

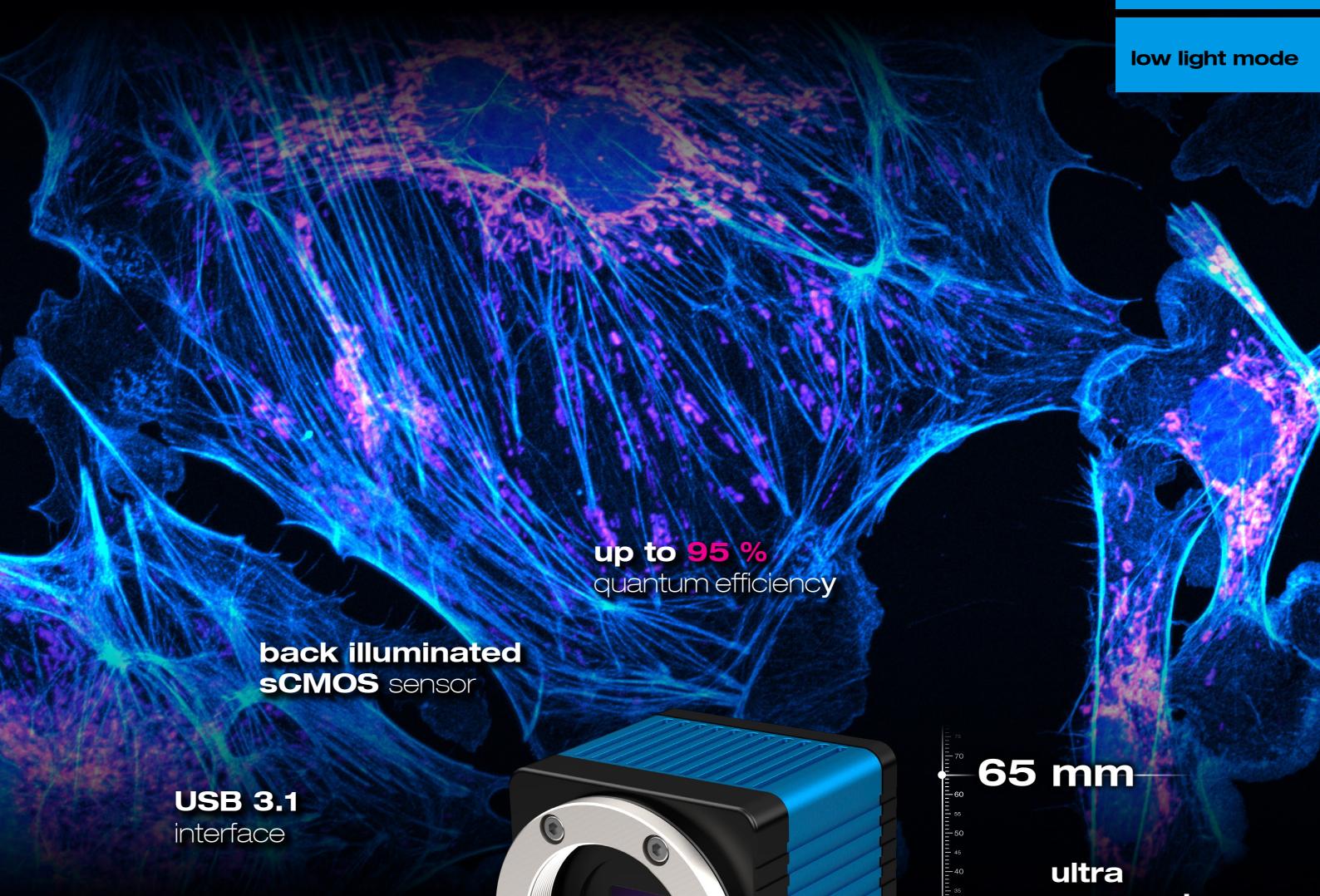
# pco.panda 4.2 bi

ultra compact **sCMOS** camera

**bi** back illuminated

lightsheet  
scanning mode

low light mode



up to 95 %  
quantum efficiency

back illuminated  
**sCMOS** sensor

**USB 3.1**  
interface

**resolution**  
2048 x 2048 pixels  
with 6.5 µm pixel size



65 mm  

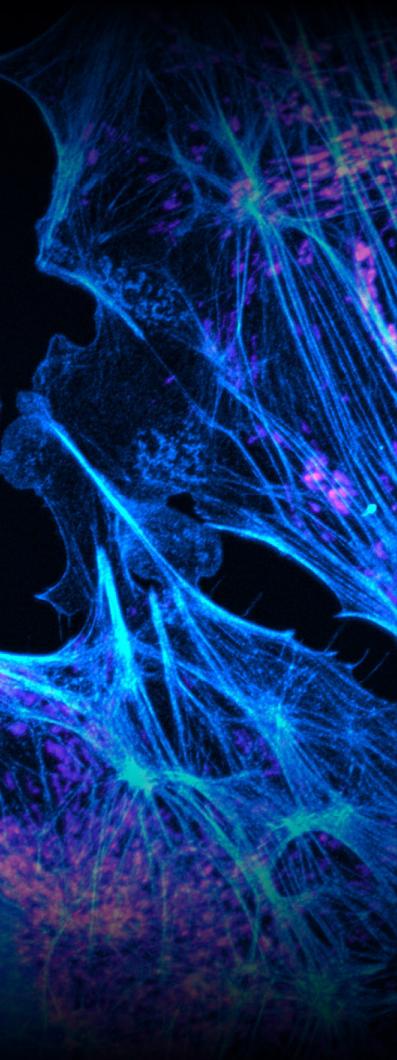

ultra  
compact  
design

**input windows**  
selectable

**single cable solution**  
data & power supply via USB 3.1

# pco.

An Excelitas Technologies Brand



## » sCMOS image sensor

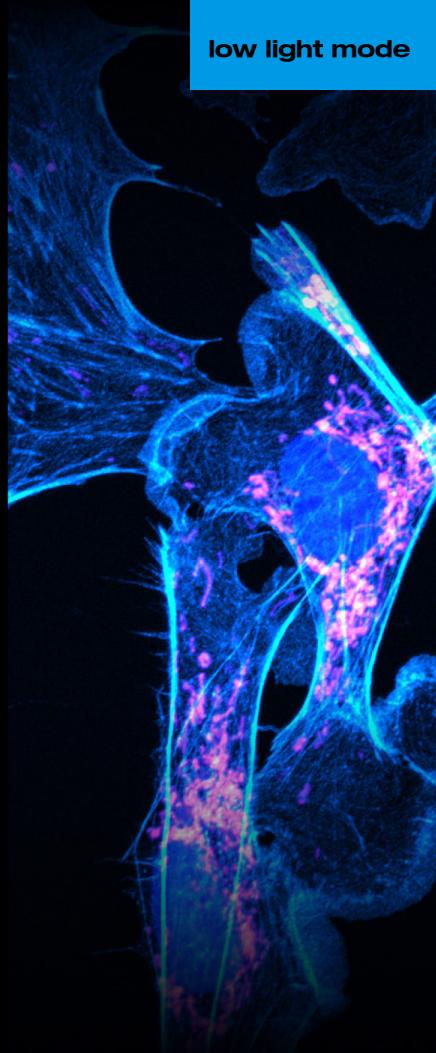
<b>type of sensor</b>	backside illuminated scientific CMOS (bi sCMOS) monochrome
<b>resolution (h x v)</b>	2048 x 2048 active pixels
<b>pixel size (h x v)</b>	6.5 µm x 6.5 µm
<b>sensor format / diagonal</b>	13.3 mm x 13.3 mm / 18.8 mm
