

## ILA.PIV.sCMOS Camera



The ILA.PIV.sCMOS camera comes with the scientific CMOS (sCMOS) imager, which enables image acquisition with high resolution, highest dynamical range available, high quantum efficiency and extremely low noise. With this camera, larger regions of interest are possible compared to the standard CCD cameras.

Furthermore, what makes this camera suitable for PIV measurements is the very short interframing time and the integrated remote focus control. The standard edition of this camera has the EOS controller ring build-in, compatible with the Canon EF lenses. Hence, the lens's aperture and focus can be adjusted remotely.

## Specifications

### General

power supply	12..24 VDC ( $\pm 10\%$ )
power consumption	20 W max (typ. 10 W @ 20 °C)
weight	700 g
operating temp.	+10 °C .. +40 °C
operating humidity	10% .. 80% (non-condensing)
storage temp range	-10 °C .. +60 °C
optical interface	Canon EF lens mount*
CE / FCC certified	yes

\* F-mount available upon request

### Frame rate table

typical resolutions	fast scan <sup>2</sup> rolling sh.	global sh.
2560 x 2160	100 fps	50 fps
1920 x 1080	200 fps	100 fps
1600 x 1200	180 fps	90 fps
1280 x 1024	210 fps	105 fps
640 x 480	450 fps	225 fps
320 x 240	900 fps	450 fps

<sup>1</sup> rs = rolling shutter / gs = global shutter

<sup>2</sup> fsc = fast scan mode. Visually lossless decompression for data transfer in fsc and horizontal resolution greater than 1920 pixel (due to Camera Link limitations).

<sup>3</sup> The readout noise values are given as root mean square (rms) and median (med) values, due to the different noise models, which can be used for evaluation.

<sup>4</sup> The dark current in global shutter mode consists of an exposure time related part and of a sensor readout time related part, which is constant for a given pixelclock 0.6 e<sup>-</sup> @ 286 MHz and frame size (here full frame). A smaller ROI reduces the latter part of the dark current accordingly.

<sup>5</sup> The high dynamic signal is simultaneously converted at high and low gain by two 11 bit A/D converters and the two 11 bit values are sophisticatedly merged into one 16 bit value.

### Image Sensor

type of sensor	scientific CMOS (sCMOS)
image sensor	CIS2051
resolution (h x v)	2560 x 2160 pixel
pixel size (h x v)	6.5 $\mu\text{m}$ x 6.5 $\mu\text{m}$
sensor size	16.6 mm x 14.0 mm
diagonal	21.8 mm
shutter modes	rolling and global (snapshot)
dynamic range	22 000 : 1 (86.9 dB)
quantum efficiency	57% @ peak
spectral range	370 nm .. 1100 nm
anti blooming factor	1:10 000
MTF	76.9 lp/mm (theoretical)
fullwell capacity	30 000 e <sup>-</sup>
readout noise	< 2.0 <sub>rms</sub> / 1.7 <sub>med</sub> e <sup>-</sup> @ (rs <sup>1</sup> , fsc <sup>2</sup> )
dark current <sup>4</sup> @ 5 °C	2 .. 6 e <sup>-</sup> /pixels/s (rs <sup>1</sup> ) 2 .. 6 e <sup>-</sup> /pixels/s + 0.6 e <sup>-</sup> /pixel (gs <sup>1</sup> )
DSNU	< 2 e <sup>-</sup> rms
PRNU	< 0.5%

### Camera

frame rate	100fps @ 2560 x 2610 pixel (rs <sup>1</sup> , fsc <sup>2</sup> ) 50fps @ 2560 x 2160 pixel (gs <sup>1</sup> , fsc <sup>2</sup> )
exposure / shutter time	500 $\mu\text{s}$ .. 2 s (rs <sup>1</sup> ) 10 $\mu\text{s}$ .. 100 ms (gs <sup>1</sup> )
interframing time	as low as 200 ns
dynamic range A/D	16 bit <sup>2,5</sup>
A/D conversion factor	0.46 e <sup>-</sup> /count
pixel scan rate	286 MHz (fsc <sup>2</sup> )
pixel data rate	190.7 Mpixel/s / 572 Mpixel/s
region of interest	selectable
non linearity	< 1% (range of 5. . 90% signal)
cooled image sensor temp	+5 °C (@ +10 °C .. +30 °C, controlled)
cooling method	Peltier with forced air (fan)
trigger input signals	frame or sequence trigger
trigger output signals	exposure, busy
data interface	dual Camera Link (full, 10 taps)
time stamp	in image (1 $\mu\text{m}$ resolution)

