

# SiS1-m4720bi



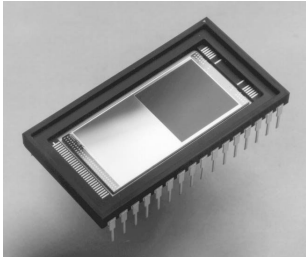
## HIGH RESOLUTION SUPER SENSITIVE 14-BIT DYNAMIC SCIENTIFIC IMAGING SYSTEM



The Scientific Imaging System SIS1-m4720bi is a high resolution 14-bit camera system designed for all kinds of industrial and scientific applications. The square 1" frame transfer CCD image sensor E2V CCD47-20 backthinned with 13.3mm x 13.3mm active image area and square pixel with a size of 13 $\mu$ m x 13 $\mu$ m fits optimally for quantitative intensity measurements. The low dark current with Advanced Inverted Mode Operation technology ("AIMO") allows long integration times. The flexible timing modes of the camera incorporate the framing modes for very fast kinetic studies, with frame rates up to some kHz, integrated with full dynamic.

Features	
<b>Highest Sensitivity</b> ▶	Low readout noise with highest SNR of 8e <sup>-</sup> /pixel/s because of the special "correlated double sampling" signal processing technique and a pixel size of 13 $\mu$ m x 13 $\mu$ m.
<b>Back illuminated Sensor</b> ▶	Highest quantum efficiency up to 92%. UV-Coating for a QE of 40% at 200nm and >70% at 250nm.
<b>14-bit Digitalization</b> ▶	Intensity resolution of 16,384 grayscales, 64 times better than 8-bit systems, important for photometric measurements and structures with low contrast. Averaging of statistical noise with image accumulation offers 15-bit dynamic. 18-bit digitalization with 16-bit data transfer for 19-bit dynamic is optional.
<b>Low Dark Current</b> ▶	The AIMO technology (Advanced Inverted Mode Operation) of the sensor reduces the dark current for $\mu$ -Lux imaging.
<b>Photometric Linearity</b> ▶	Proportionality of measured counts to incoming light intensity better than 0.4%, optimizable to linearities < 0.1% with correction tables.
<b>High Resolution</b> ▶	1 megapixel frame transfer CCD image sensor E2V CCD47-20bi with 13.3mm x 13.3mm active image area and square pixel with a size of 13 $\mu$ m x 13 $\mu$ m, 2 interlaced megapixel.
<b>External Timing</b> ▶	Asynchronous electronic integration time control by external gate input. Integration times from 10ms up to > 100s, optionally expandable.
<b>Super Pixel Binning</b> ▶	Selectable binning of charges of adjacent pixels onto the CCD Chip with single readout increases linearly the signal to noise ratio by reduced spatial resolution.
<b>High Full Well Capacity</b> ▶	Photon statistics S/N= $\sqrt{S}$ determines the signal to noise ratio SNR up from average intensities. High dynamic demands high electron capacity.
<b>100% Fill Factor</b> ▶	High precision measurements require full sensitivity of the whole image area, because otherwise small image structures result in moiré-effects.
<b>WinSIS-Software</b> ▶	WinSIS6 for WinXP/2000/NT/9x controls all camera functions and integration timing. The concept of intuitive easy-to-use operation for all imaging and processing functions with integrated job creation and macro definition offers a fast realization of complex applications without long training periods. SDK for personal programming.

