datasheet
pco.edge 4.2 bi XU USB

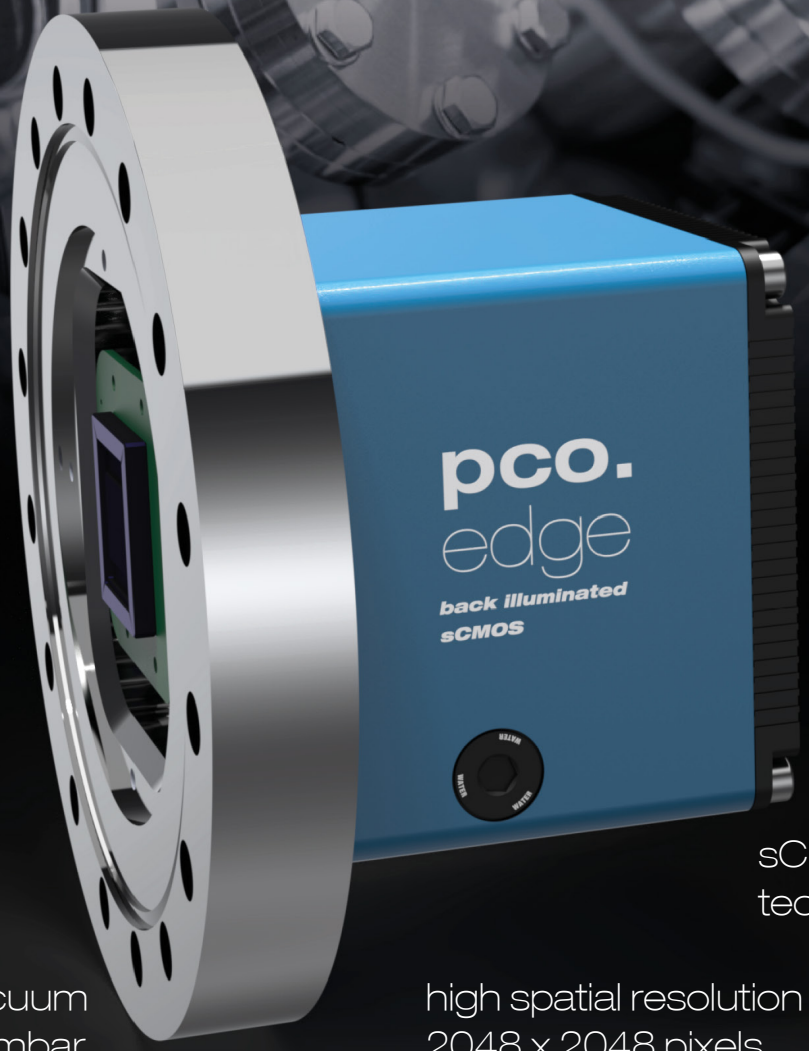
at the cutting edge with the cooled back illuminated sCMOS

XU X-ray ultraviolet

resolution
4.2 MPixel

pixel size
6.5 µm x 6.5 µm

interface
USB 3.1 Gen 1



low readout noise
1.9 e^- (med)

sCMOS PulSar technology

usable with vacuum down to $1x10^{-7}$ mbar

high spatial resolution
2048 x 2048 pixels

spectral range
1 nm to 1100 nm
(1.2 keV to 1.1 eV)

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technical data

image sensor

sensor technology	back illuminated scientific CMOS (bi sCMOS)
color type	monochrome
resolution (horizontal x vertical)	2048 px x 2048 px
pixel size (horizontal x vertical)	6.5 µm x 6.5 µm
sensor size (horizontal x vertical)	13.3 mm x 13.3 mm
sensor diagonal	18.8 mm
shutter mode	rolling shutter global reset
modulation transfer function (theoretical max.)	76.9 lp/mm
peak quantum efficiency	95 % @ 2.28 nm (545 eV)
spectral range	1 nm - 1100 nm (1.2 keV - 1.1 eV)
dark current (typ.)	0.4 e^- /pixel/s @ -18 °C sensor temperature
fullwell capacity	48 000 e^-
readout noise (typ.)[1]	2.5 e^- rms 1.9 e^- med
dynamic range (intra-scene)[2]	25 000 : 1 (88 dB)

[1] 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.
[2] The dynamic range value is calculated with the median value of the readout noise and rounded.

