sensicam qe double shutter
cooled digital 12bit CCD camera system

- super quantum efficiency up to 65%
- extremely low noise, down to 4e⁻ rms
- 12bit dynamic range
- very short interframing time of 500ns for particle image velocimetry
- thermo-electrical cooling (Peltier) down to -12°C
- high resolution (1376 x 1040pixel)
- shutter / exposure times from 500ns - 3600s
- 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 and software development kit included

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sensicam qe double shutter

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°C), extremely low noise (4e⁻ 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 3600s (long exposure). In double shutter mode two images with the very short interframing time of 500ns can be recorded. A high speed serial data link connects the system to the PC (fiber optic link available). This PIV camera system is perfectly suited for many sensitive and low noise imaging applications, like flow visualization, spray imaging & combustion imaging.

technical data

	unit	setpoint	sensicam qe double shutter
resolution (hor x ver) [1]	pixel		1376 x 1040
pixel size (hor x ver)	µm²		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..3600s
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
dark current	e⁻ /pixel·s	@ -12 °C & standard light mode	0.1
region of interest	pixel		down to 32x32

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technical data

extinction ratio		@ 1ms exposure time	1 : 2000
non linearity	%	full temperature range	< 1
uniformity darkness DSNU [3]	count	@ 90% center zone	1
uniformity brightness PRNU [4]	%		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)	mm³		93 x 78 x 210
mechanical dimensions power supply (w x h x l)	mm³		84 x 50 x 155
weight	kg	camera	1.6
operating temperature range	°C	non condensing	+5..+40
operating humidity range	%		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
interframing time	ns		500

[1] horizontal versus vertical
[2] Analog-to-Digital-converter
[3] dark signal non-uniformity
[4] photo response non-uniformity

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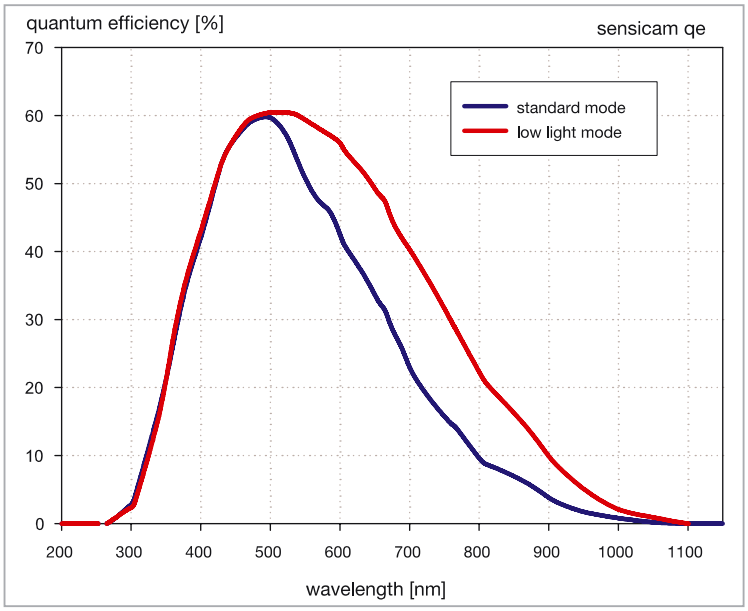
data transfer to PC	standard: twin coaxial cable (5m) optional: fiber optic link (10m - 1500m)
software	camware software for camera control, display, storage and printing of image data under Windows9x, ME, XP, WindowsNT, Windows2000; software development kit (SDK) with demo software for the above mentioned 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

- particle image velocimetry (PIV)
- spray analysis
- wind tunnels
- hydrodynamics
- fuel injection
- ballistics
- combustion analysis

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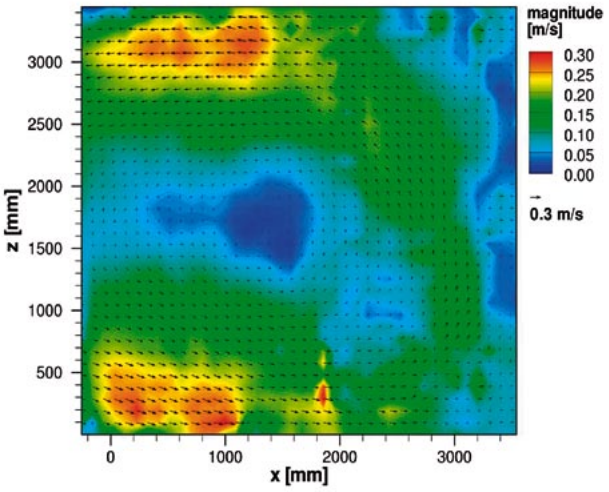
examples of applications

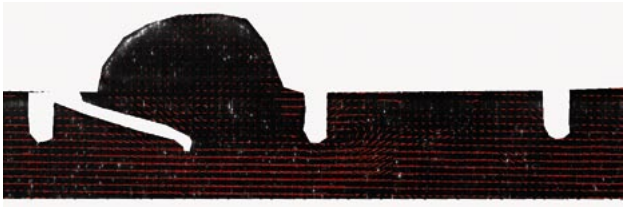
Time-average of a large-scale flow field inside a convection cell for turbulent convection in air (“barrel of Ilmenau”).

...with friendly permission of: Institute for Aerodynamics and Flow Technology, DLR, Goettingen, Germany and Department of Mechanical Engineering, Ilmenau University of Technology, Germany



Velocity distribution vectors on top of an original PIV image with fluorescent seed particles inside an artificial heart valve experiment.

...with friendly permission of: ILA Intelligent Laser Applications GmbH, Germany, www.ila.de



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