<b>shutter mode</b>	rolling shutter (RS) additional feature: <b>lightsheet scanning mode<sup>1</sup></b>
<b>MTF</b>	76.9 lp/mm (theoretical)
<b>fullwell capacity</b>	48,000 e <sup>-</sup> 1,800 e <sup>-</sup> <b>low light mode</b>
<b>readout noise (typ.)<sup>2</sup></b>	1.8 <sub>med</sub> e <sup>-</sup> / 1.9 <sub>rms</sub> e <sup>-</sup> 1.1 <sub>med</sub> e <sup>-</sup> / 1.2 <sub>rms</sub> e <sup>-</sup> <b>low light mode</b>
<b>dynamic range (typ.)</b>	26667 : 1 (88.5 dB) 1636 : 1 (64 dB) <b>low light mode</b>
<b>quantum efficiency</b>	up to 95 %
<b>spectral range</b>	370 nm ... 1100 nm 190 nm ... 1100 nm <b>UV version</b>
<b>dark current (typ.)</b>	42 e <sup>-</sup> /pixel/s @ 21 °C ambient temperature
<b>DSNU</b>	0.9 rms e <sup>-</sup> 0.4 rms e <sup>-</sup> <b>low light mode</b>
<b>PRNU</b>	1.1 % 1.4 % <b>low light mode</b>
<b>anti blooming factor<sup>3</sup></b>	> 10 000

