

Spectroscopy

## Features and Benefits

- **0.6 to 1.7  $\mu\text{m}$**   
Operating wavelength range
- **Peak QE of > 85%**  
High detector sensitivity
- **TE cooling to -90°C \*1**  
Negligible dark current without the inconvenience of LN<sub>2</sub>
- **UltraVac™ \*2**  
Permanent vacuum integrity, critical for deep cooling and sensor performance
- **Single window design**  
Delivers maximum photon throughput
- **25  $\mu\text{m}$  pixel width option**  
Ideal for high-resolution NIR spectroscopy
- **Simple USB 2.0 connection**  
USB plug and play – no controller box.  
Inputs & Outputs: External Trigger, Fire and Shutter TTL readily accessible. I<sup>2</sup>C for the more adventurous user
- **Software selectable output amplifiers**  
Allows user to optimize operation with choice of High Dynamic Range (HDR) or High Sensitivity (HS) modes of operation
- **Minimum exposure time of 1.4  $\mu\text{s}$**   
Enables higher time-resolution and minimization of dark current contribution for applications with reasonable signal level
- **Integrated in EPICS**  
Platform is fully integrated into the EPICS control software

## Andor's iDus InGaAs detector array for Spectroscopy

Andor's iDus InGaAs 1.7 array detector series provides the most optimized platform for Spectroscopy applications up to 1.7  $\mu\text{m}$ . The TE-cooled, in-vacuum sensors reach cooling temperatures of -90°C where the best Signal-to-Noise ratio can be achieved. Indeed dark current will improve moderately below -90°C where scene black body radiation will dominate, while Quantum Efficiency of the sensor will be greatly impacted at these lower temperatures and lead to a lower Signal-to-Noise ratio.

## Specifications Summary

Active pixels	512 or 1024
Pixel size (W x H)	25 x 500 or 50 x 500 $\mu\text{m}$
Pixel well depth (typical)	
High Dynamic Range mode	170 Me <sup>-</sup>
High Sensitivity mode	5 Me <sup>-</sup>
Maximum cooling *1	-90°C
Maximum spectra per sec	193
Read noise (typical)	580 e <sup>-</sup>
Dark current (typical)	11.7 ke <sup>-</sup> /pixel/sec
Minimum exposure time	1.4 $\mu\text{s}$

## Key Specifications <sup>•3</sup>

Model number	DU490A	DU491A	DU492A
Sensor options	512 pixels, 25 $\mu\text{m}$ pitch	1024 pixels, 25 $\mu\text{m}$ pitch	512 pixels, 50 $\mu\text{m}$ pitch
Active pixels	512	1024	512
Pixel size	25 x 500	25 x 500	50 x 500
Cooler type	DU		
Wavelength range	600 nm - 1.7 $\mu\text{m}$		
Minimum exposure time <sup>*4</sup>	1.4 $\mu\text{s}$		
Minimum temperatures <sup>*5</sup> Air cooled Coolant chiller, coolant @ 16°C, 0.75 l/min Coolant chiller, coolant @ 10°C, 0.75 l/min	-70°C -85°C -90°C		
Max spectra per second (100 kHz readout)	193	97	193
System window type	UV-grade fused silica, 'Broadband VUV-NIR', unwedged		
Digitization	16 bit		

## Advanced Specifications <sup>•3</sup>

Dark current $\text{ke}^-/\text{pixel}/\text{sec}$ @ max cooling <sup>*6</sup>	10.7	12.0	21.1
Pixel well depth (Me) <sup>*7</sup>			
High Dynamic Range mode High Sensitivity mode	170 5		
Read noise ( $\text{e}^-$ ) <sup>*8</sup>			
High Sensitivity mode High Dynamic Range mode	580 8150		
Sensitivity ( $\text{e}^-/\text{count}$ )			
High Dynamic Range mode High Sensitivity mode	2800 90		
Blemishes <sup>*9</sup>	0	$\leq 10$	$\leq 5$
Linearity	Better than 99%		
Insertion delay from external trigger	2.95 $\mu\text{s} \pm 0.1 \mu\text{s}$		

