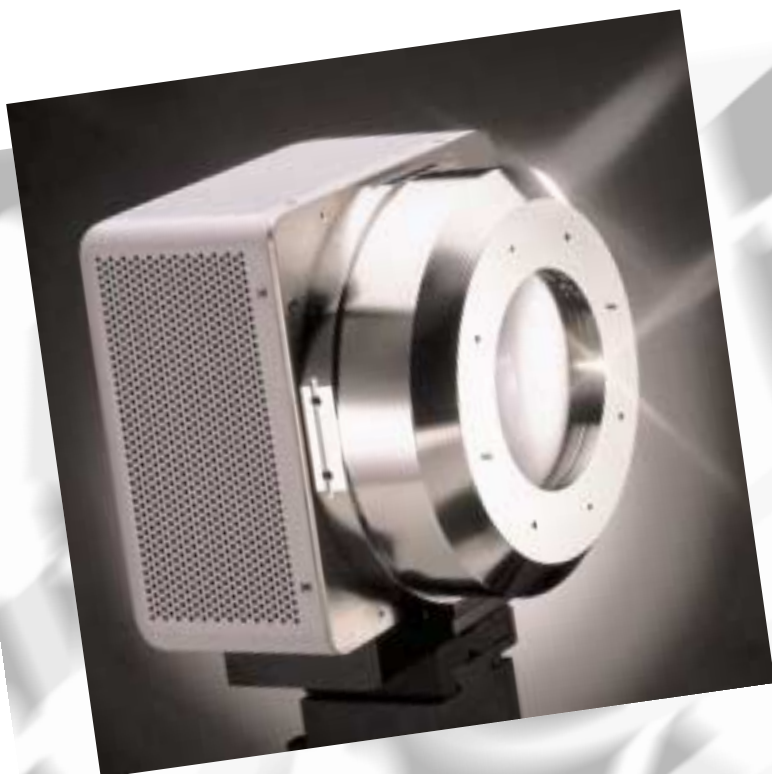


# HI-STAR AREA DETECTOR



The BRUKER AXS HI-STAR™ is one of the best instruments available for direct electronic imaging of an X-ray pattern. HI-STAR is the only multiwire proportional chamber that offers the widest solid angle and highest count-rate in a compact design. With HI-STAR's innovative design, the X-ray pattern is rapidly processed by high-speed electronics and presented to you as a multicolored display for your analysis.

## Advanced Design

Multiwire detectors have always produced the best possible data on weakly diffracting samples, due to their unique ability of counting single X-ray photons. Our advanced design eliminates all background noise which gives you reduced data collection time and greater sensitivity. Direct memory access and rapid data storage allows for full flexibility in your data collection strategy. Data can be collected as 1K x 1K pixel frames, as well as the conventional 512 x 512 pixel frames, depending upon the application.

# HI-STAR

- a perfect tool for your application

HI-STAR is used in a wide variety of X-ray diffraction applications which include:

- Protein and virus crystallography
- Powder diffraction (Debye geometry)
- Small Angle X-ray Scattering (SAXS)
- X-ray Microdiffraction

HI-STAR can be mounted on various Bruker AXS goniometer systems – such as the D8 systems – to facilitate a specific application.

