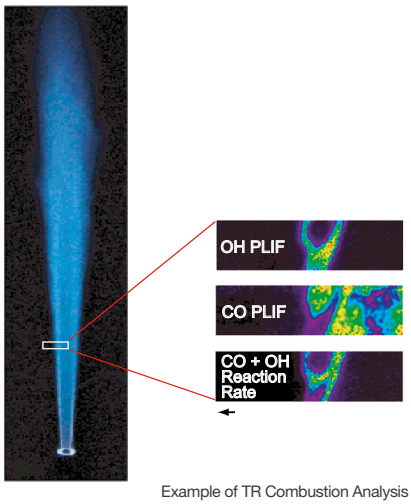
iStar 312T Series

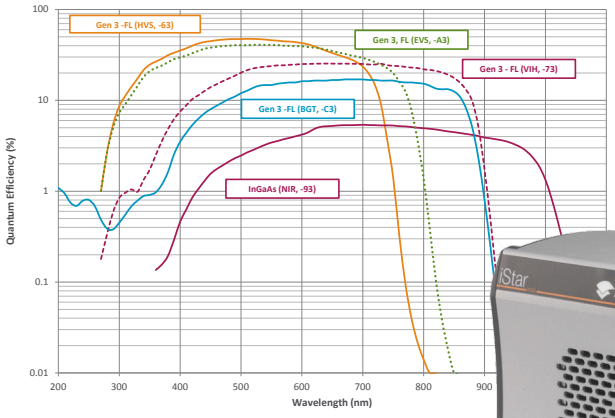
12.3 x 12.3 mm
512 x 512 pixel
Time-Resolved ICCD

ANDOR
an Oxford Instruments company

Time-Resolved



Example of TR Combustion Analysis



Features and Benefits

- **USB 2.0 connection**
  Simple Plug & Play connection
- **Multi-MHz Readout speeds**
  Rapid image capture for fast transition phenomena analysis
- **Integrated Digital Delay Generator**
  With comprehensive software controls
- **Close-Coupled Gating**
  < 2 ns true optical gating speeds - ultimate temporal resolution
- **Lowest insertion delay**
  As low as 19 ns
- **Fibre-optic coupling**
  High optical throughput without vignetting
- **IntelliGate™**[•1]
  MCP gating for On/Off ratios >10^8 in the UV
- **Photocathode gating rate up to 500 kHz**
  Increased Signal to Noise ratio for high speed laser-based experiments
- **Cropped sensor mode**
  Specialised acquisition mode to achieve fastest image acquisition rate
- **High resolution Gen 2 and 3 intensifiers**
  Highest available intensifier resolution with QE > 50% and sensitivity options from 120 nm to 1,100 nm
- **Thermo-Electric cooling down to -40°C**
  Ideal for low-light applications
- **Real-time control**
  Intuitive Windows user interface for real-time acquisition optimization
- **Photocathode dry gas purge port**
  Provides further EBI reduction for low-light applications

Industry's most integrated platform for rapid, nanosecond, Time-Resolved Imaging

Andor's iStar DH312T intensified CCD camera series is designed for rapid, ns-scale time-resolved Imaging. The 512 x 512 array is ideally suited for PLIF-based combustion analysis as well as Plasma plume analysis with ns time-resolution. It offers Multi-MHz readout for acquisition in excess of 15 frames per second, along with laptop-friendly, USB 2.0 connectivity and a fully integrated, software-controlled **D**igital **D**elay **G**enerator (**DDG**™). This allows seamless integration of complex experiments at the touch of a button, with full timing and gain control through a single interactive interface. Gen 2 & 3 image intensifiers with entrance input window and phosphor options are available to match wavelength range requirements from 120 nm to 1,100 nm .

