CHROMASENS

Offline User Manual for allPIXA evo Version 1.1.0

Table of Contents

Line Scan Cameras > Safety

Line Scan Cameras > allPIXA evo series > Introduction

Line Scan Cameras > allPIXA evo series > Models

Line Scan Cameras > allPIXA evo series > Installation

Line Scan Cameras > allPIXA evo series > Getting started > First images

Line Scan Cameras > allPIXA evo series > Getting started > Camera image calibration

Line Scan Cameras > allPIXA evo series > Camera operation - how to

Safety

Safety instructions

- Operate the device only in a faultless and safe condition.
- Modifications and extensions to the device are only permitted if the prior written consent of Chromasens GmbH is obtained.
- Comply with the ambient conditions described in this manual.
- During operation do not touch the hot surface of the device.
- During operation do not use detergents on the device.

Meaning of the signal words, safety signs and graphical symbols

Signal words

The following signal words are used in this manual:

Signal word	Meaning, consequences if not prevented
DANGER	Warns of an imminent hazardous situation which results in death or serious injury.
WARNING	Warns of a potential hazardous situation, which could result in death or serious injury.
CAUTION	Warns of a potential hazardous situation, which could result in minor or moderate injury.
NOTICE	Warns of a hazardous situation, which can result in material damage or environmental damage.

Safety signs and graphical symbols

The following safety signs and graphical symbols are used:

Sign	Meaning
	Warning of dangerous electrical voltage
	Warning of falling items
	Warning of hot surface
	Warning of potential damage to the device
	Indicates that electrical and electronic equipment should not be disposed with normal garbage at the end of its working life.

Personnel requirements

Untrained person

The untrained person has been instructed by the operating company or an authorised representative of the operating company (qualified personnel) about the tasks assigned to him and the possible dangers in case of improper behaviour. The untrained person has been instructed about the protective measures and the operating tasks. The untrained person has sufficient knowledge of the national language, both written and spoken.

Qualified personnel

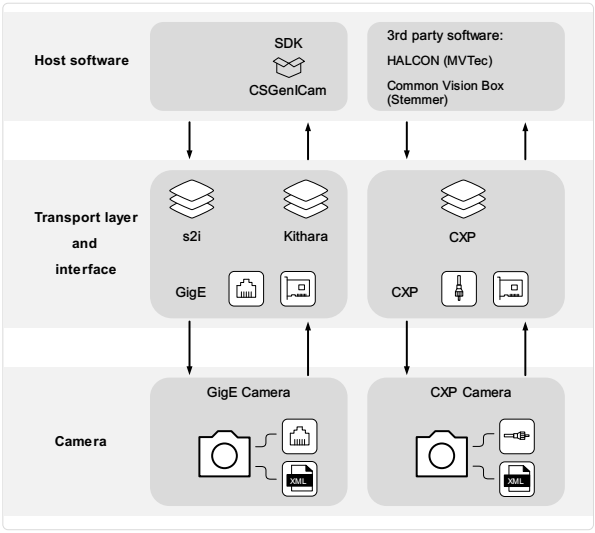
Qualified personnel are persons who, due to their professional training, knowledge and experience as well as knowledge of the relevant standards and regulations, carry out the work assigned to them, assess it and independently recognize possible dangers independently. The person knows the operating instructions of the machine. Skilled personnel are mechanics, electricians and technicians.

Assignment of the tasks

Task	Untrained person	Qualified personnel
Installation	Prohibited	Allowed
Programming	Prohibited	Allowed
Calibration	Prohibited	Allowed
Testing	Prohibited	Allowed
Cleaning	Allowed	Allowed
Repairing	Prohibited	Prohibited

Overview

The cameras offer CMOS performance with CCD image quality. The multi-line CMOS sensor features TDI options for color or mono at high speed. There are line rates possible of up to 100 kHz.
The cameras fulfill the GenICam standard communication protocol. You can set up the camera, browse and adjust parameters with every tool that fulfills the GenICam standard. The provided Chromasens GCT software is available for Windows and Linux.



Scheme of the communication between a host software and the camera

Firmware and software version

This documentation refers to the following version:
Camera: Packet 2.3.0

Feature reference

For detailed information on camera controls refer to the Feature reference - guide. It describes the standard and advanced camera control. Make sure that you always refer to the feature reference that matches the used firmware version.