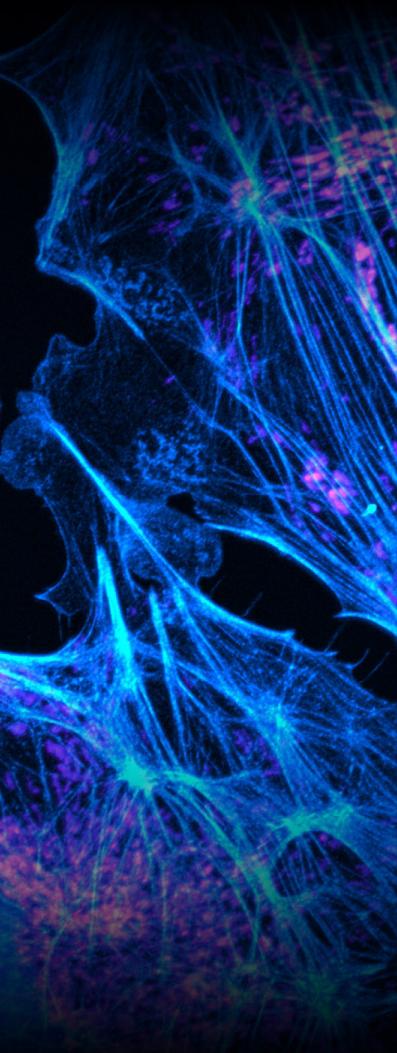
<sup>1</sup> Selectable via SDK (software development kit).<sup>2</sup> The readout noise values are given as median (med) and root mean square (rms) values, due to the different noise models, which can be used for evaluation. All values are raw data without any filtering.<sup>3</sup> Based on image sensor datasheet.

**bi** back  
illuminated

**lightsheet**  
**scanning mode**

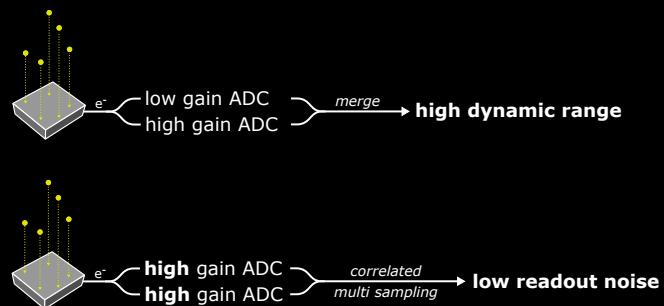
**low light mode**



**low light mode**

When the low light mode is activated, both the high and low gain A/D converter are used as high gain, which means they digitize low intensity pixel values only.