## Have you found what you are looking for?

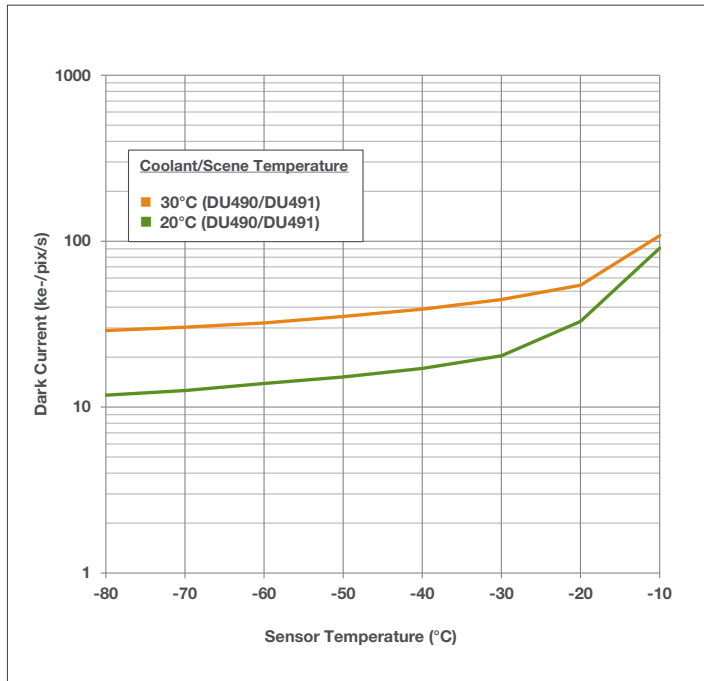
**Need extended NIR response?** The iDus InGaAs 2.2  $\mu\text{m}$  series offer three array formats.

**Need to work below 1  $\mu\text{m}$ ?** The iDus 401, 416 & 420 series offer Deep Depletion NIR optimized sensors.

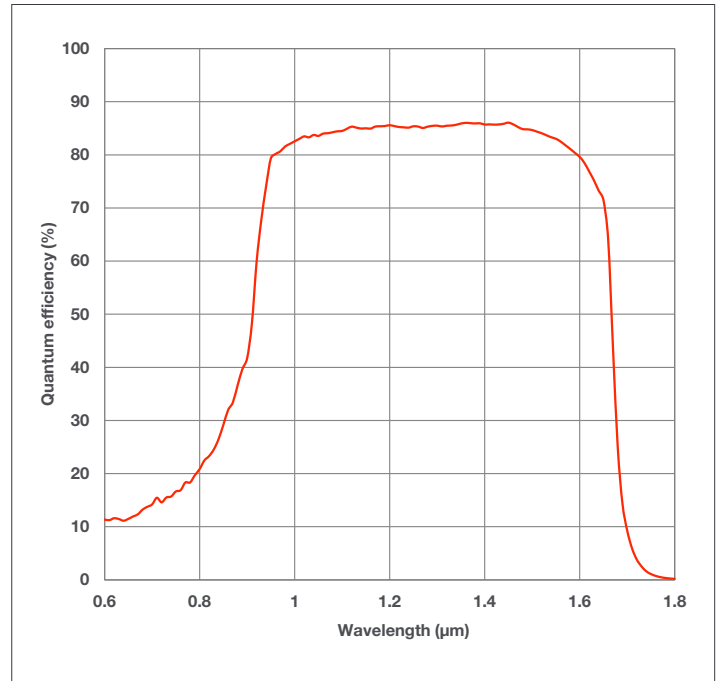
**Need a customized version?** Please contact us to discuss our Customer Special Request options.

The iDus InGaAs series combines seamlessly with Andor's research grade Shamrock Czerny-Turner spectrographs. These instruments are available on request with gold or silver coated optics for optimized NIR operations.

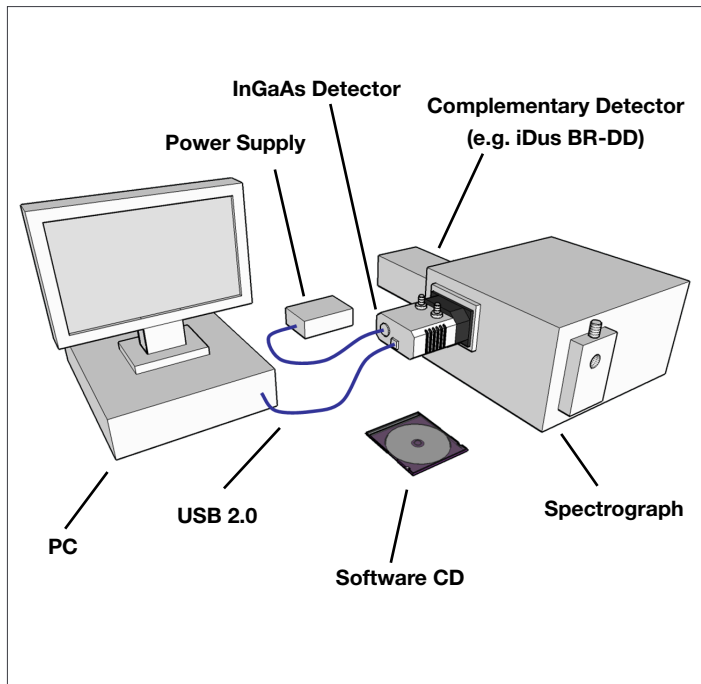
## System Dark Current vs Temperature <sup>\*\*10</sup>