Software GCT

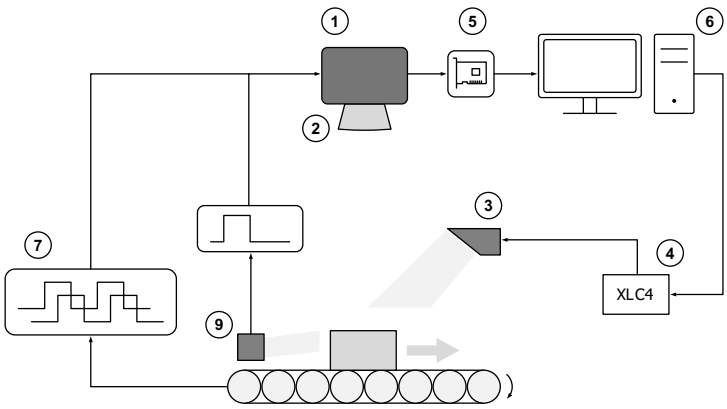
Refer to the GCT documentation for the following information:

- Installation and use
- Configuration of the PC depending on the camera interface

Intended use

- The device is designed for machines and systems which are used for commercial and industrial applications.
- The device is designed for contactless optical detection of primarily two dimensional objects.
- The device may only be connected or used as described in this manual.
- Do not use the device in safety relevant control circuits and potentially explosive environment.

Line scan system



1	Line scan camera: Scans the image line by line and communicates with the PC.	**2**	Optical system: Lenses and mounts
3	Illumination: Lights up the information carrier/scan area.	**4**	Illumination controller: Controls and monitors the illumination unit.
5	Cables and suitable network card or frame grabber in the PC: The image data are sent to a PC.	**6**	PC: The PC performs subsequent processing of the image data and can optionally control the illumination system.
7	Speed detection: The speed of the object/conveyor belt can be detected by an optional incremental encoder. The encoder can be connected to the camera.	**8**	Conveying unit: Moves the scanned object.
9	Frame trigger: A light barrier can be used to detect the object and start the image acquisition on time. The frame trigger can be connected to the camera.		

Overview

The allPIXA evo line scan cameras are available with the DXGE interface and the CXP interface. Three different positions of the interface are available. The available sensor resolutions are 8k, 10k and 15k. All cameras support color and mono.
The rating plate is located on the rear of the camera. It shows the sensor resolution and the serial number.

Available cameras

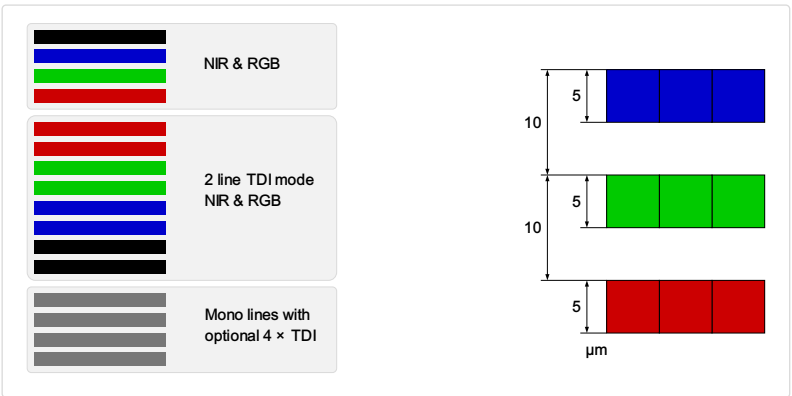
Camera	Order number	Interface	Interface position	Color space
allPIXA evo 8k DXGE X	CP000620-S-08K-11-F1-C1-X	DXGE	X	Color
allPIXA evo 8k DXGE Mono TDI X	CP000620-S-08K-11-F1-M-X	DXGE	X	Mono
allPIXA evo 10k DXGE Color X	CP000620-S-10K-11-F1-C1-X	DXGE	X	Color
allPIXA evo 10k DXGE Mono X	CP000620-S-10K-11-F1-M-X	DXGE	X	Mono
allPIXA evo 15k DXGE Color X	CP000620-S-15K-11-F1-C1-X	DXGE	X	Color
allPIXA evo 15k DXGE Mono X	CP000620-S-15K-11-F1-M-X	DXGE	X	Mono
allPIXA evo 8k CXP Z	CP000620-S-08K-33-F1-C1-Z	CXP	Z	Color
allPIXA evo 8k CXP Y	CP000620-S-08K-33-F1-C1-Y	CXP	Y	Color
allPIXA evo 8k Mono TDI Z	CP000620-S-08K-33-F1-M-Z	CXP	Z	Mono
allPIXA evo 8k Mono TDI Y	CP000620-S-08K-33-F1-M-Y	CXP	Y	Mono
allPIXA evo 10k CXP Color Z	CP000620-S-10K-33-F1-C1-Z	CXP	Z	Color
allPIXA evo 10k CXP Color Y	CP000620-S-10K-33-F1-C1-Y	CXP	Y	Color
allPIXA evo 10k CXP Mono Z	CP000620-S-10K-33-F1-M-Z	CXP	Z	Mono
allPIXA evo 10k CXP Mono Y	CP000620-S-10K-33-F1-M-Y	CXP	Y	Mono
allPIXA evo 15k CXP Color Z	CP000620-S-15K-33-F1-C1-Z	CXP	Z	Color
allPIXA evo 15k CXP Color Y	CP000620-S-15K-33-F1-C1-Y	CXP	Y	Color
allPIXA evo 15k CXP Mono Z	CP000620-S-15K-33-F1-M-Z	CXP	Z	Mono
allPIXA evo 15k CXP Mono Y	CP000620-S-15K-33-F1-M-Y	CXP	Y	Mono