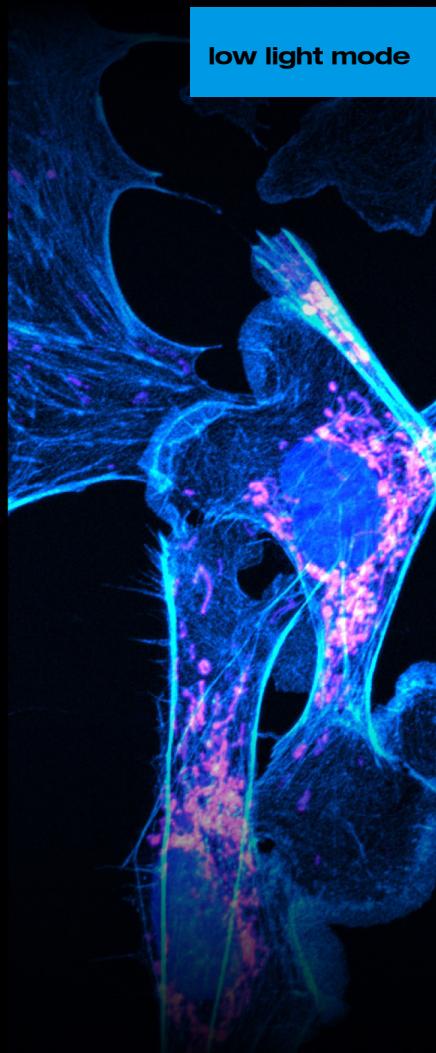
The signal within each pixel is simultaneously digitized by two separate A/D conversion units and added up, which is referred to as correlated multi sampling (CMS). This correlation causes a major reduction of the readout noise, though the usable intrascene dynamic range of the sensor is reduced.

**lightsheet scanning mode**

The PCO lightsheet scanning mode is a special readout mode dedicated to lightsheet microscopy. It is based on the rolling shutter mode in which the readout direction of the sensor is from top to bottom.

The standard line time value is 12 µs and it can be set from this camera-specific line time up to 2 ms. Compared to the standard operation mode, the lightsheet scanning mode enables the selection of the parameters "Line Time" and "Exposure Lines". This guarantees an optimized synchronization to an existing lightsheet setup which has no selectable speed or timing. It is possible to set a delay prior to the exposure start ("delay lines").

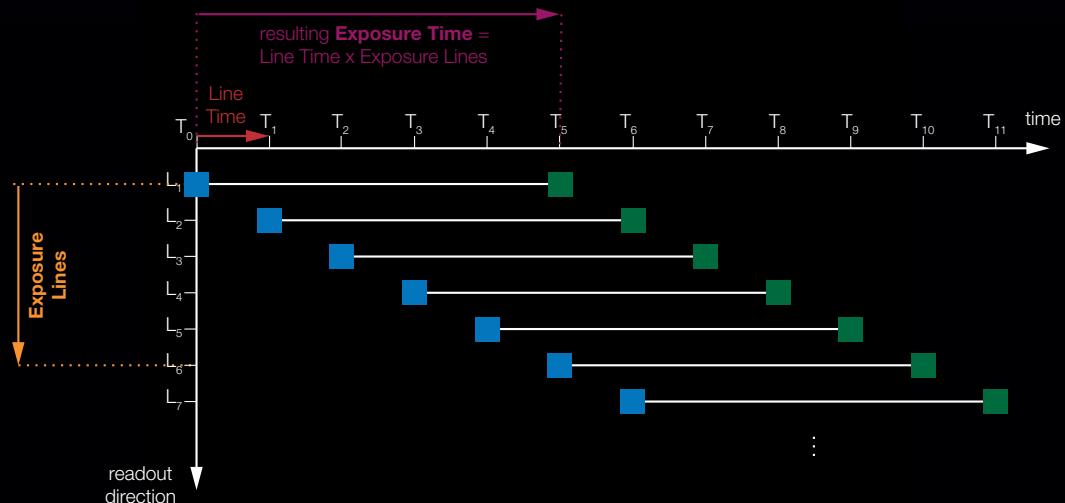
For more information on the corresponding SDK functions, please read our pco.sdk instruction manual.