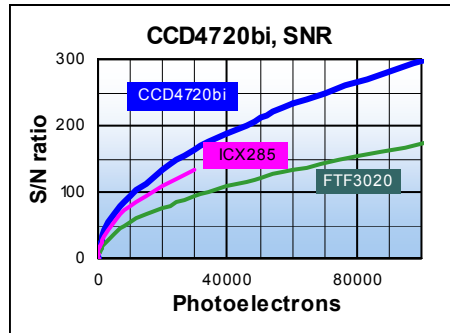
# SiS1-m4720bi



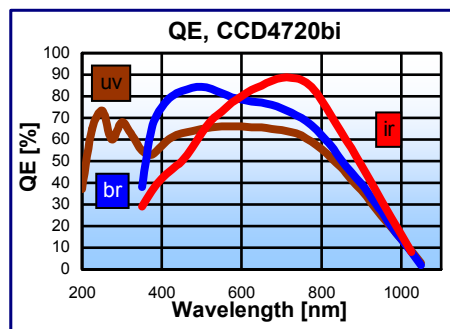
CCD Image Sensor  
E2V CCD47-20bi

## Specifications

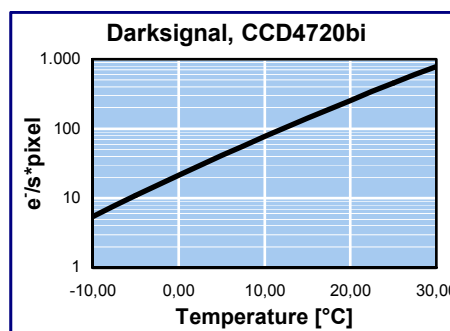
CCD Image Sensor	E2V CCD47-20bi
Sensor Type	Frametransfer
Sensor Format	1 : 1
Image Size	13.3mm x 13.3mm, 18.82mm diagonal
Pixel Size	13µm x 13µm
Pixel Count	1024 (H) x 1024 (V)
Electron Capacity	100,000e <sup>-</sup> Binning >200,000e <sup>-</sup>
Readout Noise, rms	8e <sup>-</sup>
Dynamic	12,500 : 1
Dark Current @ 15°C	140e <sup>-</sup> / pixel / s
Quantum Efficiency	> 85%
Anti-Blooming	-
Binning	horizontal, vertical
Digitalization	14-bit, 16,384 : 1 16(18)-bit, 65,536 : 1
Readout Frequency	3(5) MHz (14-bit) 1 MHz (16/(18)-bit)
Integration Time	10ms to >100s
Frame Rates	2.7(4.5) Hz; 0.9 Hz
Optical Mount	Zeiss and special
Mech. Dim. ( BxHxL )	100x80x165mm
Weight	800g
Operational Temperature	0 ... +40°C



At average light intensities the Signal to Noise Ratio SNR is mainly determined by the quantum efficiency (CCD4720bi: > 90%) of the CCD image sensor. The chart shows the graphs of the interline transfer sensor ICX 285 (purple, QE > 60%) and of the fullframe sensor FTF3020 (green, QE > 30%), for comparison.



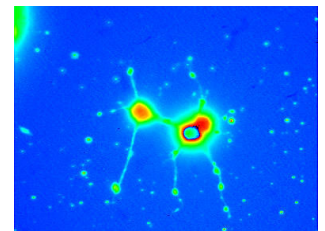
The quantum efficiency QE is defined as the percentage of the incoming photons, which generate an electronic charge.



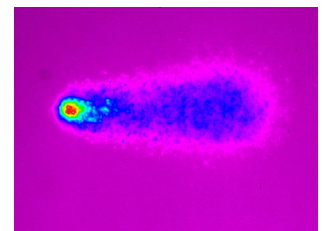
The temperature depending dark current of a CCD image sensor results from the thermal generation of electrons. The increase of the temperature of 6°C to 9°C doubles the dark current.

## Applications

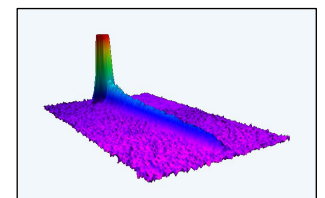
- ▶ LowLightLevel Imaging
- ▶ Fluorescence
- ▶ Luminescence
- ▶ Chemiluminescence
- ▶ Comet Assay
- ▶ FISH
- ▶ Spectroscopy
- ▶ Electrophoresis
- ▶ Gel-applications
- ▶ Astronomy
- ▶ Combustion processes
- ▶ Quality control
- ▶ Process control
- ▶ BEC



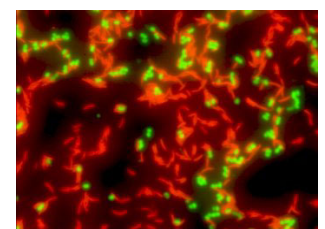
FURA, calciumfluorescence  
of a cancer cell



DAPI, Comet Assay



Absorption,  
atom laser beam



FISH Megapec

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