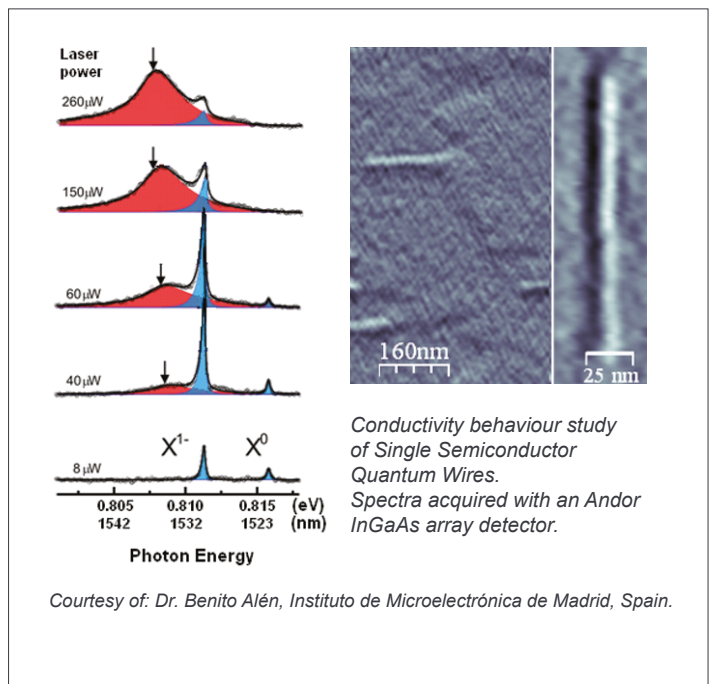
## Quantum Efficiency Curve <sup>\*\*11</sup> 20°C



## Typical Setup



## Typical Application

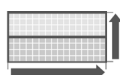


## Creating the Optimum Product for you



DU **490** A-1.7  
example shown

### Step 1. Choose the sensor array size



Array  
Size

Description	Code
25 $\mu\text{m}$ x 500 $\mu\text{m}$ , 512 pixel array	<b>490</b>
25 $\mu\text{m}$ x 500 $\mu\text{m}$ , 1024 pixel array	<b>491</b>
50 $\mu\text{m}$ x 500 $\mu\text{m}$ , 512 pixel array	<b>492</b>

### Step 2. Select an alternative camera window (optional)

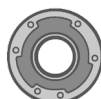


Camera  
Window

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	<b>XW-RECR</b>
Oasis 160 Ultra Compact Chiller Unit (tubing to be ordered separately)	<b>ACC-XW-CHIL-160</b>
6 mm tubing option for ACC-XW-CHIL-160	<b>ACC-6MM-TUBING-2xxxxM</b>
SR-750 Adapter Flange for InGaAs detector.	<b>SR-ASZ-0033</b>
SR-163 Adapter Flange for InGaAs detector	<b>SR1-ASZ-8044</b>
Shutter Driver for NS25B Bistable Shutter ( <u>not</u> needed for Shamrock spectrographs)	<b>ACC-SD-VDM1000</b>
Bistable Shutter, Standalone ( <u>not</u> needed for Shamrock spectrographs)	<b>ACC-SHT-NS25B</b>

#### Spectrograph Compatibility

The InGaAs series is fully compatible with Andor's Shamrock spectrograph (163 - 750 nm focal lengths) family. Shamrock spectrographs are supplied with Al/MgF<sub>2</sub> mirror coatings as standard, gold or silver optics are available on request. Spectrograph mounting flanges and software control are available for a wide variety of 3<sup>rd</sup> party spectrographs including, McPherson, JY/Horiba, PI/Acton, Chromex/Bruker, Oriel/Newport, Photon Design, Dongwoo, Bentham, Solar TII and others.