allPIXA evo 8k DXGE

Camera specifications

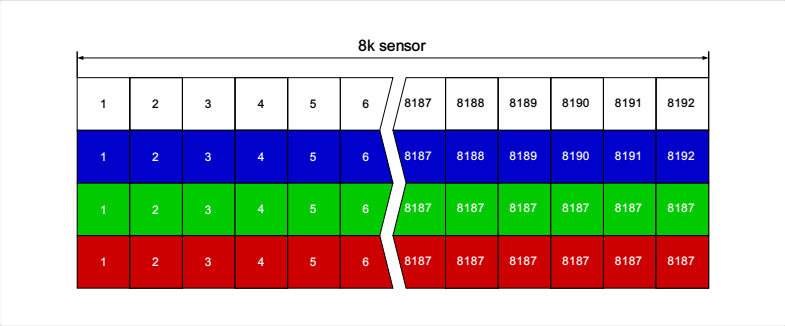
Sensor	CMOS line scan sensor, 16 lines (RGB, NIR-pass & mono)
Pixel size	5.0 µm × 5.0 µm
Line spacing	5 µm between R-G & G-B
Spectral sensitivity	360 nm – 960 nm
Resolution	8192 × 4 lines (16 lines available)
Video output	Single/Dual 10GigE, GigE Vision® 2.0 compliant
Data format	3 × 8/10/12 Bit color **or** 1 × 8/10/12 Bit mono **or** 4 × 8/10/12 RGB + NIR
Trigger Mode	Frame Start / Frame Active / Line Start External trigger Line trigger / Encoder and Frame trigger
Video output port	2 × SFP+
Interface position	X
Digital I/O port	External I/O (15 pin HD D-Sub, fem.)
Power supply	6 pin Hirose, male 12 V – 24 V DC ± 20 %; 1 A @ 24 V
Debugging port	USB 2.0 (Micro USB)
Lens mount / adapter	M72 × 0.75 mm / F-mount
Housing dimensions	102 mm × 76 mm × 82 mm (W × H × D)
Weight	0.9 kg
Temperature during operation	0 °C – 60 °C; 32 °F – 140 °F
Humidity during operation	20 % – 85 % relative air humidity, non condensing
Temperature during transport and storage	-20 °C – +85 °C; -4 °F – +185 °F
Protection category	IP50
Certifications	CE, RoHS
General ambient conditions	
Transport	IEC 721-3-3:IE33
Operation	IEC 721-3-3:IE21
Storage	IEC 721-3-3:IE11

Line scan sensor



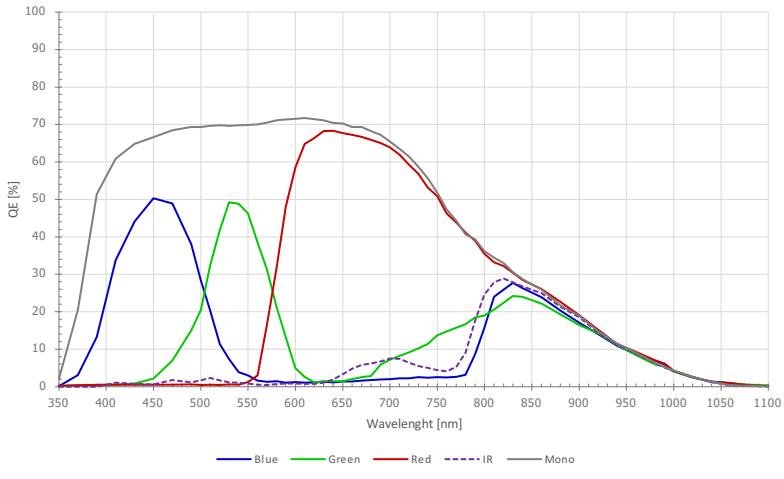
The three different read modes and the sensor line spacing

