

PI-MTE: 2048B

2048 x 2048 imaging array | 13.5 x 13.5 μm pixels

The PI-MTE: 2048B from Princeton Instruments is an innovative, high-sensitivity imaging system designed to deliver scientific performance inside high-vacuum chambers over long operation times. The PI-MTE: 2048B incorporates a back-illuminated CCD without AR coating for ultra-low-energy X-ray detection. With 13.5 x 13.5 μm pixels and 100% fill factor, this system offers a large imaging area with very high spatial resolution and dynamic range. The thermoelectrically cooled design features PCBs, thermally linked to the circulating coolant to provide reliable operation inside vacuum chambers. The system's compact size and flexible tubing facilitate the positioning of the detector in limited space or on a movable arm.

FEATURES	BENEFITS
Back-illuminated CCD (without AR coating)	Best response for soft x-ray
2048 x 2048 imaging array 13.5 x 13.5 μm pixels	Largest available area without AR coating for imaging
Unique thermal design	Efficient heat removal in high-vacuum environment
Flexible binning and readout	Increases frame rate and signal-to-noise ratio (SNR)
Compact design	For installation in limited space or on a movable arm in vacuum
Thermoelectric cooling	Minimizes dark current
Up to 2 MHz digitization	Delivers high frame rates without compromising system performance
Dual-digitizer option	Multiple-speed digitization allows complete freedom to select between "slow operation" for low noise and highest SNR or "fast operation" for rapid image acquisition
USB 2.0 interface configuration	Seamless, plug-and-play connection to PC notebooks and desktops Easy OEM integration
PCI interface configuration	Industry standard for fast data transfer over long distances
WinView and PVCAM [®]	Offers powerful, easy-to-use set of Windows [®] GUI controls Automates data acquisition, analysis, and display
Linux [®] drivers and SITK [™] plug-in for National Instruments' LabVIEW [™]	Extends system utility

Applications:

Soft X-ray Imaging , X-ray Microscopy,
EUV Lithography, X-ray Plasma Imaging

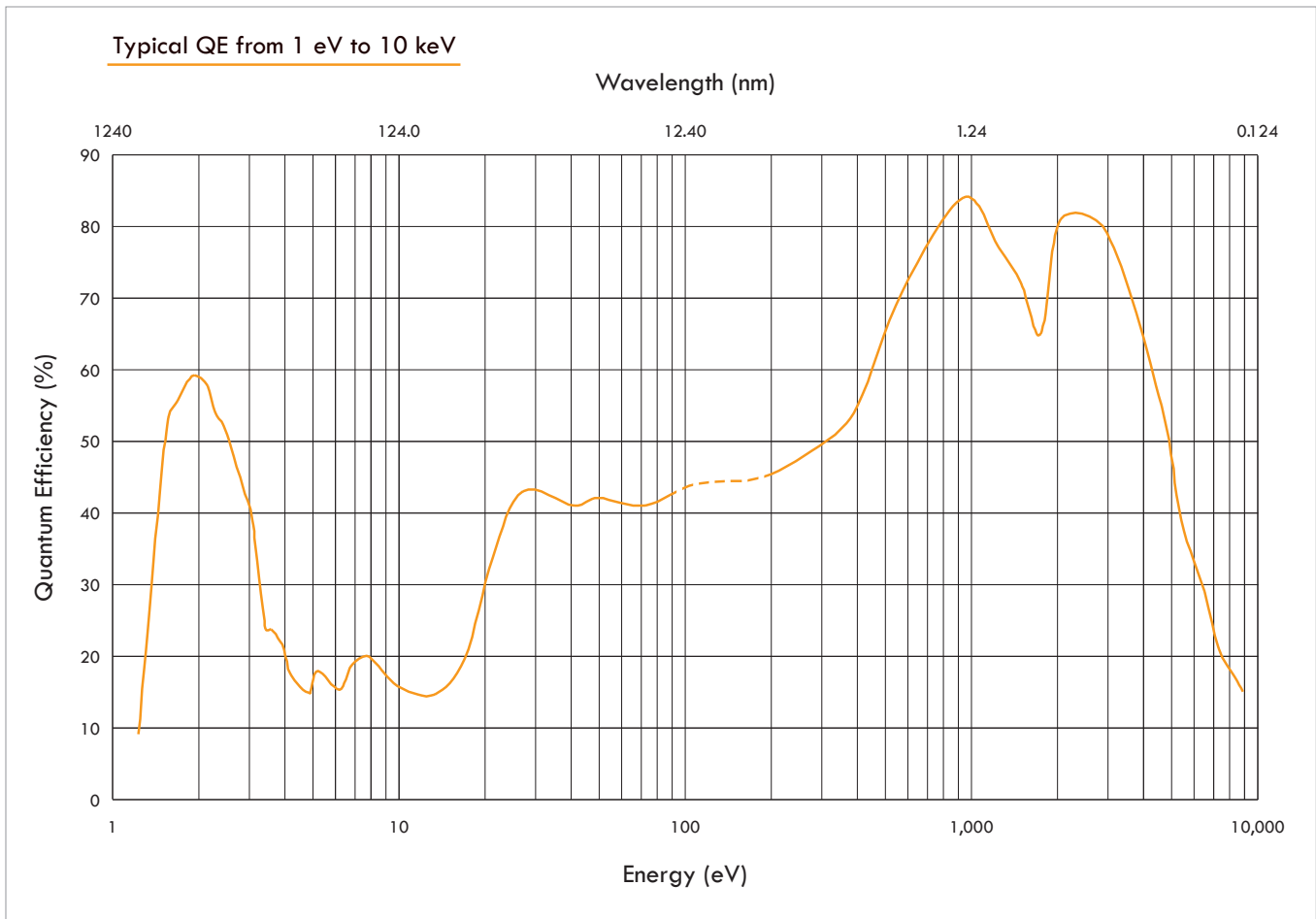
SPECIFICATIONS

CCD image sensor	Scientific-grade, back-illuminated, MPP device without AR coating		
CCD format	2048 x 2048 imaging pixels 13.5 x 13.5 μm pixels 100% fill factor 27.6 x 27.6 mm imaging area (optically centered)		
	MINIMUM	TYPICAL	MAXIMUM
Linear full well	80 ke-	100 ke-	
Output amplifier	130 ke-	200 ke-	
System read noise			
@ 50 kHz digitization		3 e- rms	4 e- rms
@ 100 kHz digitization		4 e- rms	7 e- rms
@ 1 MHz digitization		10 e- rms	15 e- rms
@ 2 MHz digitization		12 e-rms	18 e-rms
Dark current @ -40° C operation		0.05 e-/p/s	0.25 e-/p/s
Deepest cooling temperature TE (chilled liquid)	-40° C	-45° C	-50° C
Vacuum Compatibility		10 ⁻⁴ Torr	10 ⁻⁶ Torr*
Nonlinearity @ 100 kHz	2%		
Readout bits / speed	16 bits @ 50 kHz to 1 MHz		
Parallel shift rate	96.2 $\mu\text{sec}/\text{row}$		