Specifications Summary

	Ø 18 mm
Effective active area of CCD (mm)	12.3 x 12.3
Active pixels	512 x 512
Fibre optic taper magnification	1:1
Effective CCD pixel size	24 x 24 µm (100% fill factor)
Read noise	As low as 5.4 e^-
Frame rate (image/sec, max)	15.8 (28.5 with 2 x 2 binning)
Useful photocathode spectral range	120 - 1,100 nm*
Photocathode QE	Up to 50%*
Minimum optical gate width	< 2 ns*
Digitization	16-bit

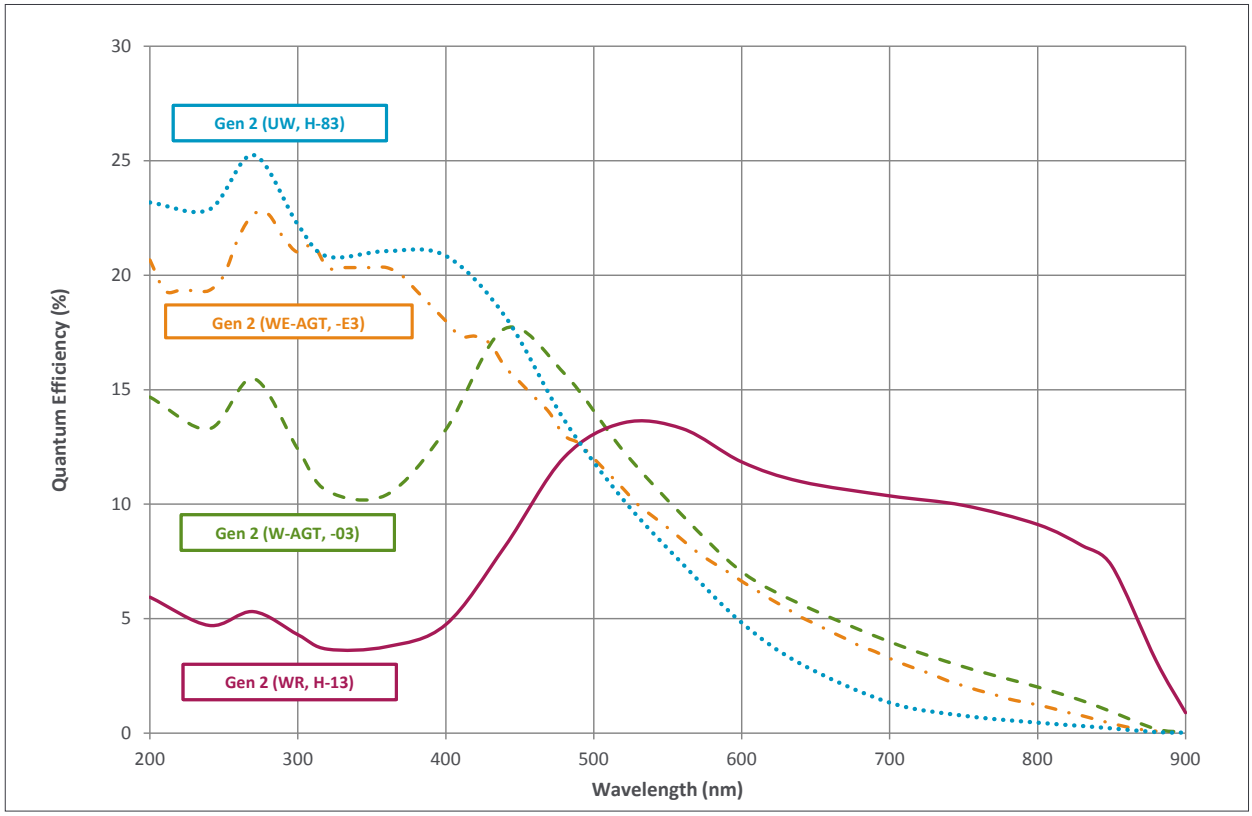
* Dependant on intensifier type

Specifications - Gen 2 Image Intensifiers [•2]