Sensor pixel arrangement



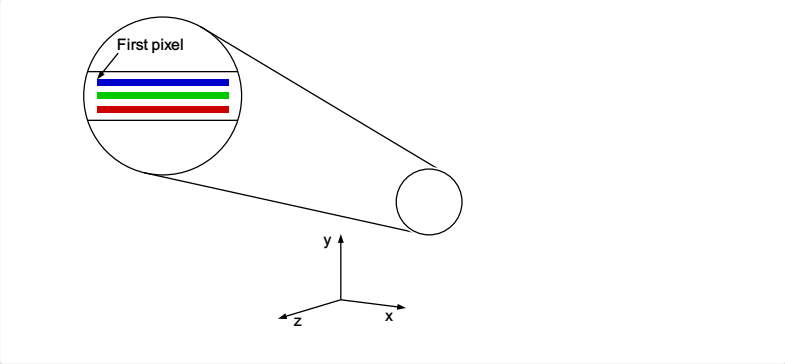
Sensor pixel arrangement

Spectral sensitivity



Measured quantum efficiency of the 8k sensor

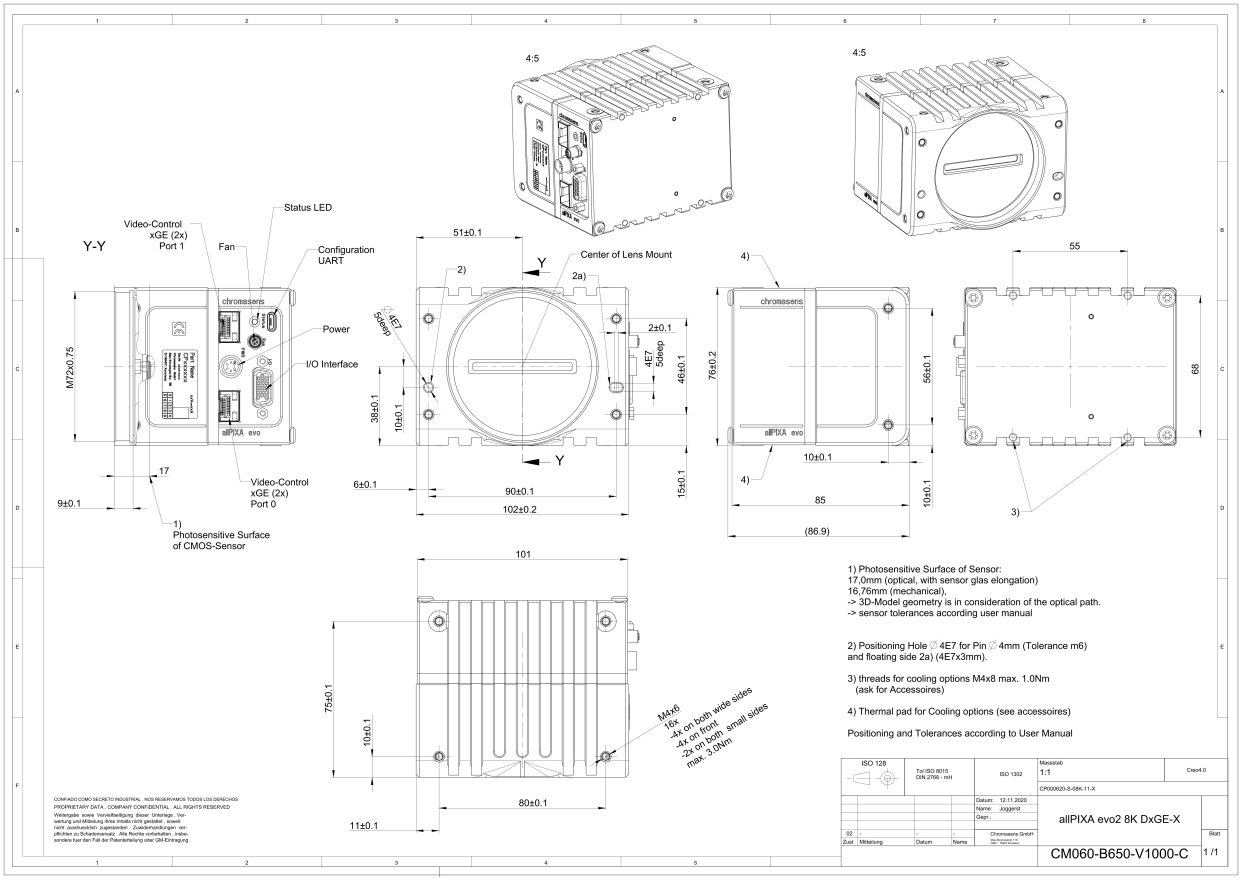
Sensor alignment and orientation



Alignment and orientation of the 8k sensor

Feature	Value
First pixel	Left side
Sensor position alignment	X: < ± 100 µm Y: < ± 100 µm Y: < ± 100 µm
Sensor rotation alignment	Y: < ± 0.1° Z: < ± 0.1°
Planarity of the sensor interface	< ± 0.5 µm
Sensor window thickness	0.7 mm
Refraction index	1.5
Optical path extension	0.35 mm

