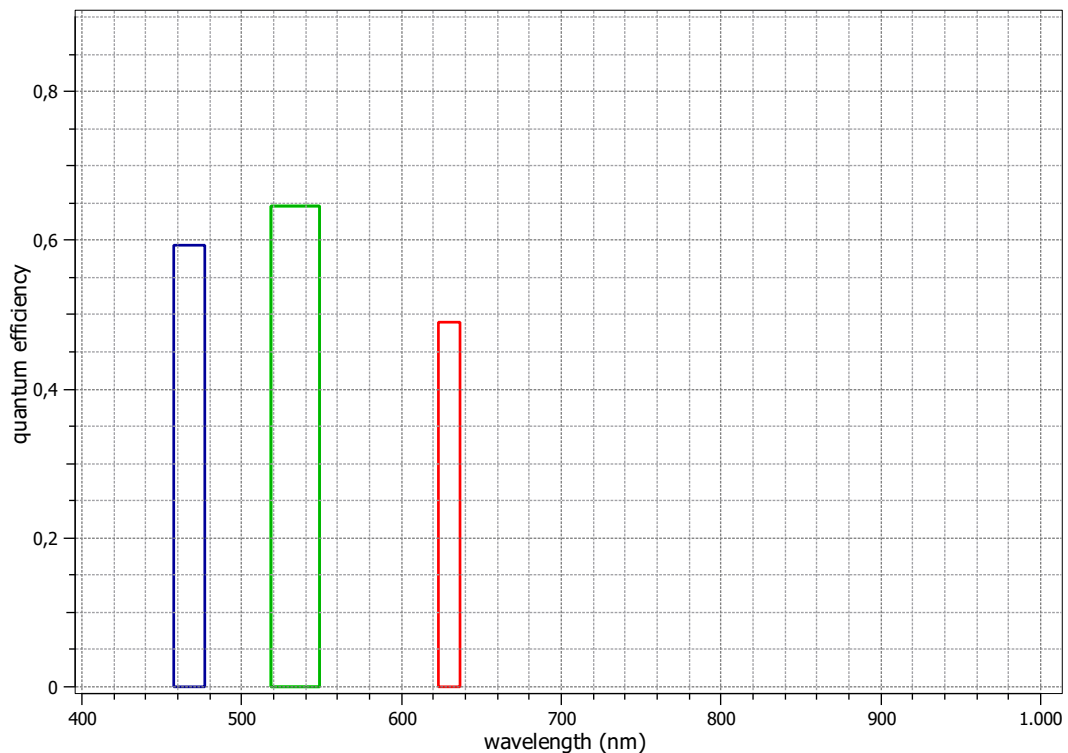


EMVA 1288 Summary Sheet

This datasheet describes the specification according to the standard 1288 release 3.1 for "Characterization and Presentation of Specification Data for Image Sensors and Cameras" issued on December 30, 2016 by the European Machine Vision Association (EMVA), published at www.standard1288.org and the *zenodo EMVA 1288 community* with proprietary extensions from AEON. The measurements were performed with the AEON ACC3 Release 7, 21.08.2018, SN 0018(AEON).

Measurements performed by Technical and Application Support Center, Baumer Optronic GmbH.