Photocathode model	18*-03	18*-04	18*-05 †	18H-13	18H-83	18*-E3[•1]
Useful aperture	Ø18 mm					
Input window	Quartz	Quartz	MgF_2	Quartz	Quartz	Quartz
Photocathode type	W-AGT	W-AGT	W-AGT	WR	UW	WE-AGT
Minimum guaranteed peak QE @ room temperature [•3]	18	18	15	13.5	25	22
Wavelength range	180 - 850 nm	180 - 850 nm	120 - 850 nm	180 - 920 nm	180 - 850 nm	180 - 850 nm
Image intensifier resolution limit [•4]	25 µm	30 µm	25 µm	25 µm	25 µm	25 µm
Phosphor type [decay time to 10%]	P43 [2 ms]	P46 [200 ns]	P43 [2 ms]	P43 [2 ms]	P43 [2 ms]	P43 [2 ms]
Minimum optical gate width (ns) [•5, 6] U (Ultrafast) F (Fast) H (High QE)	 < 2 < 5 -	 < 2 < 5 -	 < 5 < 10 -	 - - < 50	 - - < 100	 < 2 < 5 -
Maximum relative gain [•7]	> 1000	> 500	> 1000	> 850	> 500	> 300
Maximum photocathode repetition rate (with Intelligate™ OFF)	500 kHz (continuous)					
Maximum photocathode repetition rate (with Intelligate™ ON)	5 kHz (continuous)					
Equivalent Background Illuminance (EBI)	< 0.2 e^-/pix/sec			< 0.4 e^-/pix/sec	< 0.2 e^-/pix/sec	

* Substitute with appropriate gate width option, e.g. 18F-03 (please refer to page 5 for detailed ordering information)
† Available with VUV-compatible spectrograph interface

Quantum Efficiency Curves for Gen 2 Image Intensifiers [•3]

