

pixelfly double shutter high performance digital 12bit CCD camera system

- ultra compact design
- 12bit dynamic range
- high resolution (1360 x 1024pixel, HiRes)
- short interframing time of 5 μ s for particle image velocimetry (PIV)
- temperature compensated
- exposure times from 5 μ s - 65s
- readout noise typ. 7e⁻ rms
- serial high speed data transfer up to 10m
- standard PCI or compact PCI control board
- integrated front-end processor with opto-coupler input and highside driver
- free software camware and software development kit included



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pixelfly double shutter

This high performance digital 12bit CCD camera system features state of the art in CCD and electronics technology. The system consists of an ultra compact camera head, which either connects to a standard PCI or a compact PCI board via a high speed serial data link. The available exposure times range from 5µs to 65s. Two images with the short interframing time of 5µs can be recorded. A digital temperature compensation is integrated instead of a space consuming thermo-electrical cooling unit. All camera functions are remotely controlled via digital interface. This piv camera system is perfectly suited for many flow imaging applications, like flow visualization, spray imaging and combustion imaging.

technical data

	unit	setpoint	pixelfly double shutter VGA	pixelfly double shutter HiRes
resolution (hor x ver) ¹	pixel		640 x 480	1360 x 1024
pixel size (hor x ver)	µm ²		9.9 x 9.9	4.65 x 4.65
sensor format / diagonal	inch / mm		1/2" / 7.9	1/2" / 7.86
peak quantum efficiency	%	@ 500nm typical	40	43
full well capacity	e ⁻		30 000	13 000
image sensor			ICX414AL	ICX205AL
dynamic range	dB	CCD + camera	68.7	66.7
dynamic range A/D ²	bit		12	12
readout noise	e ⁻ rms	range / typical	11..14 / 12	6..9 / 7
imaging frequency, frame rate	fps	@full frame / @binning 2x ver / @binning 4x ver	50 / 95 / 177	9.5 / 18 / -
pixel scan rate	MHz		20	16
A/D conversion factor	e ⁻ / count		6.5	3.0
spectral range	nm		290..1100	290..1100
exposure time	s		5µs..65s	5µs..65s
anti-blooming factor		@ 100ms exposure time	> 1000	> 1000
smear	%		0.005	0.005

technical data

binning horizontal	pixel		1, 2	1, 2
binning vertical	pixel		1, 2, 4	1, 2
region of interest			no	no
extinction ratio		@ 1ms exposure time	1:2000	1:2000
non linearity (differential)	%	full temperature range	< 2	< 2
uniformity darkness DSNU ³	count	@ 90% center zone	1	1
uniformity brightness PRNU ⁴	%	typical	1.0	1.0
trigger, auxiliary signals		internal / external	software / TTL level, 24V	software / TTL level, 24V
power consumption	W		12	12
power supply	VAC		via PCI board	via PCI board
mechanical dimensions camera (w x h x l)	mm ³		39 x 39 x 68	39 x 39 x 68
weight	kg	camera	0.25	0.25
ambient temperature range	°C		+10..+40	+10..+40
operating humidity range	%	non condensing	10..90	10..90
storage temperature range	°C		-20..+70	-20..+70
optical input			c-mount	c-mount
optical input window			fused silica	fused silica
data interface			PCI, compact PCI	PCI, compact PCI
CE certified			yes	yes
CCD temperature control			digital compensation	digital compensation
interframing time	µs		3	3

[1] horizontal versus vertical

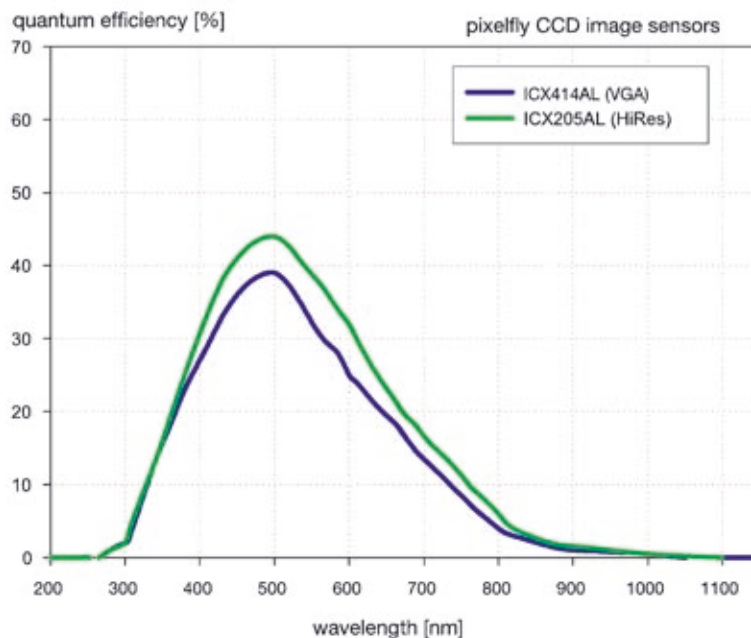
[2] Analog-to-Digital-converter

[3] dark signal non-uniformity

[4] photo response non-uniformity

CCD sensors	all image sensors are available as black & white or color version	
data transfer to PC	high speed serial LVDS shielded ethernet patch cable RJ45 connector	
frontend processor	type	Atmel AT90S8515
	speed	8Mips
	download	via PCI bus
	interface	6 optocoupler input 5V, 12V or 24V TTL I/O
connector	high density DSUB 26Pin	
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 and Linux; TWAIN driver; drivers or plug-ins for popular third party image processing products	
options	hardened against high magnetic fields custom-made versions power supply for compact PCI, 24VDC input integrated photometer for exposure control 4 highside driver 12V / 24V	

quantum efficiency



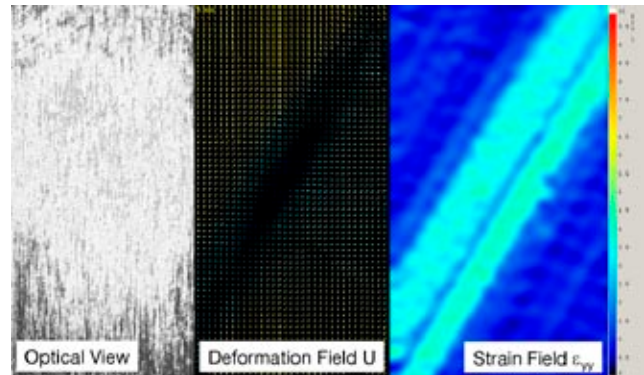
(measured by pco).

areas of application

- particle image velocimetry (PIV)
- spray imaging
- wind tunnels
- combustion imaging
- hydrodynamics
- fuel injection
- machine vision and industrial applications
- material testing
- flow visualization

examples of applications

The image sequence shows a non-destructive strain measurement. From left to right: the first part shows an image of the sample, the second part shows the calculated deformation vector field, and the third part is a visualization of the deformation field, which is the result of the assembled vector fields.



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