



XR/MEGA-10 *Extrem*e™

ICCD CAMERAS FOR IMAGING AT THE *Extrem*e

- **Photon limited fluorescence imaging**
- **High Quantum Efficiency: 40-50% typical**
- **Light Gains of 40,000 to 80,000**
- **Mega-pixel, Nyquist limited resolution**
- **Video rates and faster for dynamic event capture**
- **Exclusive ABF™/Automatic Bright Field technology**



The **XR/MEGA-10*Extrem*e™** ICCD camera platform provides the highest resolution, speed and sensitivity options available to the scientist working near and at the limits of detection. The use of Extended Blue/Filmless GEN III or advanced design GaAsP intensifier tube technologies provides optimized imaging extending from the near UV to near IR with mega-pixel, Nyquist limited resolution at speeds ranging from 15 to 120 frames per second (FPS). The XR/MEGA-10EX™ is fiber-optic coupled with a 1.6:1 taper ratio, resulting in a 10 micron pixel (nominal) at the image plane; proprietary, single step bonding assures maximum system resolution and contrast. The Stanford Photonics XR™ cameras are the only products on the market with the exclusive ABF™ (Automatic Bright Field) feature that instantaneously adjusts photocathode gate time and intensifier gain to compensate for up to seven decades of light level change, allowing for hands-off surveys of samples with large variances in brightness and bright field imaging without the need for a second camera. The XR/MEGA-10EX™ is Mac® and PC compatible and is supported by a number of high-end image capture and analysis systems.

CAMERA MODELS

XR/MEGA-10EX™: General purpose/multi-user; Highest resolution

- 1.4K by 1K full resolution, 15 FPS
- 640 by 480 (binned 2X2), 30 FPS
- 1.4K by 104 V (binned 4X) for 40% height, 120 FPS and
- RS-170 high resolution (1.4K by 488 interlaced)
- RS-170 windowed, 2X zoom (640 by 480 interlaced)

XR/MEGA-10EX™ S30: Highest Speed

- 1K by 1K, 30 FPS
- 512 by 512 (binned 2X2), 60 FPS
- 256 by 256 (binned 4X4), 90 FPS
- 1.4K by 104 V (binned 4X) for 40% height, 120 FPS

BOTH MODELS:

- 10 bit, LVDS PCI or Camera Link® interface for maximum transfer speeds
- On chip integration via computer or external control
- Gating power supply with auto (ABF™) or external control
- Remote, hand held controller for gain and mode control:
 - Compact, illuminated read-out of camera and intensifier set up parameters
 - Remote switching/ selection/ setting of gains and modes.

FEATURES/ BENEFITS

Unfilmed Extended Blue GEN III (Gallium Arsenide)

- Highest resolution and cosmetic quality
- Moderate dark level count
- Peak spectral response spanning 525 (FURA/GFP) to 850 nm (Rhodamine, CY5 and CY7, near IR).

GaAsP (Gallium Arsenide Phosphide)

- Highest Quantum Efficiency tube available for the near UV and visible spectrum
- Extremely low dark count level (10-20X lower than GIII, typical): ideal for TIRF, FRET and other low background preps.
- Peak spectral response spanning 425 to 625 nm with extended red response option to 750 nm.

SIMULTANEOUS ANALOG AND DIGITAL OUTPUTS

- RS-170 display and recording (XR/MEGA-10EX™) or multisync display (XR/MEGA-10EX™ S-30)
- High Speed Camera Link® or LVDS digital bus and interface for highest image speeds and storage rates, universal connectivity to large selection of image capture boards

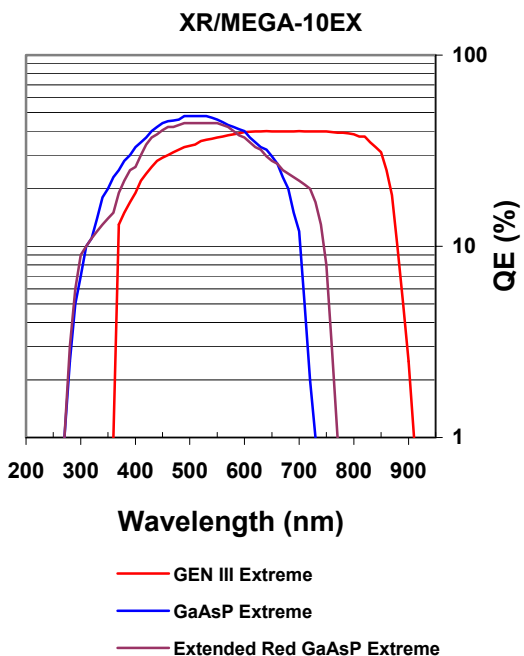
SINGLE STEP FIBER OPTIC BONDING

- Optimized design and process derived from extensive experience in military and night vision arena
- 10-15% improvement relative to standard methods