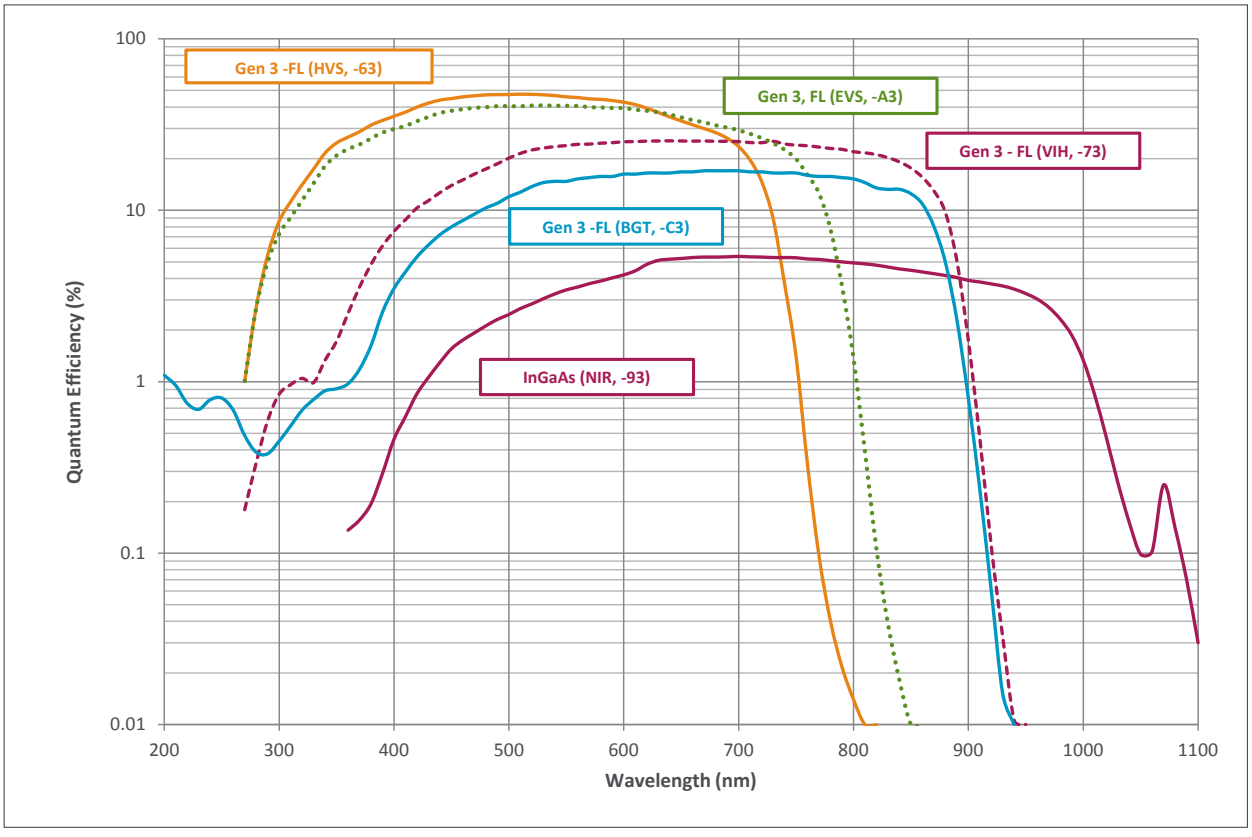


Specifications - Gen 3 Image Intensifiers [•2]

Photocathode model	18*-63	18*-73	18*-93	18*-A3	18*-C3
Useful aperture	Ø 18 mm				
Input window	Glass	Glass	Glass	Glass	MgF_2 + F/O + Lumogen
Photocathode type	HVS	VIH	NIR	EVS	BGT
Peak QE @ room temperature [•3]	> 47.5	> 25.5	> 5	> 40	> 17
Wavelength range	280 - 760 nm	280 - 910 nm	380 - 1090 nm	280 - 810 nm	< 200 - 910 nm
Image intensifier resolution limit [•4]	30 µm	30 µm	30 µm	30 µm	40 µm
Phosphor type [decay time to 10%]	P43 [2 ms]				
Minimum optical gate width (ns) [•6]					
U (Ultrafast)	< 2	< 2	< 3	< 2	< 3
F (Fast)	< 5	< 5	< 5	< 5	< 5
Maximum relative gain [•7]	> 200				
Maximum photocathode repetition rate (with Intelligate™ OFF)	500 kHz (continuous)				
Maximum photocathode repetition rate (with Intelligate™ ON)	5 kHz (continuous)				
Equivalent Background Illuminance (EBI)	< 0.1 e^-/pix/sec	< 0.3 e^-/pix/sec	< 2 e^-/pix/sec	< 0.2 e^-/pix/sec	< 0.3 e^-/pix/sec

* Substitute with appropriate gate width option, e.g. 18U-63 (please refer to page 5 for detailed ordering information)

Quantum Efficiency Curves for Gen 3 Image Intensifiers [•3, •8]



CCD Specifications •2

Total CCD matrix size	512 x 512			
Fibre optic taper magnification	Ø 18 mm 1:1			
Effective CCD pixel size	24 x 24 µm			
Effective active area	12.3 x 12.3 mm			
Pixel well depth	320,000 e^-			
Output node capacity	480,000 e^-			
Read noise e^- •9	50 kHz	1 MHz	3 MHz	5 MHz
Typical **Maximum**	5.4 7	10 14	16 20	24 50
Vertical shift speeds	6.5 to 25.7 µs			
Maximum frame and spectral rates	**Frame** 15.8 full fps 28.5 fps (2x2 binning)	**FVB** 291 sps	**Crop Mode (10 rows)** 633 fps 5,556 sps	**Fast Kinetics** 32,150 Hz (4 rows) 55,250 Hz (2 rows)
Sensitivity	2.2 to 8.7 e^-/count (software selectable)			
Linearity •10	Better than 99%			
Minimum temperature air cooled [dark current, e^-/pixel/sec] **Coolant chiller, coolant @ 10°C, 0.75 l/min [dark current, e^-/pixel/sec]**	-30°C [0.25] -40°C [0.12]			