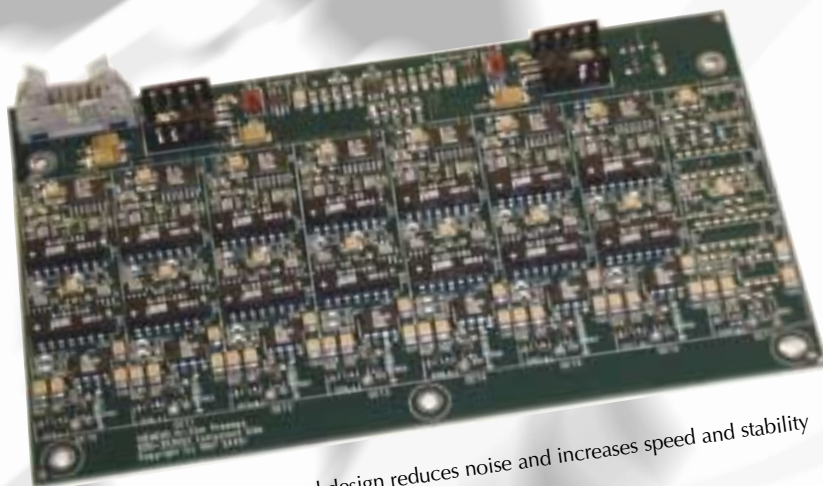
## 2D Proportional Chamber

HI-STAR consists of an X-ray proportional chamber with a precision, two-dimensional multiwire grid, an integral pre-amplifier, high-resolution, high-speed decoding electronics, and a frame buffer computer for data collection, storage and detector control. At the heart of HI-STAR is its proportional chamber. The use of a proprietary beryllium window design minimizes X-ray absorption and parallax effects.

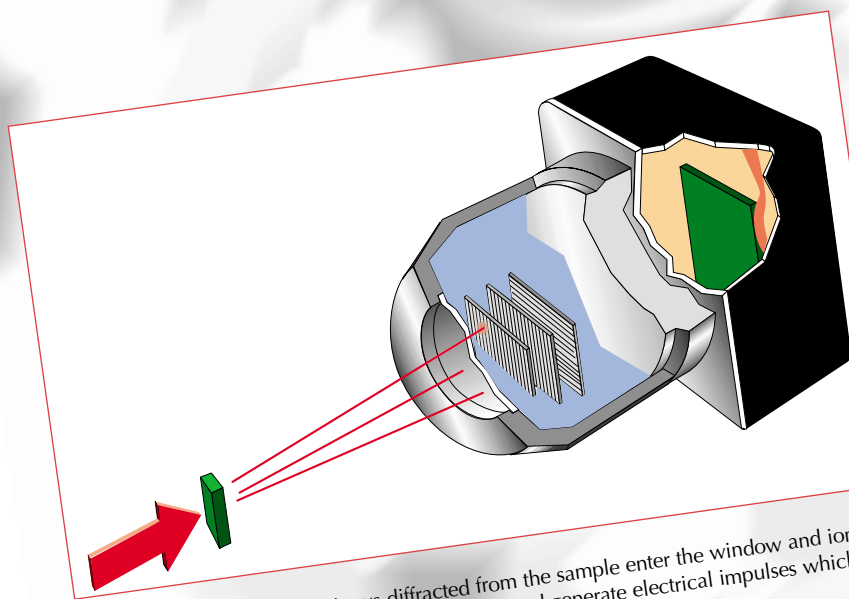
A high-pressure xenon gas mixture ensures the complete capture of all incoming X-ray photons. Each photon is converted to a charge pulse, and collected on the grid.

## Preamplifier and Control Module

Bruker AXS has engineered HI-STAR with the latest technological advances. The processing electronics of the system uses surface mounted device (SMD) circuit technology. This provides an improvement in the signal-to-noise ratio, and prolongs the stability of the calibration. The benefit is higher count rates. An added feature is the capability to vary the high voltage bias setting from the frame buffer computer which is a great convenience during calibration.



Innovative surface mount board design reduces noise and increases speed and stability in the pre-amplifier circuits.



Cutaway view of HI-STAR. X-rays diffracted from the sample enter the window and ionize the gas mixture. Electronic grids detect the ions and generate electrical impulses which are decoded into position and intensity data.



High-pressure chambers and detector grids (foreground) in clean room, ready for assembly.

