EMVA 1288 Data Sheet m0720

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 6, 26.11.2016, SN 0005(MatrixVision).

Measurements performed by T.Renner, Matrix Vision GmbH

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Matrix Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>mvBlueFOX3-2071aC</td>
</tr>
<tr>
<td>Serial number</td>
<td>FF002473</td>
</tr>
<tr>
<td>Sensor diagonal</td>
<td>17.55 mm</td>
</tr>
<tr>
<td>Lens category</td>
<td>C-Mount</td>
</tr>
<tr>
<td>Resolution</td>
<td>3216 × 2208, 12 bit</td>
</tr>
<tr>
<td>Pixel size (h×v)</td>
<td>4.50 µm × 4.50 µm</td>
</tr>
<tr>
<td>Sensor</td>
<td>IMX428</td>
</tr>
<tr>
<td>Sensor type</td>
<td>CMOS</td>
</tr>
<tr>
<td>Shutter type</td>
<td>Global</td>
</tr>
<tr>
<td>Overlap cap.</td>
<td>Overlapping</td>
</tr>
<tr>
<td>Max. frame rate</td>
<td>26.7 Hz</td>
</tr>
<tr>
<td>Interface type</td>
<td>USB3 Vision</td>
</tr>
</tbody>
</table>

Type of data presented: Single

**Operation point 1 (page 5)**
- Wavelength centroid: 468.0 nm
- Wavelength FWHM: 20.0 nm
- Gain, black-level: 0dB, 0.1

**Operation point 2 (page 20)**
- Wavelength centroid: 536.0 nm
- Wavelength FWHM: 31.0 nm
- Gain, black-level: 0dB, 0.1

**Operation point 3 (page 35)**
- Wavelength centroid: 630.0 nm
- Wavelength FWHM: 13.0 nm
- Gain, black-level: 0dB, 0.1

Optional data measured: None

![Graph showing quantum efficiency vs. wavelength](image)
Summary Sheet for Operation Point 1 at a Wavelength of 468 nm

**Type of data**  
Single

**Exposure control**  
By irradiance

**Exposure time**  
20.00 ms

**Frame rate**  
24.6 Hz

**Data transfer mode**  
BayerRG12

**Gain, black-level**  
0dB, 0.1

**Environmental temperature**  
28.7°C

**Camera body temperature**  
28.8°C

**Wavelength, centr., FWHM**  
468 nm, 20.0 nm

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**Photon Transfer**

Photon transfer m0720, 468 nm, 07.08.2018

**Signal-to-Noise Ratio**

SNR m0720, 468 nm, 07.08.2018

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**Quantum efficiency**  
\( \eta \) \( \approx 49.2\% \)

**Overall system gain**  
\( K = 157 \text{DN/e}^- \)

**Temporal dark noise**  
\( \sigma_d = 5.85 \text{e}^- \)

**Signal-to-noise ratio**  
\( \text{SNR}_{\text{max}} = 159 \)

**Absolute sensitivity threshold**  
\( \mu_{p,\text{min}} = 13.52 \text{p} \)
\( \mu_{p,\text{min}.\text{area}} = 0.668 \text{p}/\mu\text{m}^2 \)
\( \mu_{e,\text{min}} = 6.65 \text{e}^- \)
\( \mu_{e,\text{min}.\text{area}} = 0.328 \text{e}^-/\mu\text{m}^2 \)

**Saturation capacity**  
\( \mu_{p,\text{sat}} = 51571 \text{p} \)
\( \mu_{p,\text{sat}.\text{area}} = 2547 \text{p}/\mu\text{m}^2 \)
\( \mu_{e,\text{sat}} = 25369 \text{e}^- \)
\( \mu_{e,\text{sat}.\text{area}} = 1253 \text{e}^-/\mu\text{m}^2 \)

**Dynamic range**  
\( \text{DR} = 3814 \)

**Spatial nonuniformities**  
\( \text{DSNU}_{1288} = 1.45 \text{e}^- \)

**Linearity error**  
\( \text{LE}_{\text{min}} = -0.31\% \)
\( \text{LE}_{\text{max}} = 0.32\% \)

**Dark current**  
\( \mu_{c,\text{mean}} = -10 \pm 7 \text{e}^-/s \)
\( \mu_{c,\text{var}} = 17 \pm 1 \text{e}^-/s \)
\( T_d = -5 \text{°C} \)
**Summary Sheet for Operation Point 2 at a Wavelength of 536 nm**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of data</strong></td>
<td>Single</td>
</tr>
<tr>
<td><strong>Exposure control</strong></td>
<td>By irradiance</td>
</tr>
<tr>
<td><strong>Exposure time</strong></td>
<td>20.00 ms</td>
</tr>
<tr>
<td><strong>Frame rate</strong></td>
<td>24.6 Hz</td>
</tr>
<tr>
<td><strong>Data transfer mode</strong></td>
<td>BayerRG12</td>
</tr>
<tr>
<td><strong>Gain, black-level</strong></td>
<td>0dB, 0.1</td>
</tr>
<tr>
<td><strong>Environmental temperature</strong></td>
<td>28.6°C</td>
</tr>
<tr>
<td><strong>Camera body temperature</strong></td>
<td>28.7°C</td>
</tr>
<tr>
<td><strong>Internal temperature(s)</strong></td>
<td>—</td>
</tr>
</tbody>
</table>

