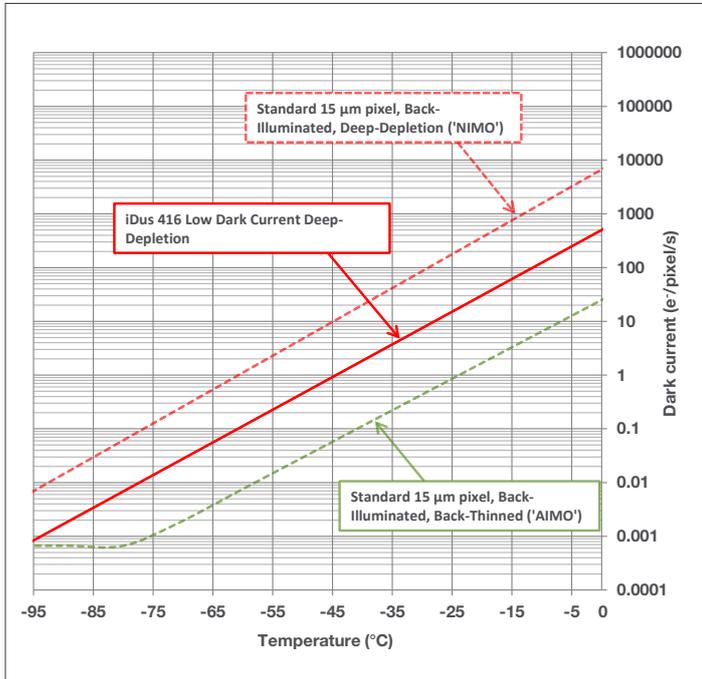
Need a faster or more sensitive CCD? The Newton series offers over 1,600 spectra per second and EM technology.

Need more UV sensitivity? The iDus 420 offers a range of UV optimized sensors.

Need a customized version? Please contact us to discuss our Customer Special Request options.
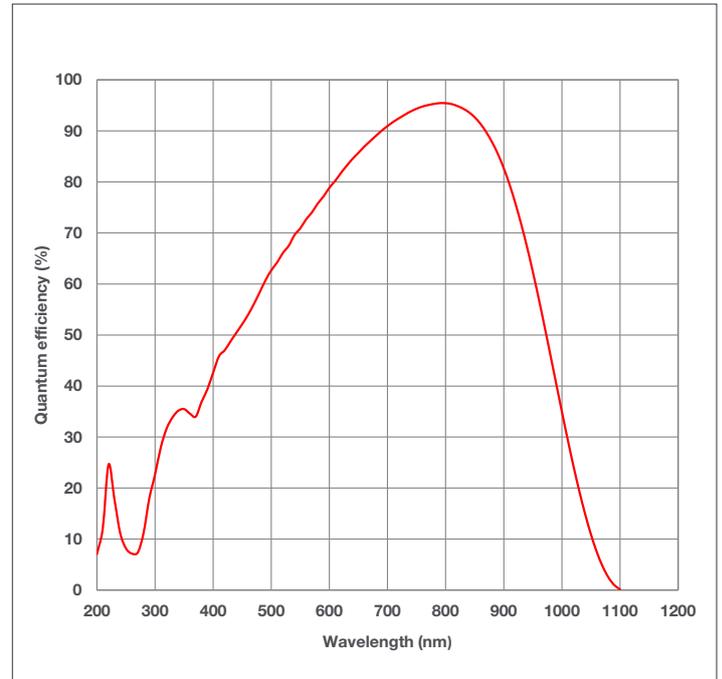
The iDus series combines seamlessly with Andor's research grade Shamrock Czerny-Turner spectrographs.
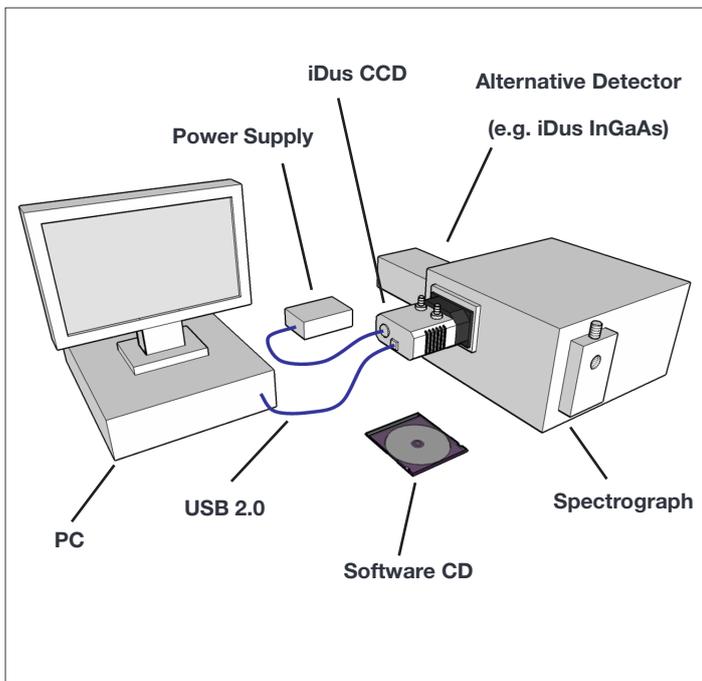
Dark Current [9]

