

# rayonix mx series **<HS>**

High speed, high resolution, large format X-ray detector

Frame-transfer technology for high speed X-ray data collection without compromising resolution or data quality while maintaining continuous imaging area

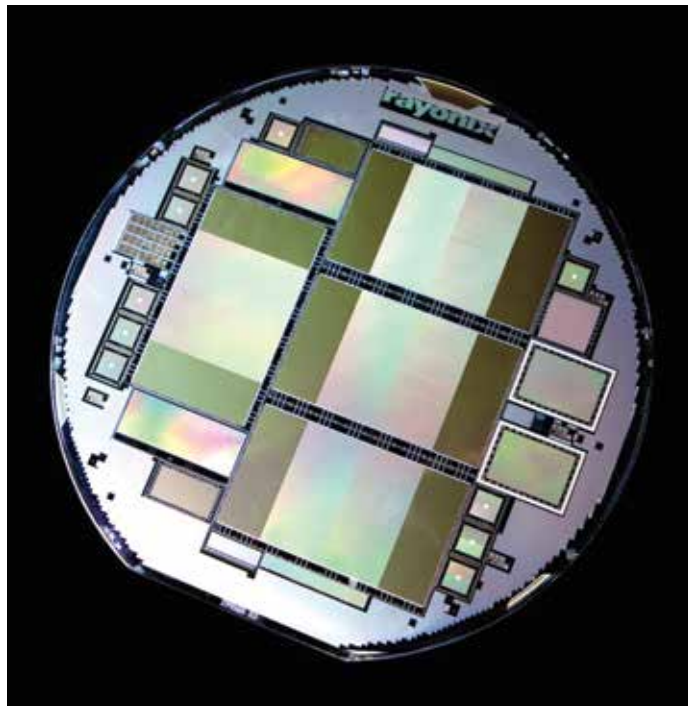


# rayonix mx series

Large, high resolution X-ray detectors using exclusive Rayonix high speed frame-transfer technology with only 1 millisecond dead time and up to 120 frames per second

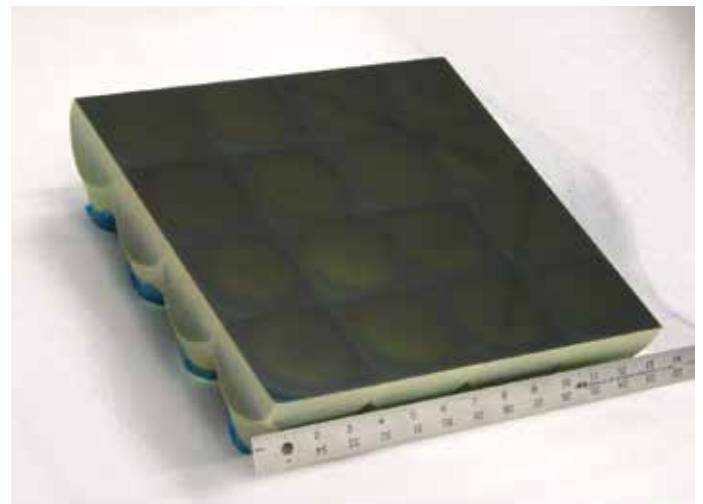
The MX-HS series from Rayonix incorporates the new, exclusive frame-transfer technology for high speed X-ray data collection without compromising resolution or data quality. The result is a new type of high speed and ultra-low noise area detector that delivers the highest performance available for X-ray diffraction applications.

The Rayonix MX-HS detectors are ideal for taking advantage of high brilliance synchrotron sources, or for any other high frame rate application. Examples include: high throughput protein crystallography, Laue diffraction, time-resolved or static small-angle X-ray scattering (SAXS), wide-angle X-ray scattering (WAXS), powder diffraction, X-ray computed tomography (CT), X-ray imaging, and coherent diffraction imaging (CDI). With no count rate limitation, these detectors are also ideal for XFEL applications.



A wafer with new Rayonix HS frame-transfer CCD chips showing the imaging and buffering areas.

Various configurations of FOT (fiber-optic taper) coupled modules are available. The detectors in the MX-HS series use 2 × 2, 3 × 3, 4 × 4, or 5 × 5 arrays of fused fiber-optic taper elements to make a very large active area. Unlike other multi-element detectors, the images produced have no gaps between the modules. The Rayonix factory calibration is permanent and suitable for all X-ray sources.