Mechanical dimensions

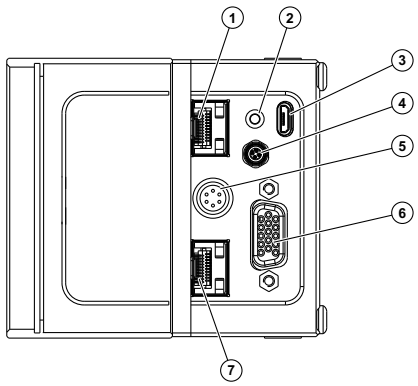


Dimensional drawing of the allPIXA evo 8k DXGE - interface position X

Download as pdf-file

Download dimensional drawing of the allPIXA evo 8k DXGE – interface position X

Interface specification



1	Video output SFP+ port 1 (10GigE)	**2**	Status LED
3	Debugging port	**4**	Connector for additional fan
5	Power supply	**6**	Digital I/O port
7	Video output SFP+ port 2 (10GigE)		

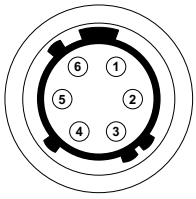
Line rate

Configuration	Single 10 GigE	Dual 10 GigE
RGB 8: 8,192 × 3 pixel	47.9 kHz	90.1 kHz
RGB 10: 8,192 × 3 pixel	24.2 kHz	43.2 kHz
RGB 12: 8,192 × 3 pixel	24.2 kHz	43.2 kHz
RGBa 8: 8,192 × 4 pixel	36.8 kHz	68.2 kHz
RGBa 10: 8,192 × 4 pixel	18.1 kHz	32.5 kHz
RGBa 12: 8,192 × 4 pixel	18.1 kHz	32.5 kHz
Mono 8: 8,192 × 1 pixel	100.0 kHz	100.0 kHz
Mono 10: 8,192 × 1 pixel	71.3 kHz	100.0 kHz
Mono 12: 8,192 × 1 pixel	71.3 kHz	100.0 kHz

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

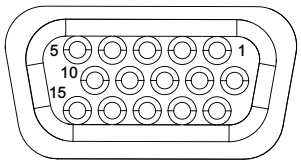
Digital I/O port

NOTE

Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS422 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

Micro USB

The Micro-USB connection is currently used for debugging information.

LED status indicator

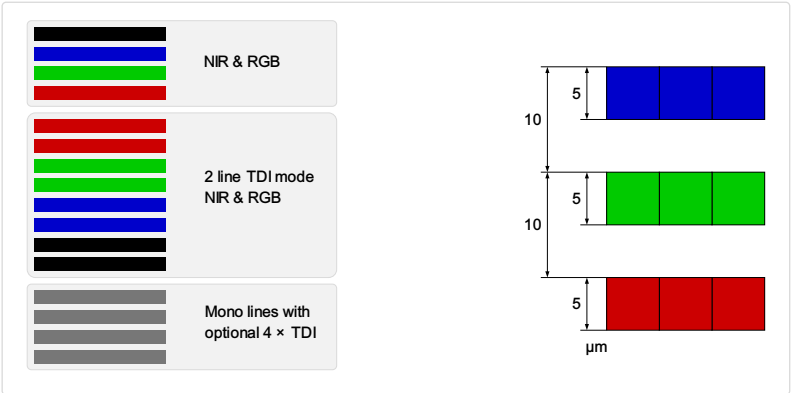
Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Blue continuous	The device is OK and provides image data. Between image gaps the LED is off.
	Green continuous	The device is in power-up mode.
	Green blinking	The device is OK and ready.
	Yellow continuous	Warning-state: The device is operational.
	Red continuous	Error-state: The device is not operational.