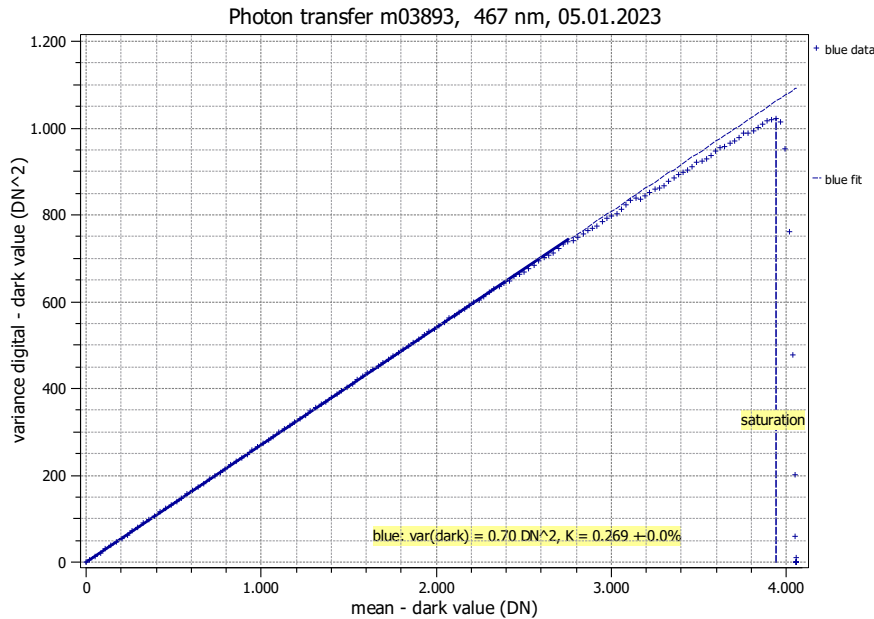
Vendor	Baumer	Type of data presented	Single
Model	VCXU.2-65C.R	Operation point 1	
Serial number	700009244989	Wavelength centroid	467.2 nm
Sensor diagonal	8.86 mm	Wavelength FWHM	19.5 nm
Lens category	C-Mount	Gain, black-level	1.0 / 39.0
Resolution	3072 × 2048, 12 bit	Operation point 2	
Pixel size (h×v)	2.40 μm × 2.40 μm	Wavelength centroid	533.3 nm
Sensor	Sony IMX178	Wavelength FWHM	30.3 nm
Sensor type	CMOS	Gain, black-level	1.0 / 39.0
Shutter type	Rolling shutter	Operation point 3	
Overlap cap.	Overlapped	Wavelength centroid	629.9 nm
Max. frame rate	0.0 Hz	Wavelength FWHM	12.9 nm
Interface type	U3V	Gain, black-level	1.0 / 39.0
		Optional data measured	
		None	



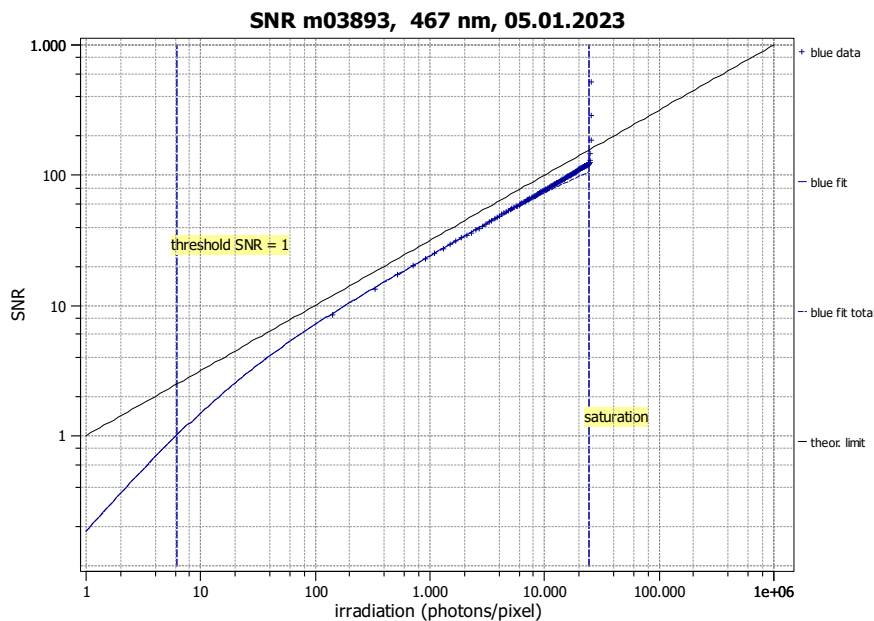
Summary Sheet for Operation Point 1 at a Wavelength of 467 nm

Type of data	Single	Gain, black-level	1.0 / 39.0
Exposure control	By irradiance	Environmental temperature	24.6 °C
Exposure time	1.58 ms	Camera body temperature	30.8 °C
Frame rate	10.0 Hz	Internal temperature(s)	—
Data transfer mode	BayerRG12	Wavelength, centr., FWHM	467 nm, 19.5 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η 59.3%