Internal Digital Delay Generator (DDG™) Key Functions

Gate pulse delay & width	• Adjustable from 0 ns to 10 s in 10 ps steps • Software controlled, pre-programmed or real-time
	Trigger Outputs
Output A, B and C	• 3x output, +5V CMOS level with 50 Ω source impedance; can drive 5V into a non-terminating load or 2.5V into 50 Ω load; output synchronized triggers for auxiliary equipment, e.g. lasers, flash lamps, National Instrument™ hardware • Individual delays control from 0 ns to 10 s in 10 ps steps • Configurable Polarity • Software controlled, pre-programmed or real-time
Fire	• 5V CMOS level reference signal for beginning and end of individual CCD exposure
Arm monitor	• 5V CMOS level reference signal to indicate when system is ready to accept external triggers. Signal goes high when system is ready to accept external triggers (after a readout has finished) and goes low when the exposure is finished
Gate & output A, B and C jitter	• 35 ps rms (relative to external trigger signal)
	Trigger Inputs
External trigger	• Trigger input for CCD and Digital Delay Generator • Up to 500 kHz for Integrate-On-Chip mode • Software-configurable Polarity, Termination and Trigger Threshold • Fast external software option for most rapid camera response to external trigger (CCD keep clean interruption) – no need for pre-trigger pulse
Direct gate	• TTL input for exact external control of photocathode width and timing with smallest insertion delay.
	Additional Controls
Gate monitoring	• AC coupling from photocathode to monitor exact photocathode on/off switching and timings
Insertion delay	< 19 ns in direct gate operation

Have you found what you are looking for?

Need higher resolution? The DH334T series cameras offers 13.5 x 13.5 µm pixels for higher resolution imaging & spectroscopy.
Need a faster response phosphor for Fast Kinetics? P46 phosphor is available as an option for all intensifier models.
Need a wider sensor format? The DH320T & high resolution DH340T series offer up to 25 mm field of view when combined with Ø 25 mm image intensifier options.
Need a customized version? Please contact us to discuss our Customer Special Request options (CSR).

Creating The Optimum Product for You

DH312T-18- F - 03

example shown

Step 1. Choose a minimum gating speed

Gating Speed

Gating Speed	Code
High QE, slow gating	H
Fast Gating	F
Ultra Fast Gating	U

Step 2. Select an image intensifier option

Intensifier

Gen 2 Intensifier option	Code
W-AGT photocathode, P43 phosphor	03
W-AGT photocathode, P46 phosphor	04
W-AGT photocathode, MgF_2 window, P43 phosphor	05
WR photocathode, P43 phosphor	13
UW photocathode, P43 phosphor	83
WE-AGT photocathode, P43 phosphor	E3

Gen 3 Intensifier option	Code
HVS photocathode, P43 phosphor	63
VIH photocathode, P43 phosphor	73
NIR photocathode, P43 phosphor	93
EVS photocathode, P43 phosphor	A3
BGT photocathode, P43 phosphor	C3

Step 3. Select the required accessories and adapters

Accessories & Adapters

Description	Order Code
C-mount lens adaptor	LM-C
F-mount lens adaptor	LM-NIKON-F
Oasis 160 Ultra compact chiller unit	ACC-XW-CHIL-160
6 mm tubing option for ACC-XW-CHIL-160	ACC-6MM-TUBING-2xxxxM
i²c to BNC cable for Shamrock shutter control	ELC-05323
Metric Bracket	ACC-ISTAR-METRIC ADP

In addition to the accessories listed the following special options are also available:

- 90° USB connection
- UV or visible lenses or adapter extension tubes

Please contact your local Sales representative for details of how to order any of these items.