### Step 4. Select the required software



Software

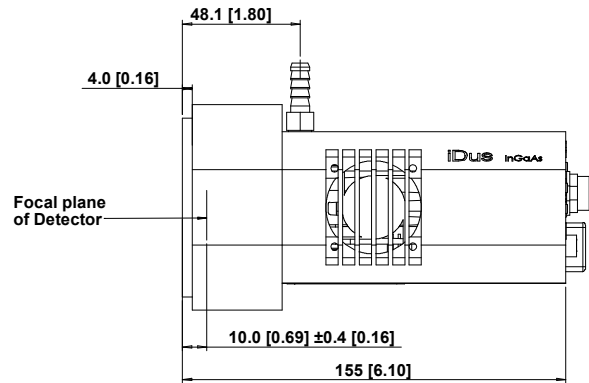
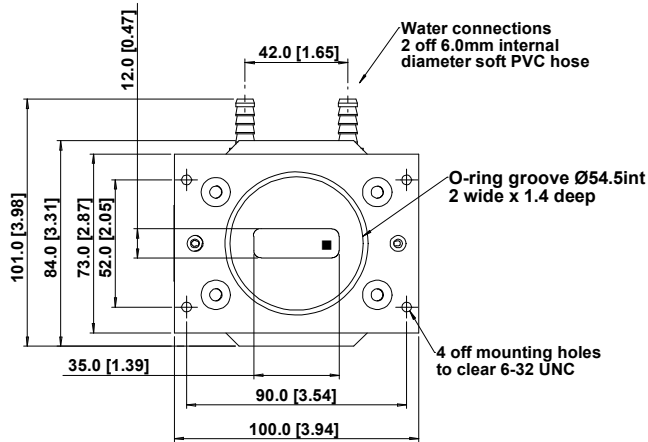
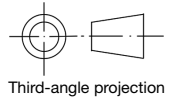
#### The InGaAs requires at least one of the following software options:

**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 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 (7, 8 and 10) and Linux. Compatible with C/C++, C#, Delphi, VB6, VB.NET, LabVIEW and Matlab.

## Product Drawings

Dimensions in mm [inches]



■ = position of pixel 1,1

Weight: 2 kg [4 lb 8 oz]

## Connecting to the InGaAs

### 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)

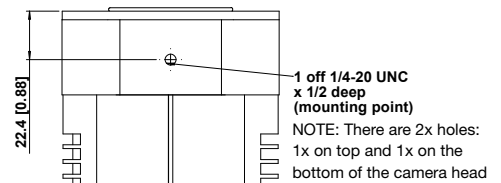
### I<sup>2</sup>C connector

Compatible with Fischer SC102A054-130

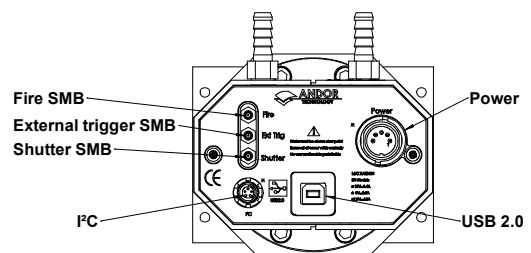
1 = Shutter (TTL), 2 = I<sup>2</sup>C Clock, 3 = I<sup>2</sup>C Data, 4 = +5 Vdc, 5 = Ground

### Minimum cable clearance required at rear of camera

90 mm



Mounting hole locations



Rear connector panel

## Applications Guide

	DU490-1.7	DU491-1.7	DU492-1.7
NIR Absorption-Transmission-Reflection Spectroscopy	○	○	●
NIR Photoluminescence	○	○	●
1064 nm Raman Spectroscopy	○	●	○

○ = Suitable

● = Optimum



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### Items shipped with your camera:

- 1x 2m BNC - SMB connection cable
- 1x 3m USB 2.0 cable Type A to Type B
- 1x Set of Allen keys (7/64" & 3/32")
- 1x Power supply (PS-25) 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. Typically obtainable at ambient temperature of 20°C, coolant chillers operating with 10°C coolant @ 0.75 l/min.
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. The InGaAs sensor starts to 'open' to light up to approximately 1  $\mu\text{s}$  before the rising edge of the Fire pulse. It then starts to 'close' to light up to 1  $\mu\text{s}$  before the falling edge of Fire. This ensures that the camera is 100% responsive by the time the Fire pulse has risen and closed by the falling edge. These figures only need to be taken into account for extremely short exposures.
5. The standard PS-25 power supply is suitable for air cooling and deep cooling. Measured at ambient temperature of 20°C.
6. Measured using 16°C water and 16°C target/scene.
7. At exposures below 20  $\mu\text{s}$ , well depth will be reduced by approximately 1/3 of typical value stated.
8. Noise is measured on a single pixel.
9. Grade 1 sensor from supplier. For further information on blemish specifications refer to: [www.andor.com/learning-academy/ccd-blemishes-and-non-uniformities-black-pixels-and-hot-pixels-on-a-ccd-sensor](http://www.andor.com/learning-academy/ccd-blemishes-and-non-uniformities-black-pixels-and-hot-pixels-on-a-ccd-sensor)
10. The coolant temperature is also representative of the scene temperature that the camera is exposed to during these measurements.
11. Quantum efficiency of the sensor at 20°C 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 (air cooling): 0°C to 20°C ambient
- Operating (deep cooling): 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



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