sensicam em
electron multiplication digital 12bit CCD camera system

- electron multiplication gain of up to 1000
- superior resolution (1004 × 1002 pixel) for EMCCD
- extremely low noise < $1e^-$
- excellent quantum efficiency of up to 65 %
- 12 bit dynamic range
- shutter / exposure times from 75 µs to 1 h
- thermo-electrical cooling of -45°C vs. ambient
- free software camware and software development kit included

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sensicam em

The new generation of electron multiplication CCD (emCCD) sensors is integrated into a sensicam camera system. With this on-chip multiplication of the light signal the readout noise of the camera can be neglected (< 1 e^- rms @ gain > 50). With its excellent resolution of 1004 × 1002 pixel this high performance cooled digital 12 bit CCD camera system is best suited for extreme low light camera applications. The system features thermo-electrical cooling of the image sensor (down to -45 °C vs. ambient) and an outstanding quantum efficiency (up to 65 %), which achieves a high spectral sensitivity in general and especially in the NIR. Exposure time modes (software selectable) range from 75 µs - 1 h. A high speed serial data link connects the system to the PC (fiber optic link available). This low light camera system is very well suited for scientific imaging (e.g. microscopy, bio marker and label imaging) and for night vision.

technical data

	unit	setpoint	sensicam em
resolution (hor × ver) [1]	pixel		1004 × 1002
pixel size (hor × ver)	µm²		8.0 × 8.0
sensor format / diagonal	mm² / mm		8.03 × 8.02 / 11.35
peak quantum efficiency	%	@ 670 nm typical	65
full well capacity	e^-		70 000
image sensor			TC285SPD
dynamic range	dB	@ CCD + camera	72
dynamic range A/D [2]	bit		12
readout noise	e^- rms	@ em gain = 2 @ em gain > 50	10 < 1
imaging frequency, frame rate	fps	@ full frame	13
pixel scan rate	MHz		16
A/D conversion factor	e^- / count	@ em gain = 2	6
spectral range	nm		290..1100
exposure time	s		75 µs..1 h
anti-blooming factor		typical	1000
smear	%		0.6
binning horizontal	pixel		1, 2, 4, 8
binning vertical	pixel	full resolution for 992 pixel ver	1, 2, 4, 8, 16, 32
dark current	e^- / pixel·s	@ –15° C typical	0.9
region of interest	pixel	for 992 pixel ver	down to 32
charge multiplication		9 steps	2, 5, 10.. 1000

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technical data

non linearity	%	full temperature range @ gain = 2	< 2
uniformity darkness DSNU [3]	e^- rms	@ 90% center zone & gain = 2	2
uniformity brightness PRNU [4]	% rms	typical	0.6
trigger, auxiliary signals		internal / external	software / TTL level
power consumption	W	typical	36
power supply	VAC		90..260
mechanical dimensions camera (w × h × l)	mm³		93 × 78 × 210
mechanical dimensions power supply (w × h × l)	mm³		84 × 50 × 155
weight	kg		1.6
operating temperature range	°C		+5..+40
operating humidity range	%		10..90
storage temperature range	°C		-20..+70
optical input			c-mount, Nikon f-mount
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	versus ambient temperature	Δ -45 [5]
cooling method			2 stage Peltier cooler with forced air cooling

[1] horizontal versus vertical
[2] Analog-to-Digital-converter
[3] dark signal non-uniformity
[4] photo response non-uniformity
[5] factory preset at -12°C for control margin

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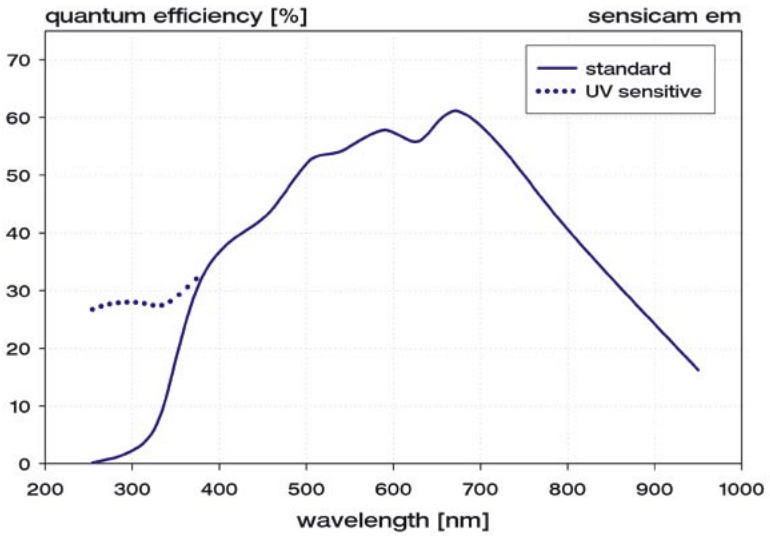
software	Camware software for camera control, image acquisition and archiving of images in various file formats, WindowsNT, 2K and XP, 32 bit-dynamic link library (DLL) is available for user customisation and integration on PC platforms (software development kit - SDK), software is operational in either single mode or with builtin recorder functions, drivers for popular third party software packages are available (see website)
options	CCD image sensor in UV sensitive version custom-made versions

frame rate table [frames per second]

vertical resolution [pixel]	vertical binning	frame rate [fps]
1002	1	12.9
501	2	25.2
248	4	47.9
124	8	86.6
62	16	86.6
31	32	108.4

quantum efficiency



(TC285SPD qe curves as measured by PCO AG)

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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) ■ scientific imaging ■ confocal microscopy ■ night vision ■ surveillance and security

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sensicam em product sheet 05/2005
subject to changes without prior notice

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