Step 4. Select the required software

Software

The iStar ICCD requires at least one of the following software options:

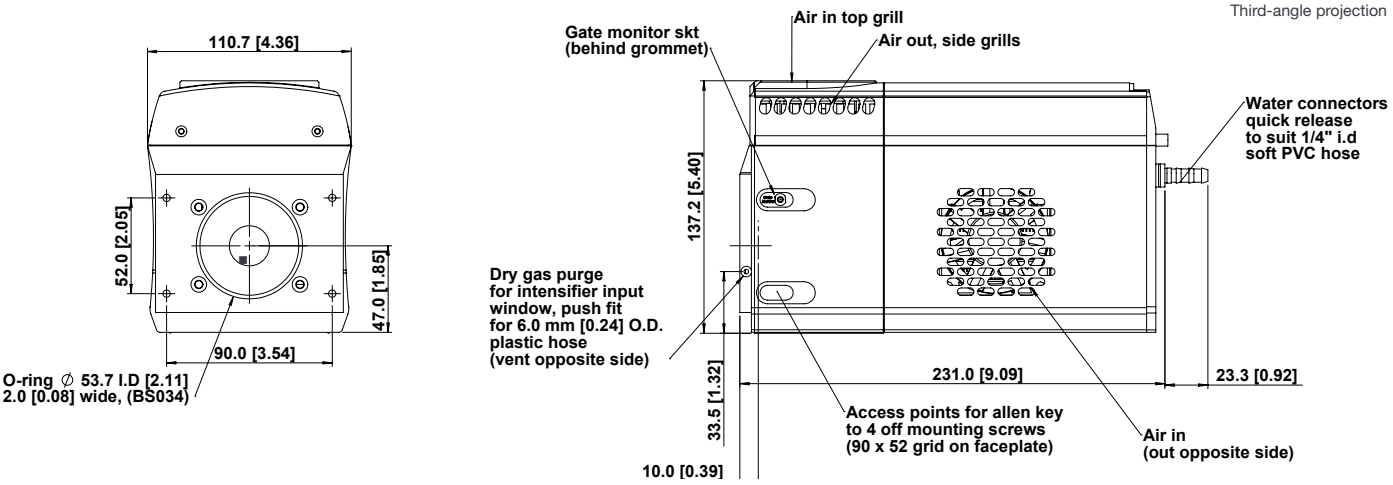
Solis for Time-Resolved A 32-bit and fully 64-bit enabled application for Windows (XP, Vista, 7 and 8) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

Andor SDK A software development kit that allows you to control the Andor range of cameras from your own application. Available as 32 and 64-bit libraries for Windows (XP, Vista, 7 and 8) and Linux. Compatible with C/C++, C#, Delphi, VB6, VB.NET, LabVIEW and Matlab.

Product Drawings

Dimensions in mm [inches]

Third-angle projection



Weight: 4.2 kg [9 lb 4 oz]

■ = position of pixel 1,1

Connecting to the iStar

Camera Control

Connector type: USB 2.0

Logic Input / Output

Connector type: SMA, provided with SMA - BNC cable

5x outputs: FIRE pulse, Output A, B, C from DDG™ and ARM

2x inputs: Camera trigger from 3rd party source & direct gate for complete, direct external control of intensifier gating

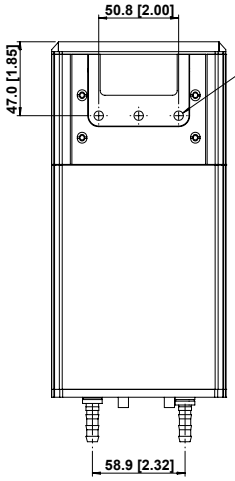
I²C connector

Compatible with Fischer SC102A054-130, pin-outs as follow:

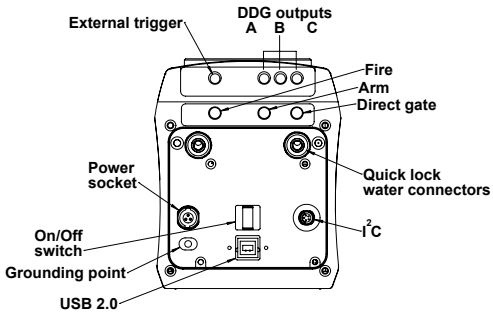
1 = Shutter (5V CMOS level with 50 Ω impedance), 2 = I²C Clock (5V), 3 = I²C Data (5V), 4 = +5 Vdc, 5 = Ground