frame rate table

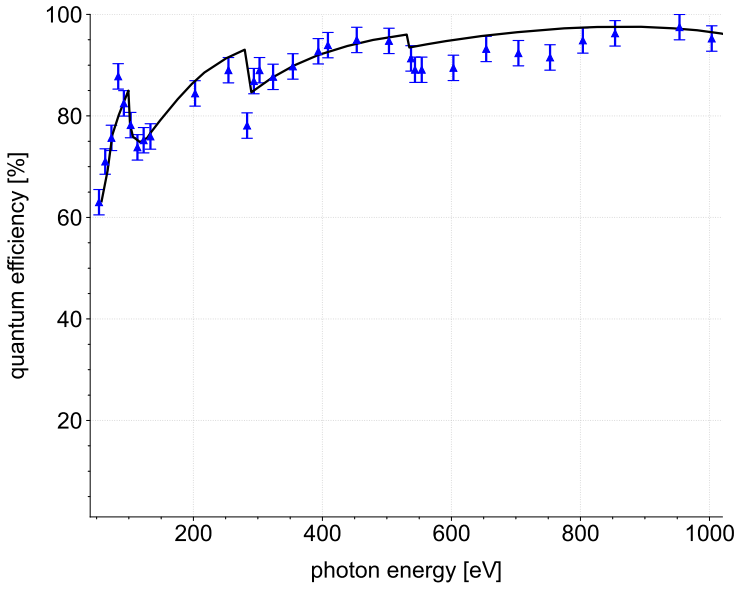
vertical resolution reduction	
2048 x 2048	40 fps
2048 x 1024	80 fps
2048 x 512	159 fps
2048 x 256	302 fps
2048 x 128	527 fps
2048 x 40	1080 fps
2048 x 8	1747 fps

typical resolutions	
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

camera	
max. frame rate @ full resolution	40 fps
exposure time range	21 µs - 20 s
dynamic range A/D[1]	16 bit
conversion factor[2]	0.8 e^-/DN
pixel rate	184 MPixel/s
region of interest (ROI)	horizontal: steps of 8 columns (min. 32) vertical: steps of 1 row (min. 8)
binning	horizontal: x2, x4 (sum) vertical: x2, x4 (sum)
non-linearity	< 0.6 %
dark signal non-uniformity (DSNU)	< 0.6 e^- rms
photo response non-uniformity (PRNU)	< 1.2 %
cooling temperature image sensor	air-cooled: +5 °C (ambient temperature +25 °C) air- & liquid-cooled: -5 °C (liquid temperature +20 °C)
cooling method	forced air & liquid cooling
trigger input signals	external exposure start, external exposure control, sequence trigger, acquire enable
status output signals	exposure, busy, line
input / output signal connectors	SMA
time stamp	in image (1 µs resolution)
data interface	USB 3.1 Gen 1

[1] 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 sophistically merged into one 16 bit value.
[2] According to EMVA1288, the conversion factor equals the inverse of the system gain and can be operational mode dependent.