Overall system gain

K 0.269 DN/e⁻

$1/K$ 3.712 e⁻/DN

Temporal dark noise

σ_d 2.93 e⁻

$\sigma_{y,\text{dark}}$ 0.84 DN

Signal-to-noise ratio

SNR_{max} 121

41.6 dB

6.9 bit

$1/\text{SNR}_{\text{max}}$ 0.83%

Absolute sensitivity threshold

$\mu_{p,\text{min}}$ 6.16 p

$\mu_{p,\text{min,area}}$ 1.070 p/μm²

$\mu_{e,\text{min}}$ 3.66 e⁻

$\mu_{e,\text{min,area}}$ 0.635 e⁻/μm²

Saturation capacity

$\mu_{p,\text{sat}}$ 24638 p

$\mu_{p,\text{sat,area}}$ 4277 p/μm²

$\mu_{e,\text{sat}}$ 14618 e⁻

$\mu_{e,\text{sat,area}}$ 2538 e⁻/μm²

Dynamic range

DR 3999

72.0 dB

12.0 bit

Spatial nonuniformities

DSNU₁₂₈₈ 0.17 e⁻

0.05 DN

PRNU₁₂₈₈ 0.45%

Linearity error

LE_{min} -0.33%

LE_{max} 1.09%

Dark current

$\mu_{c,\text{mean}}$ -0.02 ± 0.02 e⁻/s

-0.00 DN/s

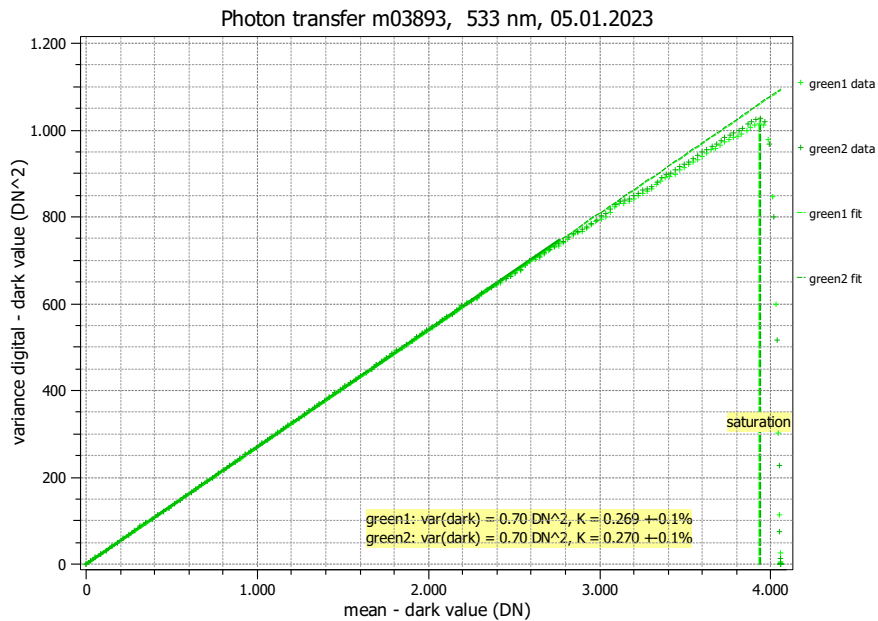
$\mu_{c,\text{var}}$ 0.30 ± 0.04 e⁻/s

T_d — °C

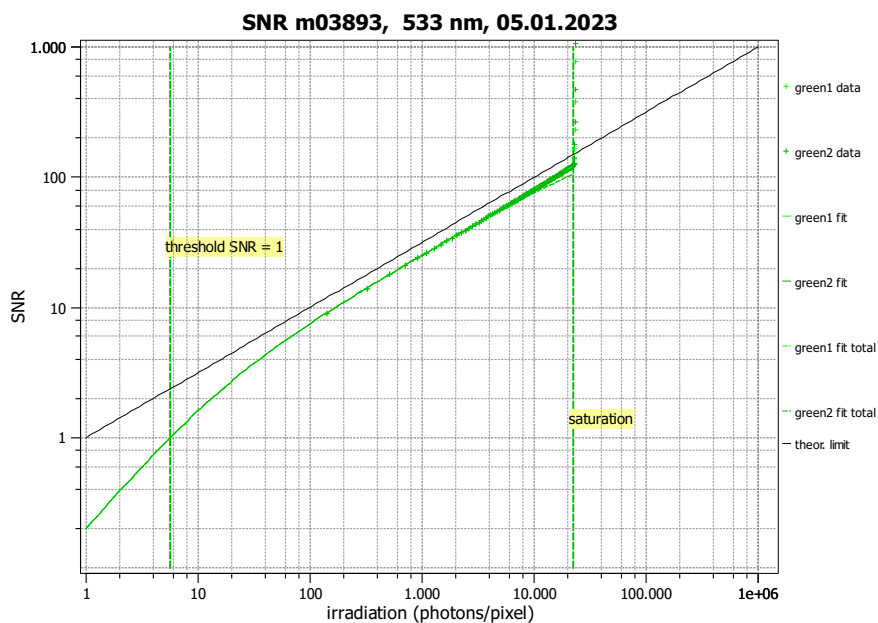
Summary Sheet for Operation Point 2 at a Wavelength of 533 nm