Gate Monitor

1x output: AC coupling to photocathode



Mounting hole locations



Rear connector panel

Applications Guide

	Gen 2	Gen 2 UV Enhanced (-05, -83, -E3)	Gen 3*	InGaAs
Plasma Studies	✓	✓	✓	✓
Laser Induced Fluorescence (LIF, PLIF)	✓	✓	✓	
Time Resolved Luminescence Imaging	✓	✓	✓	
Transient Absorption Imaging	✓	✓	✓	✓
Time Resolved Photoluminescence Imaging			✓	✓
Particle Image Velocimetry (PIV)	✓	✓	✓	

* Gen 3 typically do not exhibit any UV response - Andor -C3 is constructed with an additional input phosphor interface to provide this UV response.

✓ = 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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Phone +44 (28) 9023 7126
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Fax +1 (860) 290 9566

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

Items shipped with your camera

Power Brick, 12V, 120W single line
2x 2m BNC to SMA cable
1x Gate Monitor cable
3 Metre USB cable A to B type, shielded (1off)
1x Quick launch guide
1x CD containing Andor user guides
1x Individual system performance booklet

Regulatory Compliance

Compliant with the requirements of the EU EMC and LV Directives through testing to EN 61326-1 and EN 61010-1.
External power supply PSE-approved

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Footnotes: Specifications are subject to change without notice

1. The On/Off ratio for the 'E3' image intensifier in the UV with MCP gating is typically 10^5.
2. Figures are typical unless otherwise stated.
3. Typical photocathode Quantum Efficiency and standard quartz input window transmission as measured by the tube manufacturer. MgF_2 window allows extended operation down to 120 nm.
4. Typical resolution of the image intensifier tube only, not the overall resolution of the system. As a rough guide, the smallest resolvable FWHM feature will be approximately 2x the CCD pixel size. This is a very important consideration for optical resolution calculations in spectrograph-based systems.
5. Gen 2 High QE (H) option – Photocathode QE is inherently linked to the gating speed of the intensifier. High QE option (H) offers higher peak QE than Ultrafast (U) or Fast (F) intensifiers, while exhibiting minimum gating speed one order of magnitude slower.
6. Actual measured minimum optical gating of the photocathode, reflecting not only the electrical pulse width applied to the photocathode but also its inherent irising time.
7. Gain is software-selectable through a 12-bit DAC and varies exponentially with DAC setting. Value refers to the ratio of max to min intensifier gain as measured for individual cameras. Actual optical gain (counts/photoe$^-$) for a DAC setting is accessed by the multiplication of the relative gain (at that DAC value) by the minimum system gain (at DAC = 0, CCD e$^-$ /photoe$^-$) and divided by the sensitivity (CCD e$^-$/count) at a given CCD PAG. Sensitivities are individually measured and reported for each system.
8. Combination of -73 GaAsP photocathode with a lumogen-coated fibre-optic plate and protective MgF_2 window. The latter additional optical interfaces are the reason for the lowered QE in the visible NIR region, for the -C3 model.
9. Measured for the entire system. Combination of CCD readout noise and A/D noise - measurement is for single pixel readout with -30°C CCD cooling and at minimum exposure time under dark conditions. Values quoted are measured with highest available PAG setting.
10. Linearity is measured from a plot of counts vs exposure time under constant photon flux up to the saturation point of the system.

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, 7 and 8) or Linux

Operating & Storage Conditions

- Operating Temperature: 0°C to 40°C ambient
- Relative Humidity: < 70% (non-condensing)
- Storage Temperature: -20°C to 55°C

Power Requirements

- 100 - 240 VAC, 50 - 60 Hz