**Photon Transfer**

![Photograph of the diagram]

**Signal-to-Noise Ratio**

![Photograph of the diagram]

**Quantum efficiency**

\[ \eta = 60.4\% \]

**Overall system gain**

\[ K = 0.157 \text{DN/e}^- \]
\[ \frac{1}{K} = 6.360 \text{e}^-/\text{DN} \]

**Temporal dark noise**

\[ \sigma_d = 5.85 \text{e}^- \]
\[ \sigma_y, \text{dark} = 0.96 \text{DN} \]

**Signal-to-noise ratio**

\[ \text{SNR}_{\text{max}} = 159 \]
\[ \text{SNR}_{\text{max}} = 44.0 \text{dB} \]
\[ 1/\text{SNR}_{\text{max}} = 0.63\% \]

**Absolute sensitivity threshold**

\[ \mu_p, \text{min} = 11.02 \text{p} \]
\[ \mu_p, \text{min, area} = 0.544 \text{p}/\mu\text{m}^2 \]
\[ \mu_e, \text{min} = 6.65 \text{e}^- \]
\[ \mu_e, \text{min, area} = 0.328 \text{e}^-/\mu\text{m}^2 \]

**Saturation capacity**

\[ \mu_p, \text{sat} = 41792 \text{p} \]
\[ \mu_p, \text{sat, area} = 2064 \text{p}/\mu\text{m}^2 \]
\[ \mu_e, \text{sat} = 25223 \text{e}^- \]
\[ \mu_e, \text{sat, area} = 1246 \text{e}^-/\mu\text{m}^2 \]

**Dynamic range**

\[ \text{DR} = 3792 \]
\[ \text{DR} = 71.6 \text{dB} \]
\[ \text{DR} = 11.9 \text{bit} \]

**Spatial nonuniformities**

\[ \text{DSNU}_{1288} = 1.53 \text{e}^- \]
\[ \text{DSNU}_{1288} = 0.24 \text{DN} \]
\[ \text{PRNU}_{1288} = 1.08\% \]

**Linearity error**

\[ \text{LE}_{\text{min}} = -0.33\% \]
\[ \text{LE}_{\text{max}} = 0.36\% \]

**Dark current**

\[ \mu_c, \text{mean} = -10 \pm 7 \text{e}^-/\text{s} \]
\[ \mu_c, \text{mean} = -1.5 \text{DN/s} \]
\[ \mu_c, \text{var} = 20 \pm 2 \text{e}^-/\text{s} \]
\[ T_d = — ^\circ\text{C} \]
Summary Sheet for Operation Point 3 at a Wavelength of 630 nm

Type of data: Single
Exposure control: By irradiance
Exposure time: 20.00 ms
Frame rate: 24.6 Hz
Data transfer mode: BayerRG12

Gain, black-level: 0dB, 0.1
Environmental temperature: 28.5°C
Camera body temperature: 28.6°C
Internal temperature(s): —

Quantum efficiency: η = 55.1%
Overall system gain: K = 0.157 DN/e−
1/K = 6.372 e−/DN

Temporal dark noise:
σ_d = 5.85 e−
σ_y.dark = 0.96 DN

Signal-to-noise ratio:
SNR = 44.1 dB
1/SNR = 0.63 %

Absolute sensitivity threshold:
μ_p.min = 12.08 p
μ_p.min.area = 0.596 p/μm²
μ_e.min = 6.65 e−
μ_e.min.area = 0.328 e−/μm²

Saturation capacity:
μ_p.sat = 46441 p
μ_p.sat.area = 2293 p/μm²
μ_e.sat = 25575 e−
μ_e.sat.area = 1263 e−/μm²

Dynamic range:
DR = 3845
71.7 dB
11.9 bit

Spatial nonuniformities:
DSNU_{1288} = 1.56 e−
0.25 DN
PRNU_{1288} = 1.08 %

Linearity error:
LE_{min} = -0.79%
LE_{max} = 0.41%

Dark current:
μ_c.mean = -9 ± 7 e−/s
-1.4 DN/s
μ_c.var = 17 ± 1 e−/s
T_d = — °C