quantum efficiency



Citation R.H. Menk et al 2022 JINST 17 C01058

general

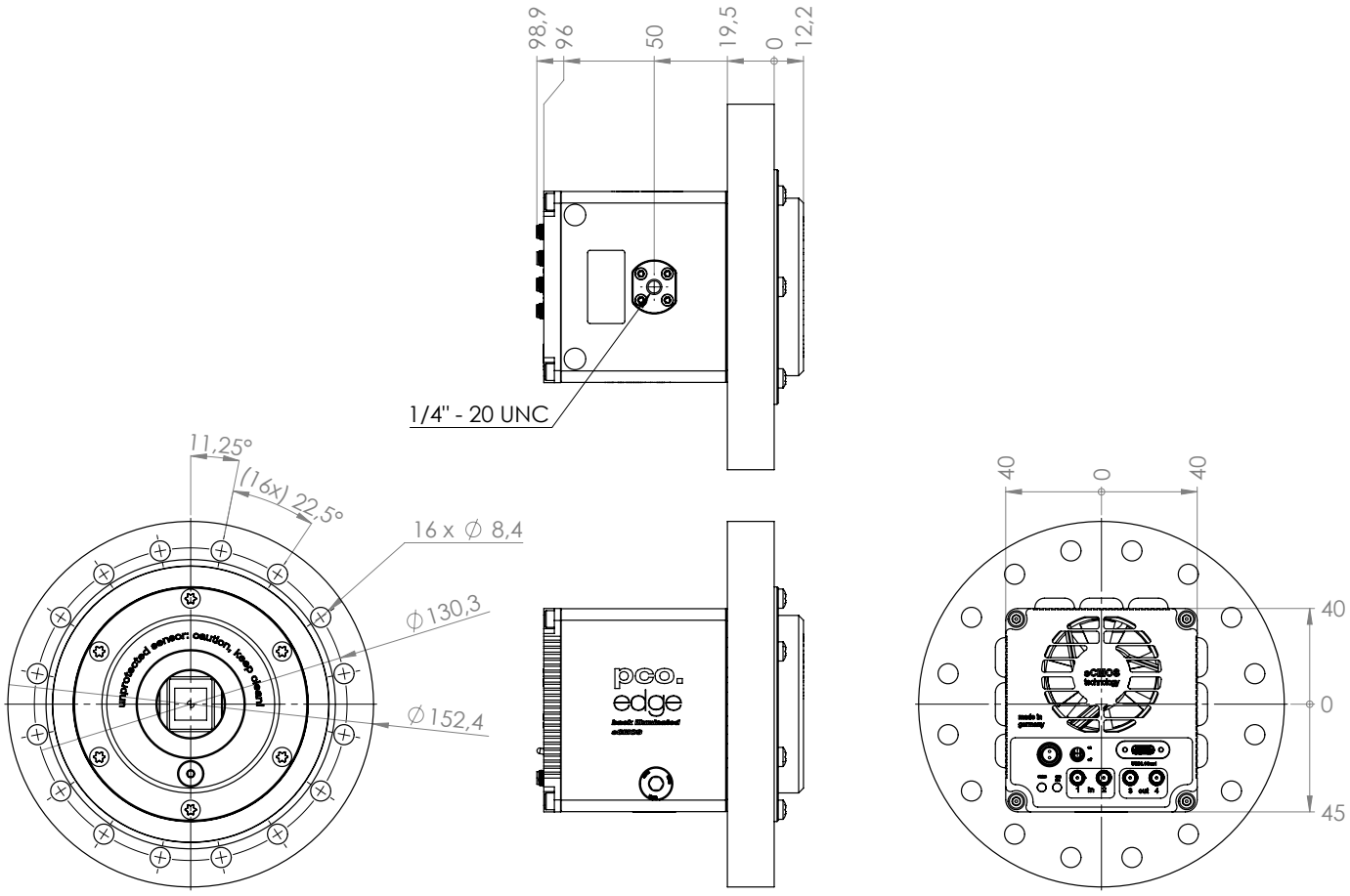
power supply	power over USB 3.1 Gen 1 and power connector (24 VDC ±10 %)
power consumption	max. 6 W over USB 3.1 Gen 1 and max. 22 W over power connector
weight	3.1 kg
dimensions (height x width x length[1])	152 mm x 152 mm x 96 mm
operating temperature range	+10 °C to +40 °C
storage temperature range	-10 °C to +60 °C
humidity range (non-condensing)[2]	10 % to 80 % (recommended < 65 %)
certifications	CE, FCC, UKCA

[1] This value refers to the length of the camera without protective cover.
[2] Applicable to camera outside vacuum setup.

optical interface

opto-mechanical interface	DN100 CF flange
bolt circle	available with a starting angle of 0° or 11.25°
protective cover	for transportation, storage, and use without vacuum setup

dimensions



outlines of pco.edge 4.2 bi XU USB with protective cover (all dimensions given in mm)

software

Your first choice is pco.camware:

Our main camera control software enables control of most camera settings and facilitates image acquisition and storage.

You can customize it exactly to your needs using different layouts, styles and features.

You want to create your own application:

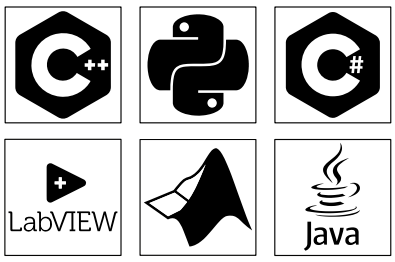
We feature a wide range of software development kits (SDK) for various programming languages, such as C++, Python, C#, LabVIEW, Matlab, and Java.

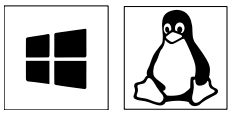
If you are looking for more general SDKs, we present pco.sdk and pco.recorder, our low-level SDKs with C interface.

You prefer to use a different software:

Our cameras integrate with a range of third-party software applications.

In microscopy we offer dedicated support for µManager, while ensuring compatibility with other software maintained by their providers.





Our software is available for Windows and Linux platforms.

Visit our **website** for detailed information, installation guidance, and Github projects.

areas of application

EUV lithography monitoring | Fourier transform holography (FTH) imaging | high-harmonic generation EUV detection | in-situ radiography | small-angle X-ray scattering (SAXS) | soft X-ray ptychography | spectroscopy | tomography

ordering information

pco.edge 4.2 bi XU USB	85108075023	camera system, 2048 x 2048 pixel, monochrome, back illuminated sensor for extreme UV & soft X-ray applications, rolling shutter, USB 3.1 interface, air & liquid cooling, CF100 flange

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