- Standard 15 µm pixel, Back-Illuminated, Deep-Depletion ('NIMO')
- iDus 416 Low Dark Current Deep-Depletion
- Standard 15 µm pixel, Back-Illuminated, Back-Thinned ('AIMO')

Quantum Efficiency Curves [10]

25°C

Typical Setup

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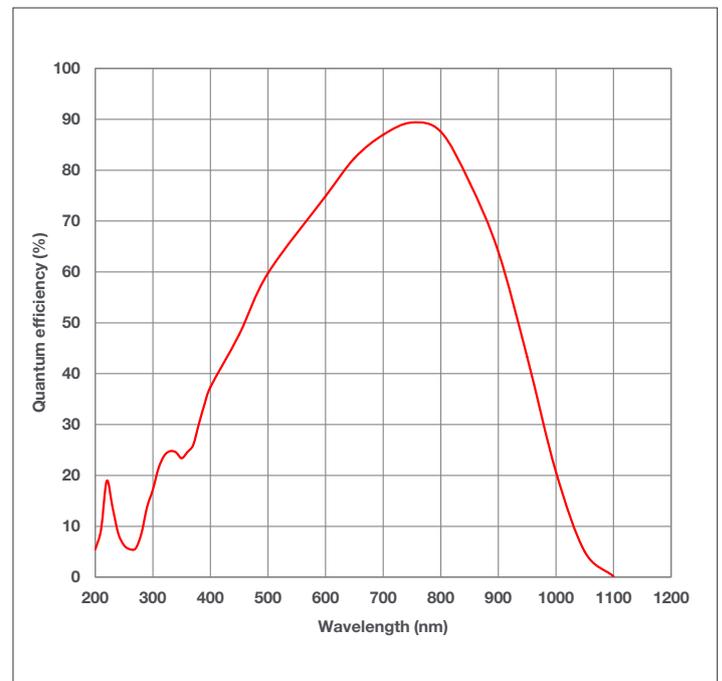- Power Supply
- USB 2.0
- PC
- Software CD
- Spectrograph

Quantum Efficiency Curves [10]

-95ºC

Customizable & Flexible

For industrial applications, the iDus 416 offers various levels of customization based around the following:

- Lockable USB
- Alternative water connections (90 degrees)
- Chassis mounting options

Please contact us to discuss your specific requirements.

Creating the Optimum Product for you

DU — 416A-LDC-DD

example shown

Step 1. Choose the cooling option

Cooling

Description	Code
Standard cooling: (Air cooled : -55ºC, Coolant recirculator: -65ºC, Coolant chiller, coolant @ 10ºC, 0.75 l/min: -70ºC)	**DV**
Deep cooling: (Air cooled: -80ºC, Coolant recirculator: -90ºC, Coolant chiller, coolant @ 10ºC, 0.75 l/min: : -95ºC)	**DU**

Step 2. Select an alternative camera window (optional)

Camera
Window

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 3. Select the required accessories and adapters

Accessories &
Adapters

Description	Order Code
Coolant 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 option for ACC-XW-CHIL-160	**ACC-6MM-TUBING-2xxxxM**
C-mount lens adaptor	**LM-C**
F-mount lens adaptor	**LM-NIKON-F**
Nikon F-mount lens adaptor with shutter	**LMS-NIKON-F-NS25B**
Shutter Driver for NS25B Bistable Shutter (not needed for Shamrock spectrographs)	**ACC-SD-VDM1000**
Bistable Shutter, Standalone (not needed for Shamrock spectrographs)	**ACC-SHT-NS25B**

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 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.

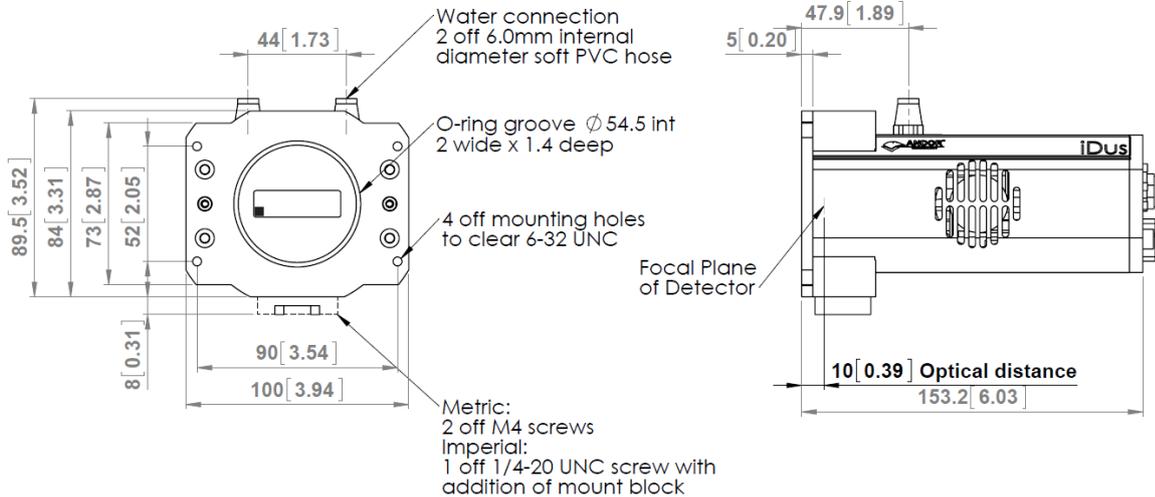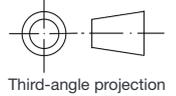### Step 4. Select the required software

