



PHOTRON-X, X-Ray and Neutron Detection, Röntgenstr. 30, 85521 Ottobrunn, Germany

## Short Product Information: APD-Detector



The MioStar II, APD (Avalanche Photo-Diode) detector is a new, low-cost, state-of-the-art replacement for all x-ray instruments equipped with a scintillator-photomultiplier (PMT) combination. Extremely high count rates up to 50 MHz and still reasonable energy resolution make this detector a favorite candidate, where both are needed. The MioStar II APD is available with a 5x5 mm<sup>2</sup> or 10x10 mm<sup>2</sup> silicon photo-diode. An integrated high voltage control ensures high stability during long-term operation. A high gain, broadband, ultra low noise pre-amplifier provides a signal output to the analog pulse shaping amplifier and associated read-out electronics.

### APPLICATIONS

- X-ray diffraction
- Nuclear resonant scattering
- Time-resolved X-ray transmission spectroscopy
- Material structure analysis
- Biology, medicine, pharmacy
- Metallurgy
- Polymer science
- Scientific research
- Tunnel construction
- Quality control
- Brand protection
- Coating analysis
- Soil analysis; porous materials
- Archeology
- Car industry

### Data Acquisition



### Features

- Silicon APD
- Small, compact design
- Energy Monitor (max. 100 kcts/s)
- Very high count rates (50MHz)
- Stable gain due to HV-control
- Two active area sizes
- Insensitive to magnetic fields
- Portable version possible

### Benefit

- Low cost, no maintenance, reliable
- Close detector-source coupling
- No liquid nitrogen, stable operation
- Minimal peak shift
- Low calibration maintenance
- Excellent scintillator replacement
- Industrial applications
- Field use

### Standard Package Includes:

#### 1. Detector Head

- 5x5 or 10x10 mm<sup>2</sup> Avalanche Photo Diode (APD)
- beryllium entrance window
- high gain, broadband preamplifier
- 3m detector cable

#### 2. Data Acquisition

- Pulse shaping and signal conditioner incl. ultra-fast CFD
- Real USB 2.0 stand-alone device for PC-free operation
- Programmable in- and output trigger capabilities
- External rate meter
- Complete detector supply

#### 3. Software

4. Live data display
5. Full operation control under software
6. Scan-Information is projected into up to 65k channels
7. Discriminated Energy-information (Monitor) in parallel to Scan-information



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## Detector Specifications

Diode Active Area: 25 or 100 mm<sup>2</sup>  
Diode Thickness: ~110µm  
Diode Structure: reach-through  
High Voltage: 300V to 400V  
Gain: ~200 at 370V  
Detector Window: 100µm Beryllium  
Efficiency: ~95% at 6 keV ~45% at 12 keV  
Energy Resolution: ~ 25%  
Noise: < 1 pulse/sec.  
Size: 25mm x 25mm x 100mm

## Read-Out Specifications

AMP + CFD + BLR + ADC + CPU + HVC<sup>1</sup>  
HV APD bias: 0 to 500VDC  
Maximum count rate up to 100MHz  
Input Trigger Signal: TTL input programmable  
Output Trigger Signal: TTL output programmable  
Output for external rate-meter  
Direct Clock output: TTL  
Relays output: activated on DAQ Start/Stop  
Scan-Mode: Master and Slave mode  
Bin-time in scan-mode: 10ms to 10sec.  
Max. no of bins:  $2^{16}-1=65535$   
Available in two sizes:

- 19-inch module: 484mm x 95mm x 315mm
- small stand-alone box:

## Comparism between scintillators and APD

	Nal(Ti)	YAP: Ce	APD
active detector area	5cm <sup>2</sup>	5cm <sup>2</sup>	1cm <sup>2</sup>
energy range	> 5keV	5 to 60keV	3 to 30keV
energy resolution	28,00%	56%%	20-30%
dead time	1µs	0.11µs	0.006µs
count rate (1% linearity)	10kHz	100kHz	2MHz
count rate (5% linearity)	50kHz	450kHz	9MHz

<sup>1</sup> AMP=amplifier, CFD=constant fraction discriminator, BLR=base-line restoration, ADC=analog-to-digital converter for energy-monitor, CPU=control processing unit with 512kB RAM, HVC=high-voltage control