Type of data	Single	Gain, black-level	1.0 / 39.0
Exposure control	By irradiance	Environmental temperature	24.7°C
Exposure time	3.15 ms	Camera body temperature	31.4°C
Frame rate	10.0 Hz	Internal temperature(s)	—
Data transfer mode	BayerRG12	Wavelength, centr., FWHM	533 nm, 30.3 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η 64.6%

Overall system gain

K 0.269 DN/e⁻

$1/K$ 3.715 e⁻/DN

Temporal dark noise

σ_d 2.92 e⁻

$\sigma_{y,\text{dark}}$ 0.84 DN

Signal-to-noise ratio

SNR_{max} 121

41.6 dB

6.9 bit

$1/\text{SNR}_{\text{max}}$ 0.83%

Absolute sensitivity threshold

$\mu_{p,\text{min}}$ 5.65 p

$\mu_{p,\text{min,area}}$ 0.980 p/μm²

$\mu_{e,\text{min}}$ 3.65 e⁻

$\mu_{e,\text{min,area}}$ 0.633 e⁻/μm²

Saturation capacity

$\mu_{p,\text{sat}}$ 22536 p

$\mu_{p,\text{sat,area}}$ 3913 p/μm²

$\mu_{e,\text{sat}}$ 14564 e⁻

$\mu_{e,\text{sat,area}}$ 2529 e⁻/μm²

Dynamic range

DR 3992

72.0 dB

12.0 bit

Spatial nonuniformities

DSNU₁₂₈₈ 0.18 e⁻

0.05 DN

PRNU₁₂₈₈ 0.46%

Linearity error

LE_{min} -0.52%

LE_{max} 1.28%

Dark current

$\mu_{c,\text{mean}}$ -0.01 ± 0.02 e⁻/s

-0.00 DN/s

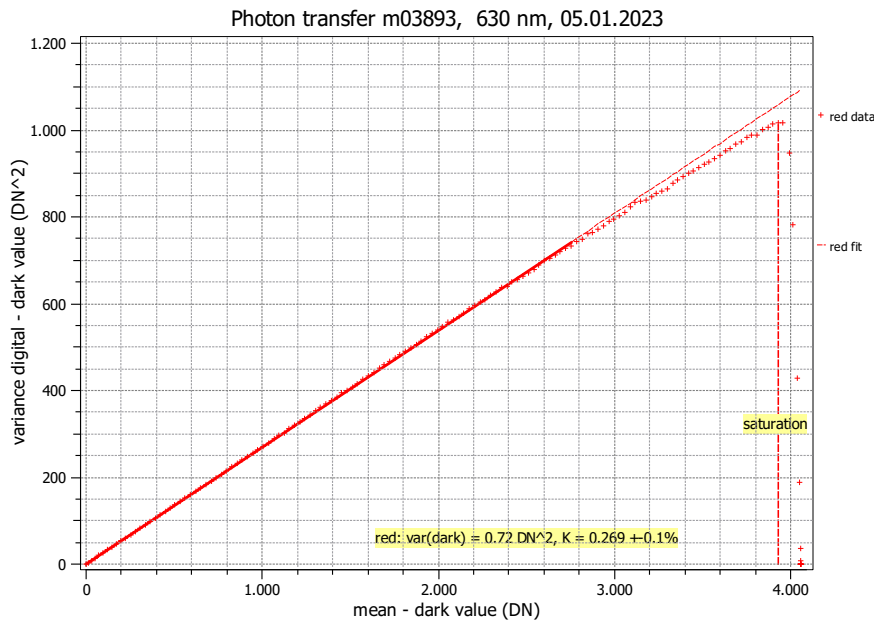
$\mu_{c,\text{var}}$ 0.43 ± 0.03 e⁻/s

T_d — °C

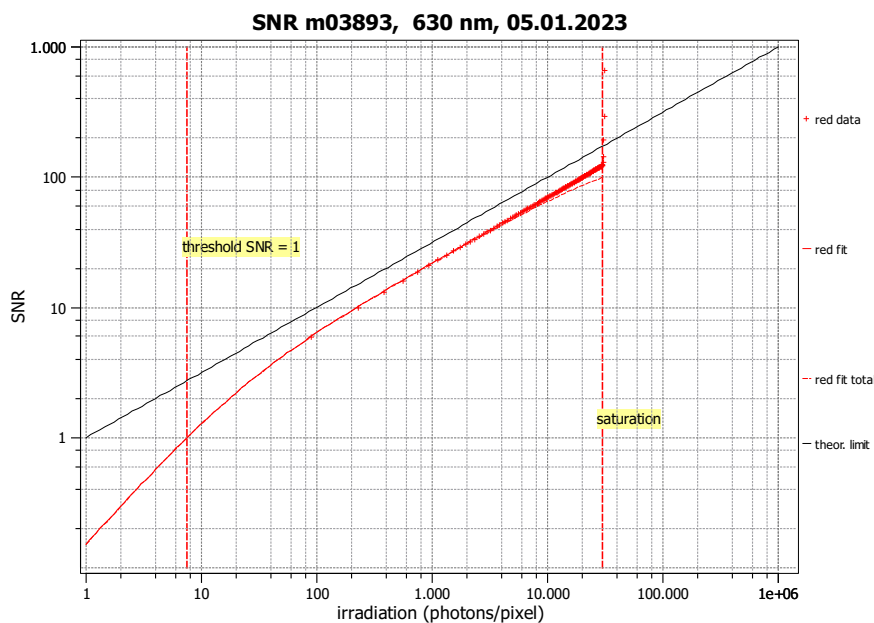