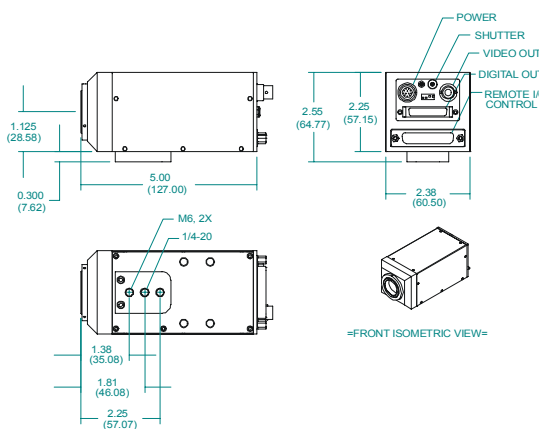
EXCLUSIVE ABF™ EXPOSURE CONTROL

- In-camera electronics automatically control intensifier gate speed (shutter) and gain on a frame by frame basis for seven decades of light level compensation
- Use for survey mode, bright field/fluorescence interweaving
- Protects image intensifier tube from inadvertent high light exposure
- Easy override to fixed/manual gain operation for quantitative measurements

SPECTRAL RESPONSE CURVES



CAMERA DIMENSIONS: in (mm)



CAMERA CONTROLLER



INTENSIFIER OPTIONS:

Unfilmed Extended Blue Gen III and GaAsP

The absence of an ion barrier film in both -10EXTM designs results in 30-40% more electrons generated by the photocathode (conversion of in-coming photons to electrons) traveling into and through the amplifying stage of the intensifier to the final output image. At low light, this results in measurably higher sensitivity and signal-to-noise relative to standard Gen III and filmed technology.

Parameter	GEN III Extreme	GaAsP Extreme
Spectral Response (min. and max. wavelengths for 10% QE and higher)	370nm to 875nm	300nm to 700nm
Equivalent Background Input (EBI) $X10^{-11}$ lum/cm ²	2.5 Max., 1.0 typical	0.2 Max., 0.05 typical
Dark Counts: Equivalent photons/sec-pixel;	TBD	TBD
Resolution (limiting) ¹	64 lp/mm	55 lp/mm
Phosphor and decay time to 10% ²	P43, 2 ms	P43, 2 ms
Max. Gain	80,000 typical	40,000 typical
Min. Gate Width (internal via ABF TM)	100 ns	100 ns
Min. Gate Width (External/ Optional) ³	5 ns	5 ns

Notes:

- (1) The XX285 image sensor, with taper, has a resolution limit of approximately 50 line pairs per millimeter. This is less than either of the tubes and defines the finest structure that can be resolved at the image plane.
- (2) The decay time of P43 decreases with shorter (pulsed) exposure. For example, a 250 microsecond pulsed excitation and/ or a photocathode gate time of 250 microseconds reduces the decay time to 1 ms. Higher temporal resolution within each frame can be derived by using a pulsed or gated exposure.
- (3) Both intensifier tube types can be externally gated to 5 ns. Contact the main office for information regarding gating and gate control options.

CCD SENSOR AND READOUT ELECTRONICS

Both cameras use the Sony XX285 scientific grade image sensor, which has a full frame pixel count of 1380 by 1024K. Pixels are 6.47 microns square. The addition of a 1.6:1 fiber optic taper between the CCD and image intensifier output creates an effective pixel sized of 10.35 microns at the input image plane. For this pixel size the resolution limit is close to 50 line pairs per millimeter, so the CCD and not the image intensifier is the limiting resolution element. At 100X, the pixels are roughly 100nm square when referenced back to the object/sample plane.

Type	XR/MEGA-10EX TM	XR/MEGA-10EX TM S30
Active Pixels (readout)	1380 x 1024	1024 X 1024
Baseline frame rate	15 FPS, Full frame	30 FPS, Full frame
Effective Pixel Size (including taper mag.)	10.35 microns	10.35 microns
Single Pixel Well Capacity	18,000 electrons	18,000 electrons
Pixel Clock (unbinned, native)	27 Mhz	45 Mhz
Read out noise (CCD)	10 electrons rms	15 electrons rms
Active Image Area	14.23 mm H by 10.6 mm V	10.6 mm H by 10.6 mm V

MODES AND SPEEDS

Unbinned full frame	1.4 by 1K, 15 FPS	1K by 1K, 30 FPS
2 by 2 binning, full	640 by 480, 30 FPS	512 by 512, 60 FPS
4 by 4 binning, full		256 by 256, 90 FPS
1 by 4 binning, centered	1.4 by 104 (40% V height), 120 FPS	1K by 180 (70% V height), 120 FPS
Analog video	1.4K by 488 RS-170 and 640 by 480 RS-170, 2X Zoom	Analog progressive scan output; all modes

CAMERA

Digital outputs	10 bit LVDS or Camera Link®
Video Gain (Manual Remote)	Unity to 10X
External Controls	Free run or Async.; Mode select; Integrate on chip
Thread Mount	C-mount, 18mm image format
Weight	26 oz./728 gms.
Power	12VDC @ 400 mA

SYSTEM

Because of the RS-170 outputs available with the XR/MEGA-10EXTM, this model can be operated in a stand-alone mode with direct video display and video recording devices. Images may also be captured into a computer using analog (typically 640 by 480 by 8 bits) frame grabbers. Both the XR/MEGA-10EXTM and XR/MEGA-10EX-S30TM can be input as 10 bit digital images into a PC or Mac® using a number of Camera Link® or PCI LVDS capture cards and software systems. Contact main office for more information regarding high performance software and acquisition via Camera Link®. Each camera is shipped with:

- 12 VDC power supply; wall mount
- Computer interface cable (capture card and software specific)
- Hand held controller and 2 meter interconnect cable

Note: Specifications are typical and subject to change without notice. All sales are subject to export control under the International Traffic in Arms Treaty.