### **Position Decoding Circuit Controller**

The Position Decoding Circuit (PDC) module uses ultra-fast linear conversion circuitry to calculate the X-Y position and the energy of each X-ray photon. This unique design interpolates between wire spacings for excellent resolution. The PDC for HI-STAR uses ultra-fast 14-bit analog-to-digital converters (ADC) providing high resolution and reliable performance. The analog divider gives full control over the entire linear range to improve the linearity response providing more accurate results. HI-STAR is different from other integrating photon detection devices because it can discriminate the energy of the X-ray photon, ensuring that  $\lambda/2$  events are not counted. This also improves the accuracy of the intensity measurement.

The PDC passes the validated X-Y position to the frame buffer computer. The results are continuously updated on the multicolor display. The entire image, now called a frame, can then be stored on the frame buffer or transferred directly to another host computer for display and processing.

The result of this entire process is the capture and display in real-time of the X-ray scattering from the sample. These results can be used with Bruker AXS robust family of application software packages.

### **Comprehensive Service and Support**

Bruker AXS backs its instrumentation throughout their life by one of the best support organizations in the world. HI-STAR can be integrated with Bruker AXS systems which are tested as complete units in our factory. On-site service by experienced X-ray service personnel, factory support, an extensive spare parts stock, and factory courses in maintaining and troubleshooting area detectors all contribute to a smoothly running system. With unparalleled support and superior products, Bruker AXS is the logical choice for your next investment in X-ray instrumentation.

## Technical Data

### HI-STAR Area Detector

Detector Dimensions	23 cm x 23 cm x 21.3 cm
Detector Mount	Standard dovetail
Weight (Detector only)	10 kg
Imaging Area	11.5 cm diameter (4.33 in)
Quantum Efficiency	>80 % at 8 keV
Dynamic Range	0 - 10 <sup>6</sup>
Energy Range	3 - 15 keV
Pre-amplification	Integral with detector
Construction	Multiwire sealed proportional chamber
Entrance Window	Round, proprietary concave Be window
Internal Geometry	Focusing
Gas Fill	Proprietary Xe balanced mixture
Gas Pressure	~ 4 bar
Data Collection	Direct into frame buffer computer memory
Data Frame Size	512 x 512 or 1024 x 1024 pixels, user selectable
Real-Time Display	In color on frame buffer computer's color monitor
Frame Buffer Computer	<ul style="list-style-type: none"> <li>High speed computer with:           <ul style="list-style-type: none"> <li>■ Parallel area detector interface</li> <li>■ High resolution color monitor</li> </ul> </li> <li>■ Requires the appropriate Frame Buffer Software</li> </ul>
Optional Frame Buffer Software Includes	<ul style="list-style-type: none"> <li>■ Graphic user interface with pop-up menus and panels for user input</li> <li>■ Operation via command line mode for command and command files</li> <li>■ Real-time color display of X-ray image (frame) on frame buffer</li> <li>■ Rotation frames with real-time option</li> <li>■ Scan frames over specified range, angle, and time</li> </ul>
Add-on Items	<ul style="list-style-type: none"> <li>■ Helium beam path with beam stop</li> <li>■ Ethernet interface for connecting to remote host computer (IEEE 802.3)</li> </ul>
Hardware Compatibility	HI-STAR can be interfaced with a variety of goniometers and cameras including the Bruker AXS D8 goniometer
Software Compatibility	<ul style="list-style-type: none"> <li>■ GADDS: for general X-ray diffraction applications in material science including powder, polymer, and metals.</li> <li>■ SAXS: for small angle X-ray scattering data collection and analysis.</li> <li>■ MICRODIF: for X-ray diffraction micro-analysis.</li> <li>■ FRAMBO and SAINT: for collecting frames of data on single crystal samples, indexing reflections and determination of lattice parameters; symmetry determination; 3D integrated intensity determination</li> </ul>

**Note:** To complete your installation, HI-STAR may require a goniometer, X-ray generator, radiation enclosure, and a host computer, which may be obtained from Bruker AXS. If the entire system is provided from Bruker AXS, it will be integrated and tested at our factory before installation on-site.

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