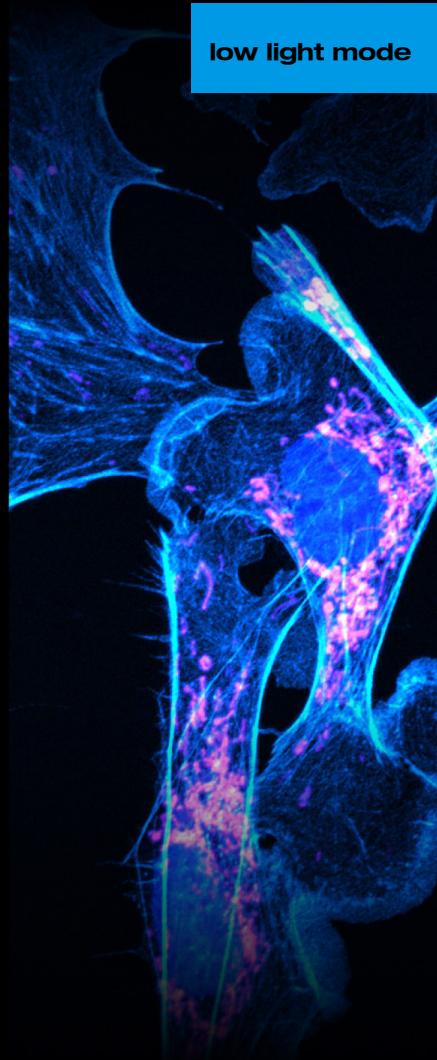
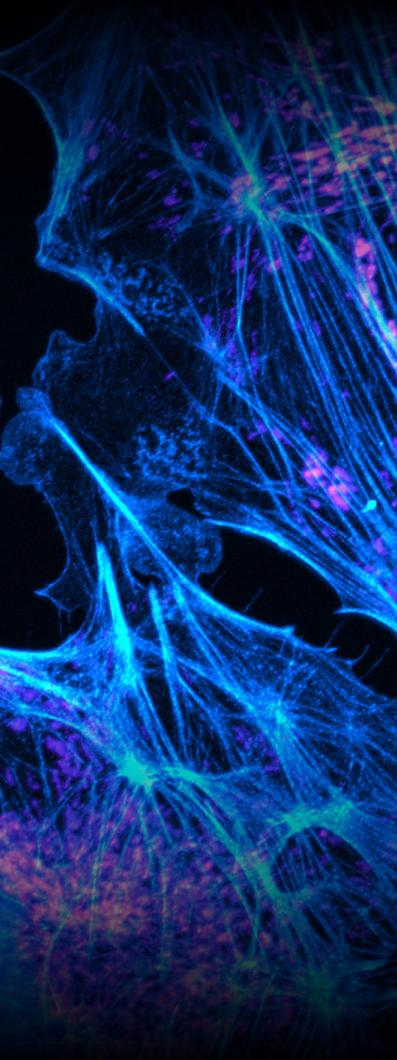


selectable parameter:  
(only via SDK)

$T_x$  Line Time      (12 µs ... 2 ms)  
 $L_x$  Exposure Lines      (1 ... 2048)

Start Exposure  
End Exposure





## » camera system

<b>maximum frame rate @ full resolution</b>	40 fps
<b>exposure / shutter time</b>	21 µs .. 500 ms
<b>dynamic range A/D<sup>4</sup></b>	16 bit
<b>A/D conversion factor</b>	0.8 e-/DN 0.03 e-/DN <b>low light mode</b>
<b>pixel scan rate</b>	46.0 MHz
<b>pixel data rate</b>	184.0 Mpixel/s
<b>binning horizontal</b>	x1, x2, x4
<b>binning vertical</b>	x1, x2, x4
<b>region of interest (ROI)</b>	horizontal: steps of 8 pixels vertical: steps of 1 pixels
<b>non linearity</b>	< 0.6 % < 0.4 % (low light mode)
<b>cooling method</b>	passive cooled
<b>trigger input signals</b>	frame trigger, acquire (SMA connectors)
<b>trigger output signals</b>	exposure, busy (SMA connectors)
<b>data interface</b>	USB 3.1 Gen 1
<b>time stamp</b>	in image (1 µs resolution)

<sup>4</sup> The high dynamic signal is simultaneously converted at high and low gain by two 12 bit A/D converters and the two 12 bit values are sophisticatedly merged into one 16 bit value.