Summary Sheet for Operation Point 3 at a Wavelength of 630 nm

Type of data	Single	Gain, black-level	1.0 / 39.0
Exposure control	By irradiance	Environmental temperature	24.6°C
Exposure time	3.15 ms	Camera body temperature	31.5°C
Frame rate	10.0 Hz	Internal temperature(s)	—
Data transfer mode	BayerRG12	Wavelength, centr., FWHM	630 nm, 12.9 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η 49.0%

Overall system gain

K 0.269 DN/e⁻

$1/K$ 3.713 e⁻/DN

Temporal dark noise

σ_d 2.95 e⁻

$\sigma_{y,\text{dark}}$ 0.85 DN

Signal-to-noise ratio

SNR_{max} 121

41.7 dB

6.9 bit

$1/\text{SNR}_{\text{max}}$ 0.83%

Absolute sensitivity threshold

$\mu_{p,\text{min}}$ 7.52 p

$\mu_{p,\text{min,area}}$ 1.305 p/μm²

$\mu_{e,\text{min}}$ 3.68 e⁻

$\mu_{e,\text{min,area}}$ 0.639 e⁻/μm²

Saturation capacity

$\mu_{p,\text{sat}}$ 29873 p

$\mu_{p,\text{sat,area}}$ 5186 p/μm²

$\mu_{e,\text{sat}}$ 14633 e⁻

$\mu_{e,\text{sat,area}}$ 2541 e⁻/μm²

Dynamic range

DR 3974

72.0 dB

12.0 bit

Spatial nonuniformities

DSNU₁₂₈₈ 0.21 e⁻

0.06 DN

PRNU₁₂₈₈ 0.56%

Linearity error

LE_{min} -0.27%

LE_{max} 0.38%

Dark current

$\mu_{c,\text{mean}}$ -0.01 ± 0.02 e⁻/s

-0.00 DN/s

$\mu_{c,\text{var}}$ 0.31 ± 0.04 e⁻/s

T_d — °C