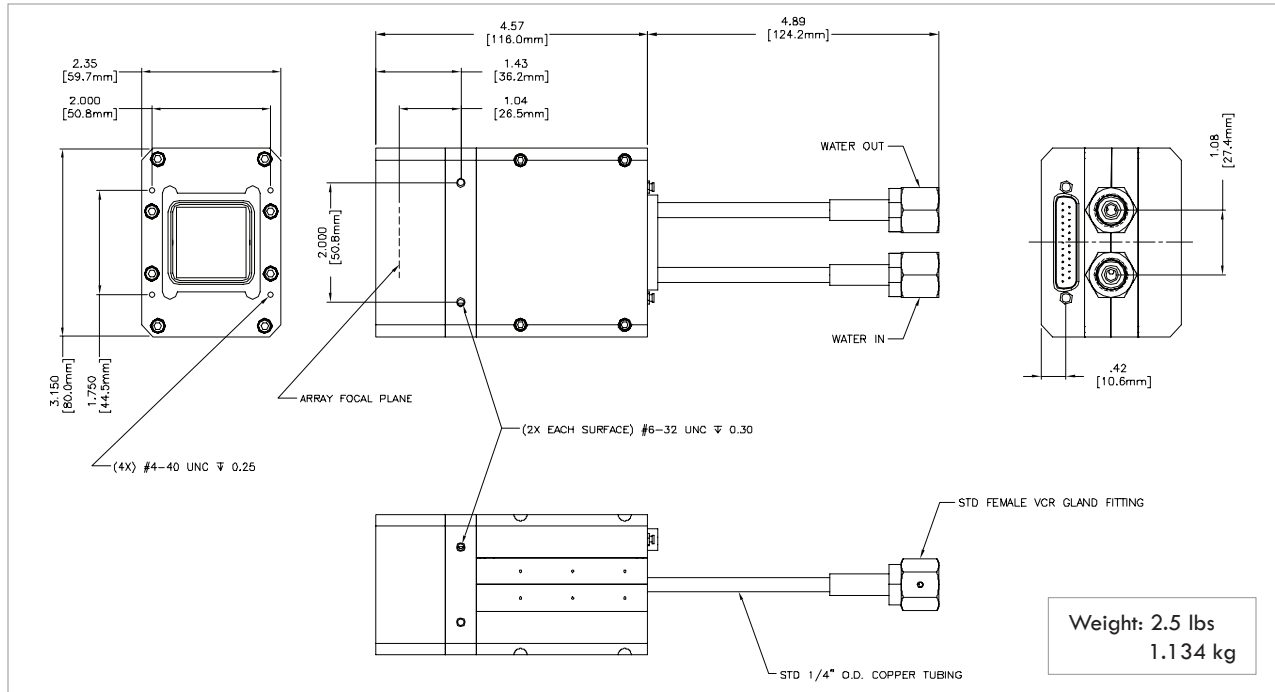
NOTE: All specifications subject to change

* Requires dynamic vacuum

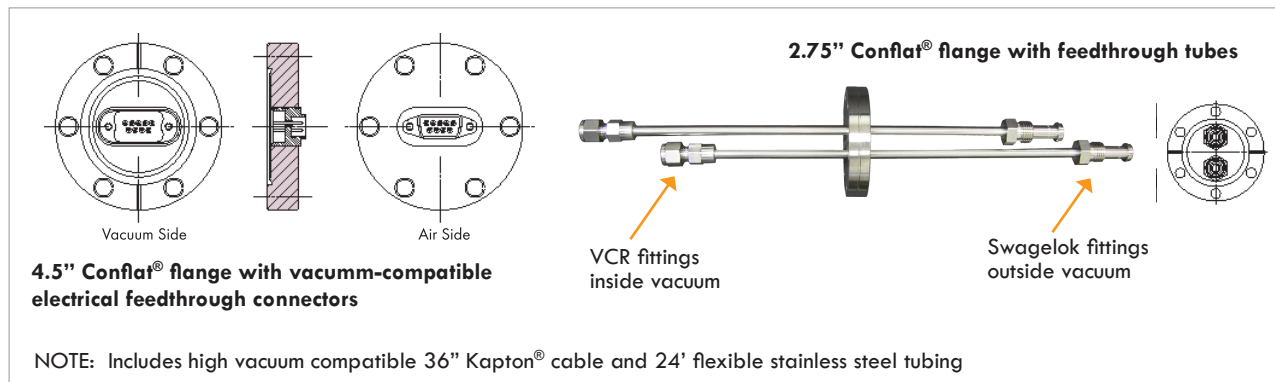
Quantum Efficiency Curve



MTE Drawing



Vacuum Interface



Readout Rates

Binning	@ 2 MHz	@ 1 MHz	@ 100 kHz	@ 50 kHz
1 x 1	2.39 sec	4.59 sec	40.25 sec	78.42 sec
2 x 2	1.185 sec	1.765 sec	11.254 sec	20.80 sec
4 x 4	0.61 sec	0.77 sec	3.456 sec	5.845 sec