## » general

<b>power delivery</b>	power over USB 3.1 Gen 1
<b>power consumption</b>	typ. 4.5 W (max. 6.0 W)
<b>weight</b>	420 g
<b>operating temperature</b>	+ 10 °C ... + 40 °C
<b>operating humidity range</b>	10 % .. 80 % (non-condensing)
<b>storage temperature range</b>	- 10 °C .. + 60 °C
<b>optical interface</b>	C-mount (optional: F-mount)
<b>maximum cable length</b>	5 m
<b>CE / FCC certified</b>	yes

## » frame rate table

2048 x 2048	40 fps
2048 x 1024	80 fps
2048 x 512	159 fps
2048 x 256	302 fps
2048 x 128	527 fps
1920 x 1080	76 fps
1600 x 1200	68 fps
1280 x 1024	80 fps
640 x 480	171 fps
320 x 240	320 fps

**technical  
specifications**

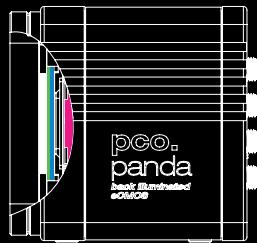
**pco.panda 4.2 bi**

**bi** back illuminated

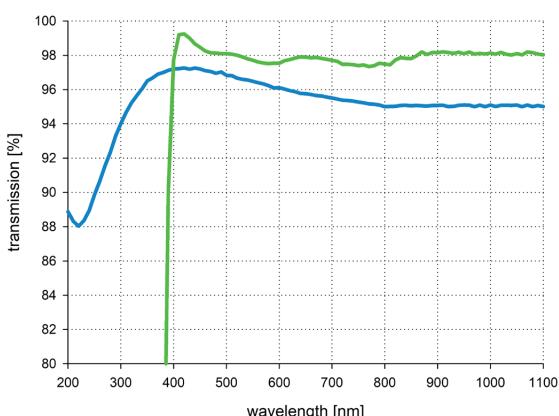
**lightsheet  
scanning mode**

**low light mode**

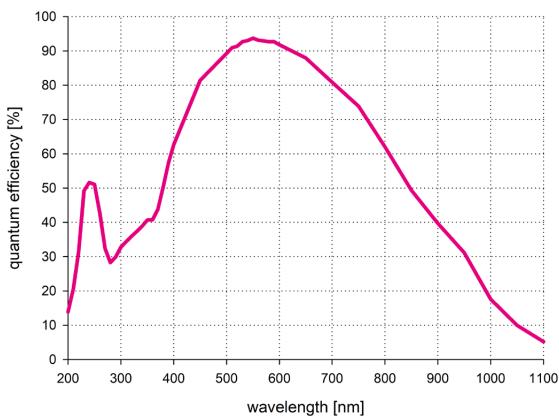
selectable  
**input windows**  
available



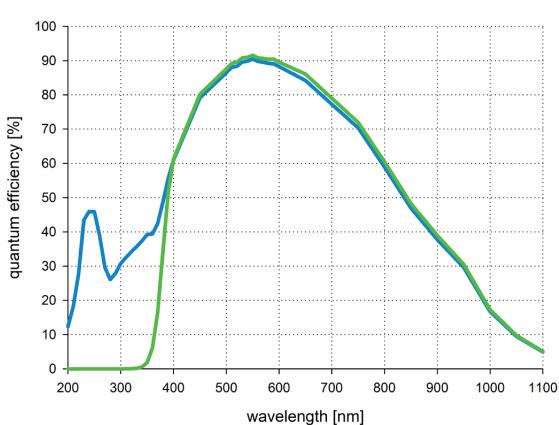
**UV+**      **input window**      **VIS+**



