

# sensicam qe cooled digital 12bit CCD camera system

- super quantum efficiency up to 65%
- extremely low noise, down to  $4e^-$  rms
- 12bit dynamic range
- thermo-electrical cooling (Peltier) down to  $-12^{\circ}\text{C}$
- high resolution (1376 x 1040pixel)
- shutter / exposure times from 500ns - 1000s
- binning (horizontal & vertical)
- region of interest (ROI)
- 10 frames per second at full CCD resolution
- remote control up to 1500m distance (with fiber optic link)
- free software camware included



# sensicam qe

This high performance cooled digital 12bit CCD camera system comprises advanced CCD and electronics technology. The system features thermo-electrical cooling of the image sensor (down to  $-12^{\circ}\text{C}$ ), extremely low noise (down to  $4\text{e- rms}$ ) and an outstanding quantum efficiency, which achieves a high spectral sensitivity in general and especially in the NIR. Exposure time modes (software selectable) range from 500ns (fast shutter) to 1000s (long exposure). A high speed serial data link connects the system to the PC (fiber optic link available).

## technical data

	unit	setpoint	sensicam qe
resolution (hor x ver) [1]	pixel		1376 x 1040
pixel size (hor x ver)	$\mu\text{m}^2$		6.45 x 6.45
sensor format / diagonal	inch / mm		2/3" / 11.14
peak quantum efficiency	%	@ 500nm typical	62
full well capacity	e-		18 000
image sensor			ICX285AL
dynamic range	dB	@ gain low, CCD + camera	70.1
dynamic range A/D [2]	bit		12
readout noise	e- rms	@ gain high @ gain low	4..5 5..6
imaging frequency, frame rate	fps	@ full frame @ binning 2x2	10.0 19.8
pixel scan rate	MHz		16
A/D conversion factor	e- / count	@ gain high @ gain low	2 4
spectral range	nm		290..1100
exposure time	s		500ns..1000s
anti-blooming factor		@ standard light mode / @ low light mode @ 100ms exposure time	> 400 / > 4
smear	%		<0.002
binning horizontal	pixel		1,2,4,8
binning vertical	pixel		1,2,4,8,16,32
region of interest	pixel		down to 32x32
extinction ratio		@ 1ms exposure time	1 : 2000
non linearity	%	full temperature range	< 1
uniformity darkness DSNU[1]	count	@ 90% center zone	1

## technical data

uniformity brightness PRNU[2]	%		0.6
trigger, auxiliary signals		internal / external	software / TTL level
power consumption	W		36
power supply	VAC		90..260
mechanical dimensions camera (w x h x l)	mm <sup>3</sup>		93 x 78 x 210
mechanical dimensions power supply (w x h x l)	mm <sup>3</sup>		84 x 50 x 155
weight	kg	camera	1.6
operating temperature range	°C		+5..+40
operating humidity range	%	non condensing	10..90
storage temperature range	°C		-20..+70
optical input			c-mount with adjustable back focal length
optical input window			fused silica
data interface			PCI local bus, Rev. 2.1, burst rate 132 MByte/s
CE certified			yes
cooled CCD temperature	°C		-12
cooling method			2 stage Peltier cooler with forced air cooling
modes		light mode / gain mode	standard - low light / standard - high

[1] horizontal versus vertical

[2] Analog-to-Digital-converter

[3] dark signal non-uniformity

[4] photo response non-uniformity

#### data transfer to PC

standard: twin coaxial cable (5m)  
optional: fiber optic link (10m - 1500m)