allPIXA evo 8k CXP

Camera specifications

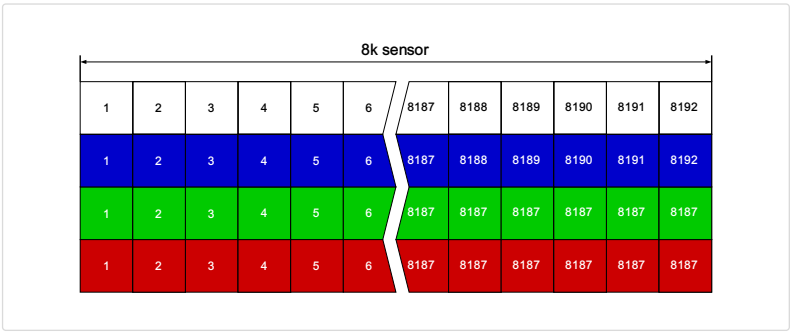
Sensor	CMOS line scan sensor, 16 lines (RGB, NIR-pass & mono)
Pixel size	5.0 µm × 5.0 µm
Line spacing	5 µm between R-G & G-B
Spectral sensitivity	360 nm – 960 nm
Resolution	8192 × 4 lines (16 lines available)
Video output	4 × CoaXPress 2.0
Data format	3 × 8/10/12 Bit color **or** 1 × 8/10/12 Bit mono **or** 4 × 8/10/12 RGB + NIR
Trigger Mode	Frame Start / Frame Active / Line Start External trigger Line trigger / Encoder and Frame trigger
Video output port	4 × CXP-12 Micro-BNC
Interface position	Y, Z
Digital I/O port	External I/O (15 pin HD D-Sub, fem.)
Power supply	6 pin Hirose, male 12 V – 24 V DC ± 20 %; 1 A @ 24 V
Debugging port	USB 2.0 (Micro USB)
Lens mount / adapter	M72 × 0.75 mm / F-mount
Housing dimensions	102 mm × 76 mm × 82 mm (W × H × D)
Weight	0.9 kg
Temperature during operation	0 °C – 60 °C; 32 °F – 140 °F
Humidity during operation	20 % – 85 % relative air humidity, non condensing
Temperature during transport and storage	-20 °C – +85 °C; -4 °F – +185 °F
Protection category	IP50
Certifications	CE, RoHS
General ambient conditions	
Transport	IEC 721-3-3:IE33
Operation	IEC 721-3-3:IE21
Storage	IEC 721-3-3:IE11

Line scan sensor



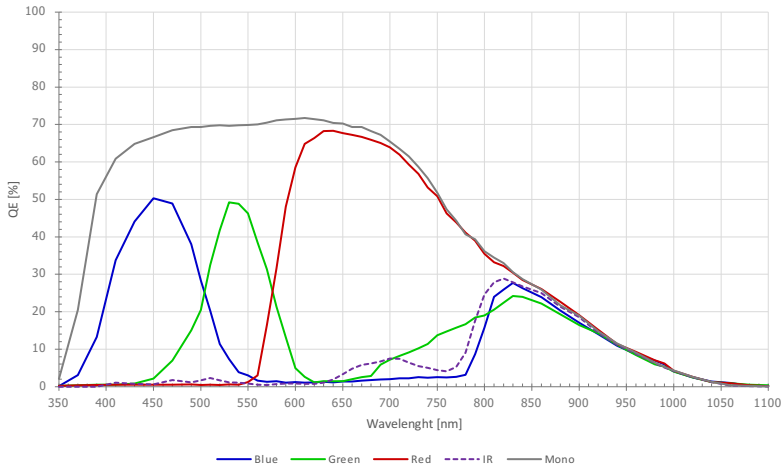
The three different read modes and the sensor line spacing