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 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 Shamrock spectrographs and a very wide range of 3rd 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 (7, 8 and 10) and Linux. Compatible with C/C++, C#, Delphi, VB6, VB.NET, LabVIEW and Matlab.

Product Drawings

Dimensions in mm [inches]

Third-angle projection

Water connection
2 off 6.0mm internal
diameter soft PVC hose

O-ring groove ∅ 54.5 int
2 wide x 1.4 deep

4 off mounting holes
to clear 6-32 UNC

Focal Plane
of Detector

44 [1.73]
89.5 [3.52]
84 [3.31]
73 [2.87]
52 [2.05]
8 [0.31]
90 [3.54]
100 [3.94]

Metric:
2 off M4 screws
Imperial:
1 off 1/4-20 UNC screw with
addition of mount block

47.9 [1.89]
5 [0.20]
10 [0.39] Optical distance
153.2 [6.03]

■ = position of pixel 1,1

Weight: 2 kg [4 lb 8 oz]

NOTE: There are 2x holes:
1x on top and 1x on the
bottom of the camera head

Imperial:
1/4-20 UNC screw
max depth 1/4inch

22.4 [0.88]

Metric:
M4 screws
max depth 10mm

Mounting hole locations

Connecting to the iDus

Camera Control

Connector type: USB 2.0

TTL / Logic

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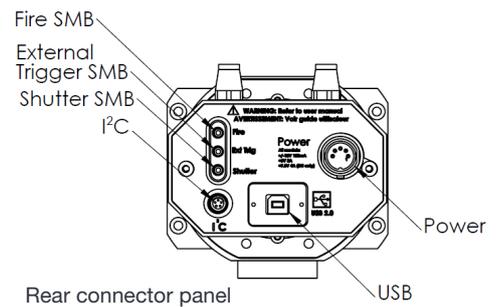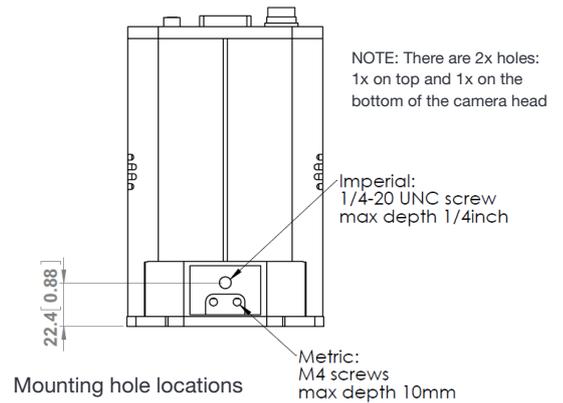
Fire (Output), External Trigger (Input), Shutter (Output)

I²C connector

Compatible with Fischer SC102A054-130

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

Minimum cable clearance required at rear of camera

90 mm

Fire SMB
External Trigger SMB
Shutter SMB
I²C

Power

USB

Rear connector panel

Applications Guide

	DV 416	DU 416
Absorption/Transmittance/Reflection	○	●
Fluorescence & Luminescence (VIS)	○	●
Photoluminescence	○	●
Raman Spectroscopy (488, 514, 532, 633, 785, 830 nm)	○	●
Plasmonics	○	●

○ = Suitable   ● = Optimum

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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Concord, MA, USA
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 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)

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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 32 μs.
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 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, and designed to give optimum Charge Transfer Efficiency (CTE) at 32 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. The 'BR-DD NIMO' and 'BV' dark current curves are shown for comparison purposes only, and have been scaled to account for pixel size differences between the iDus 401 and iDus 416 sensors.
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 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

bsi. ISO 9001 Quality Management FM40523
bsi. ISO 14001 Environmental Management EMS91062
bsi. OHSAS 18001 Occupational Health and Safety Management OHS02497
CE

Compatible with Windows 7
Windows 8 Compatible
Windows 10 Compatible
Linux
LabVIEW
MATLAB
HI-SPEED USB CERTIFIED

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.