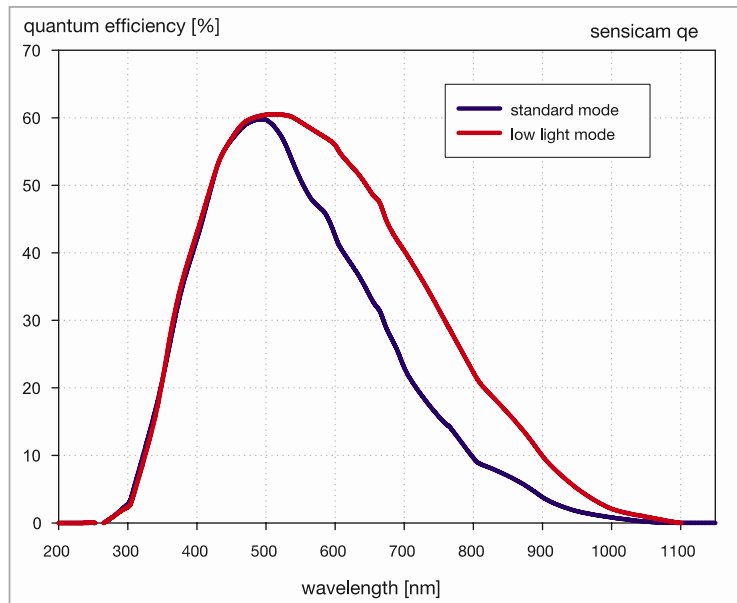
#### software

camware software for camera control, display, storage and printing of image data under Windows9x, ME, XP, WindowsNT, Windows2000; software development kit (SDK) with demo software for the above mentioned operating systems; TWAIN drivers; drivers or plug-ins for popular third party image processing products

#### options

hardened against high magnetic fields  
water cooling  
external fan cooling  
custom-made versions

## quantum efficiency



(measured by pco).

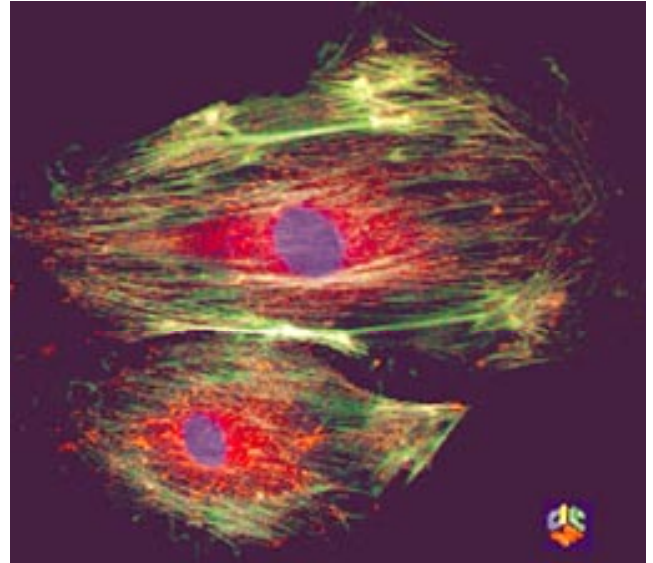
## areas of application

- laser induced fluorescence
- fluorescence microscopy
- electron microscopy
- Red and NIR fluorescence applications
- bioluminescence / chemoluminescence
- spectroscopy
- gel imaging
- ion imaging
- low light level imaging
- semiconductor quality control
- imaging of bio markers (e.g. green fluorescent protein, GFP)

# examples of applications

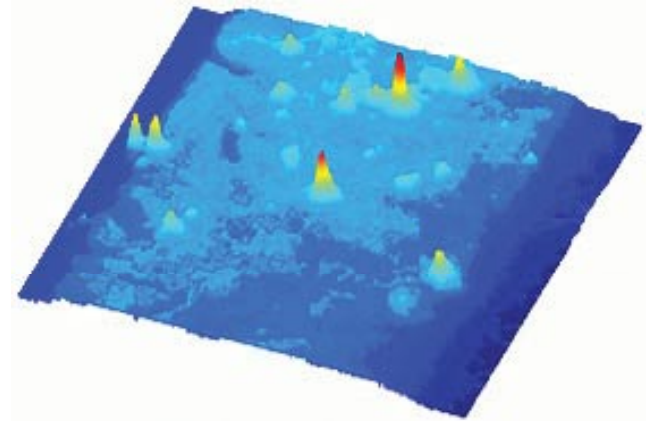
Fluorescence in-situ hybridization (FISH) of an endothel cell.

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An area of  $50\mu\text{m} \times 50\mu\text{m}$  is visible, the bright peaks correspond to single Terrylene molecules - single-molecule spectroscopy at low temperatures.

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sensicam qe 08/2003  
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