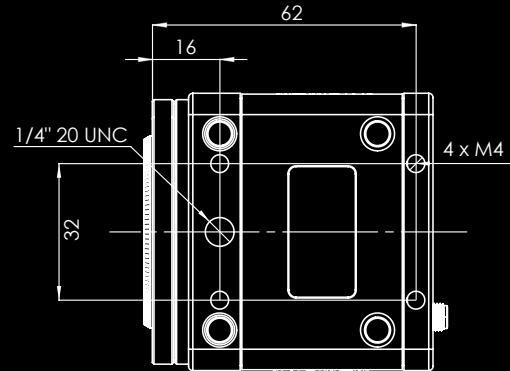
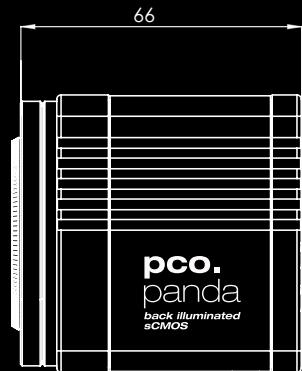
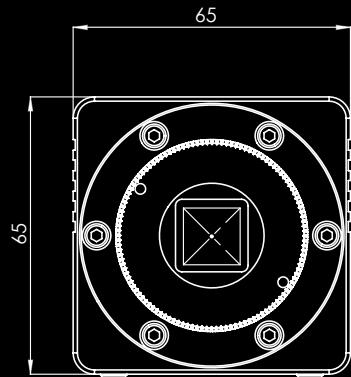
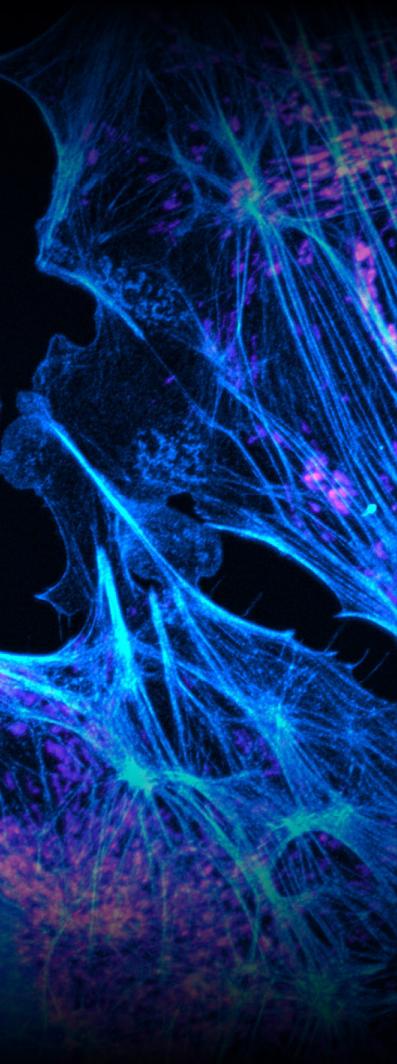
**sensor**



**pco.panda 4.2 bi UV camera**

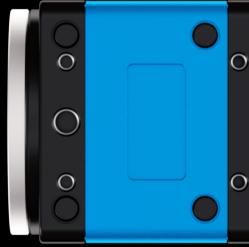
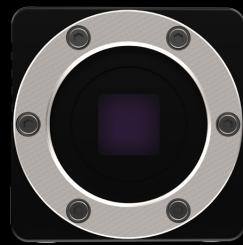


» dimensions



F-mount and C-mount lens adapter are changeable. All dimensions are given in millimeter.

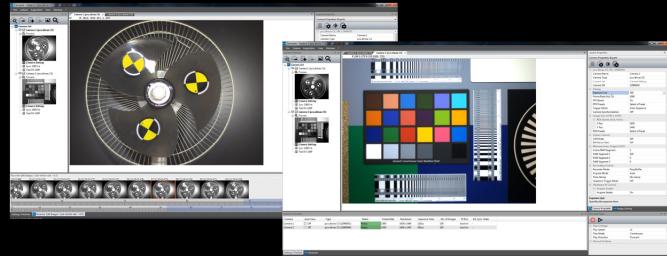
» camera view



» applications

brightfield microscopy | fluorescence microscopy | single molecule localization microscopy | lightsheet fluorescence microscopy (LSFM) | calcium imaging | FRET | FRAP | high-speed bright field ratio imaging | biochip reading | spinning disk confocal microscopy | ophthalmology | industrial quality inspection

» software



With pco.camware you control all camera settings, the image acquisition, and the storage of your image data. The pco.sdk is the complementary software development kit. It includes dynamic link libraries for user customization and integration on Windows PC platforms. Drivers for popular third party software packages are also available for you.

All these items like pco.camware, pco.sdk, and third party drivers are free-to-download at [www.pco.de](http://www.pco.de)

» third party integrations



**MathWorks**



# pco.

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