A 4 × 4 array of fused fiber-optic tapers used in our MX300 and MX340 cameras. Taper elements are bonded together without gaps in the final X-ray images.

## FT-CCDs Bonded to Fiber-optic Tapers

### Active Imaging Surface

**Readout Electronics** 16 channels per FT-CCD






### Physical Dimensions






| Detector Head                  | Height × Width × Depth |
|--------------------------------|------------------------|
|                                | Approximate Weight     |
| Electronics / Cooling Assembly | 175 cm × 64 cm × 64 cm |
| Cabinet                        | 215 kg                 |
| Power Supply / Computer        | 116 cm × 64 cm × 64 cm |
| Cabinet                        | 180 kg                 |

## MX-HS Technical Specifications

|  |   |
|--|---|
| <b>Sensors</b>                             | Proprietary Rayonix frame-transfer CCD  |
| <b>Dead Time</b>                           | 1 millisecond   |
| <b>Full Well Capacity at 2 x 2 Binning</b> | 400ke <sup>-</sup> /pixel   |
| <b>Noise</b>                               | High Speed mode: 8 e <sup>-</sup> /pixel    Low Noise mode: 4 e <sup>-</sup> /pixel |
| <b>Dynamic Range</b>                       | High Speed mode: 16 bit    Low Noise mode: 18 bit                                   |
| <b>Dark Current</b>                        | 0.003 e <sup>-</sup> /pixel/second or 0.0004 photons/pixel/second (12keV)           |
| <b>Phosphor</b>                            | 40μm standard, 20–80μm by special order   |
| <b>PSF, FWHM</b>                           | 100μm with 40μm thick phosphor, 65μm with 25μm phosphor                             |
| <b>Sensor Operating Temperature</b>        | –80° C  |
| <b>Cooling</b>                             | Closed-cycle refrigeration  |

## User-configurable Imaging Parameters

|  |                 |   |   |  |
|--|-----------------|--|---|---|
|  |                 |  |  |   |
| On-chip Binning                                | Frame Rate (Hz) | Pixel Size (μm)  | Pixel Size (μm)   | Pixel Size (μm)   |
| 1 x 1  | 2.5             | 44   | 39  | 44  |
| 2 x 2 (standard)                               | 10              | 89   | 78  | 89  |
| 3 x 3  | 20              | 133  | 117   | 133   |
| 4 x 4  | 40              | 177  | 156   | 177   |
| 5 x 5  | 55              | 221  | 195   | 221   |
| 6 x 6  | 75              | 266  | 234   | 266   |
| 8 x 8  | 100             | 354  | 312   | 354   |
| 10 x 10  | 120             | 440  | 390   | 440   |
| Other Specifications                           |                 |  |   |   |
| <b>Fiber-optic Taper Demagnification Ratio</b> |                 | 2.92: 1  | 2.6: 1  | 2.92: 1   |
| <b>Electro-optical Gain</b>                    |                 | 7e <sup>-</sup> /12keV photon  | 9e <sup>-</sup> /12keV photon   | 7e <sup>-</sup> /12keV photon   |

|  |  |  |  |  |
|--|---|---|--|---|
| <b>4 Modules</b><br><b>15 Megapixels</b>   | <b>9 Modules</b><br><b>33 Megapixels</b>  | <b>16 Modules</b><br><b>59 Megapixels</b>   | <b>16 Modules</b><br><b>59 Megapixels</b>  | <b>25 Modules</b><br><b>92 Megapixels</b>   |
| 170 mm x 170 mm,<br>28,900 mm <sup>2</sup>   | 225 mm x 225 mm,<br>50,625 mm <sup>2</sup>  | 300 mm x 300 mm,<br>90,000 mm <sup>2</sup>  | 340 mm x 340 mm,<br>115,600 mm <sup>2</sup>  | 425 mm x 425 mm,<br>180,625 mm <sup>2</sup>   |
| 64 channels  | 144 channels  | 256 channels  | 256 channels   | 400 channels  |
| 34 cm x 29 cm x 43 cm  | 49.5 cm x 41 cm x 48 cm   | 77 cm x 49 cm x 48 cm   | 81 cm x 54 cm x 48 cm  | 101 cm x 62 cm x 48 cm  |
| 50 kg  | 90 kg   | 190 kg  | 210 kg   | 270 kg  |
| N/A  | Includes one unit   | Includes two units  | Includes two units   | Includes three units  |

Each system includes one unit



**rayonix**

High-performance X-ray technology

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