Sensor pixel arrangement



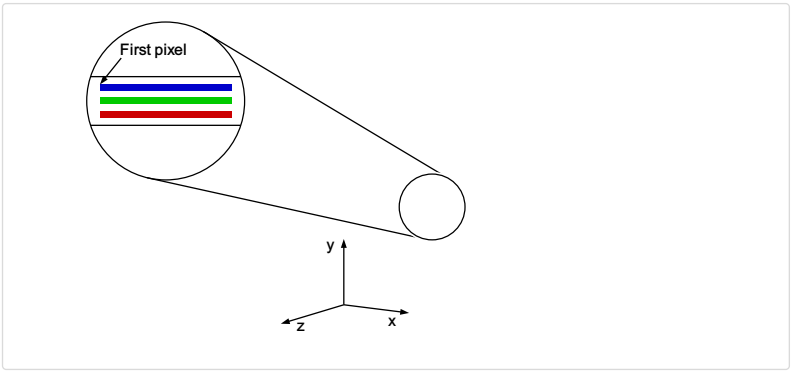
Sensor pixel arrangement

Spectral sensitivity



Measured quantum efficiency of the 8k sensor

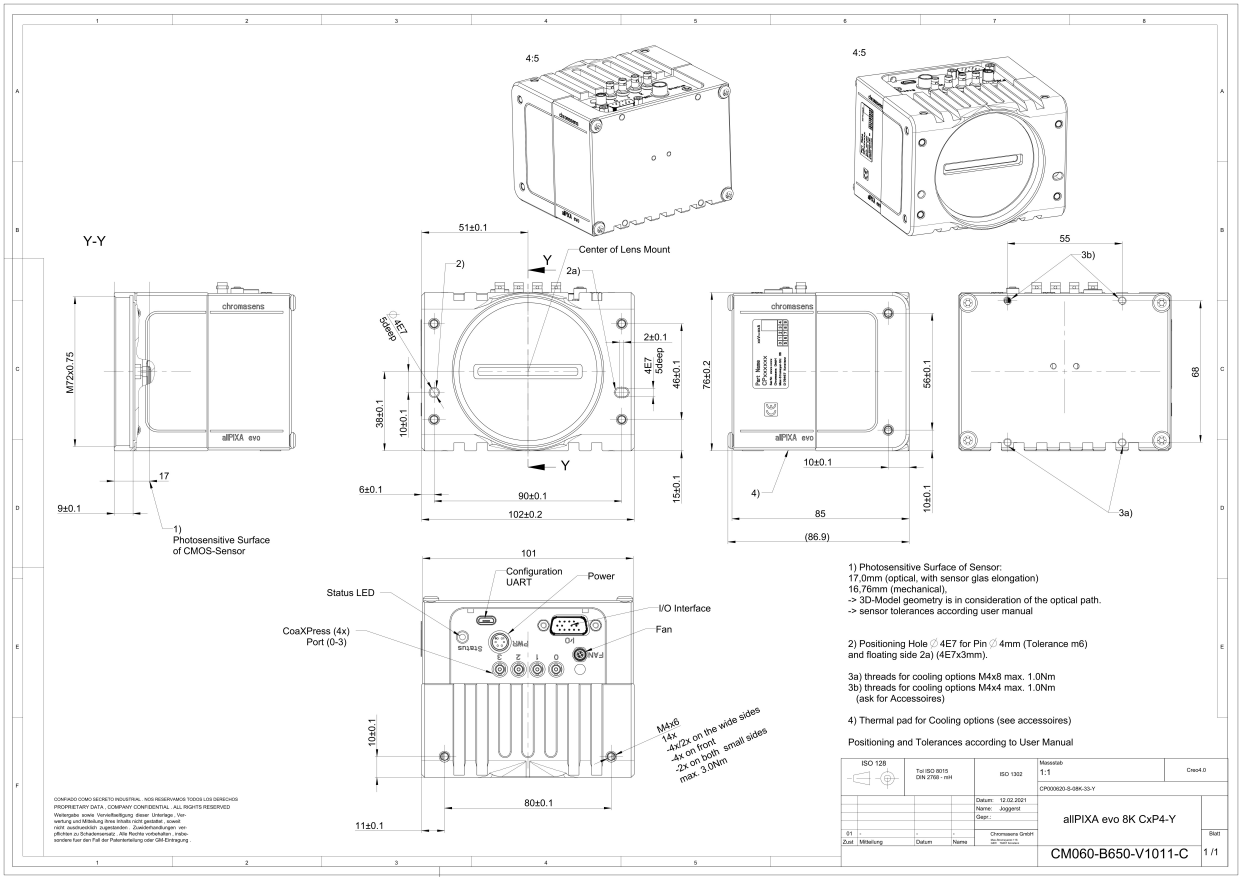
Sensor alignment and orientation



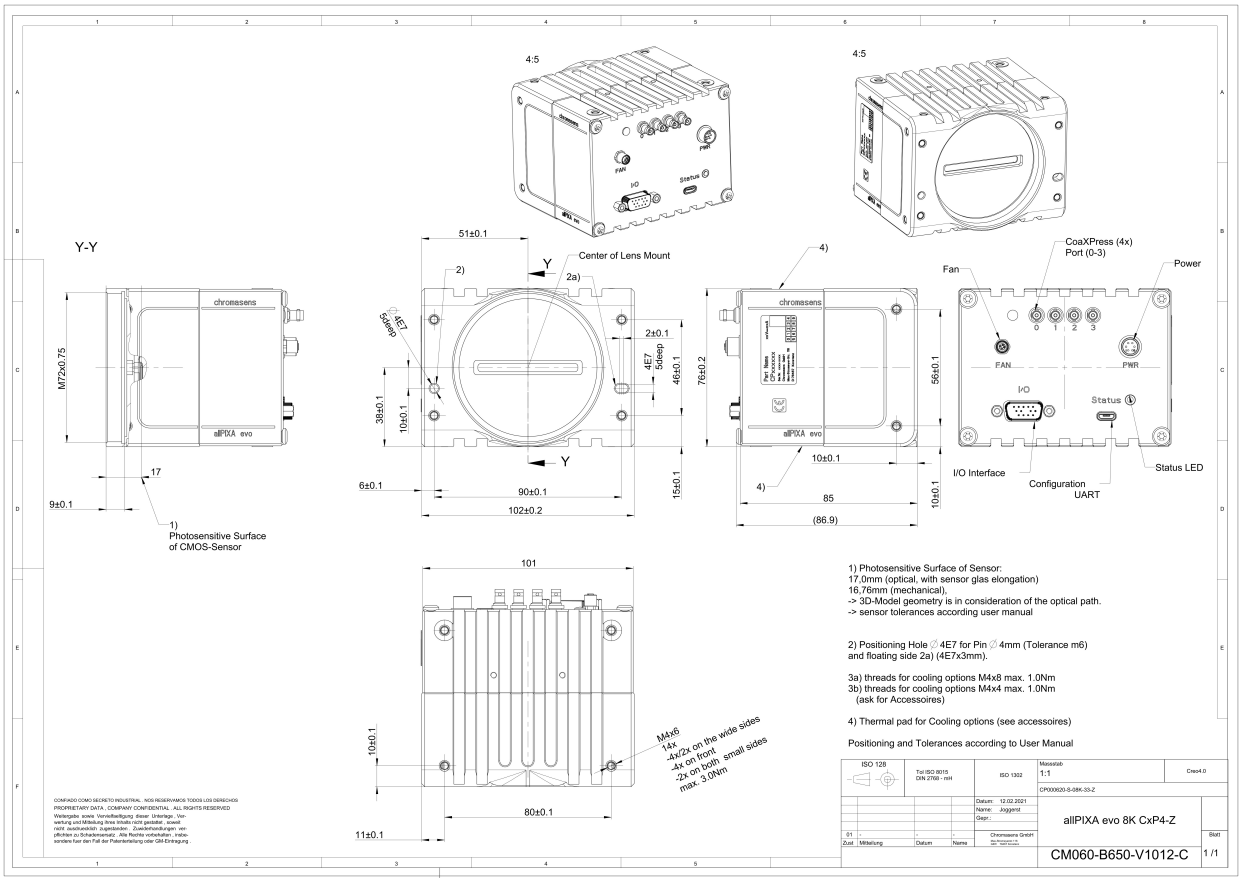
Alignment and orientation of the 8k sensor

Feature	Value
First pixel	Left side
Sensor position alignment	X: < ± 100 µm Y: < ± 100 µm Y: < ± 100 µm
Sensor rotation alignment	Y: < ± 0.1° Z: < ± 0.1°
Planarity of the sensor interface	< ± 0.5 µm
Sensor window thickness	0.7 mm
Refraction index	1.5
Optical path extension	0.35 mm

Mechanical dimensions



Dimensional drawing of the allPIXA evo 8k CXP - interface position Y

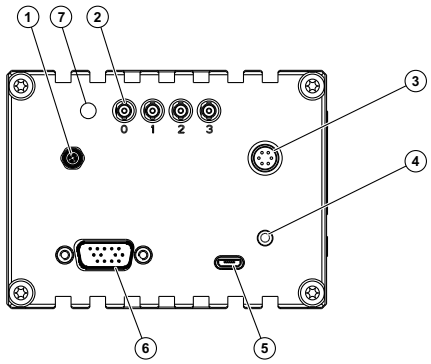


Dimensional drawing of the allPIXA evo 8k CXP - interface position Z

Download as pdf-file

Download dimensional drawing of the allPIXA evo 8k CXP – interface position Y
Download dimensional drawing of the allPIXA evo 8k CXP interface position Z

Interface specification



1	Connector for additional fan	**2**	Video output port (4 × CoaXPress 2.0)
3	Power supply	**4**	Status LED
5	Debugging port	**6**	Digital I/O port
7	CXP Interface LED		

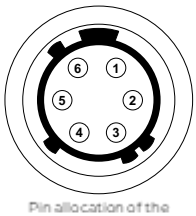
Line rate

Configuration	CXP 12 one port (CXP12_X1)	CXP 12 two ports (CXP12_X2)	CXP 12 four ports (CXP12_X4)
RGB 8: 8,192 × 3 pixel	43.2 kHz	90.1 kHz	100.0 kHz
RGB 10: 8,192 × 3 pixel	20.7 kHz	32.5 kHz	90.1 kHz
RGB 12: 8,192 × 3 pixel	20.7 kHz	32.5 kHz	90.1 kHz
RGBa 8: 8,192 × 4 pixel	32.5 kHz	68.2 kHz	100.0 kHz
RGBa 10: 8,192 × 4 pixel	15.6 kHz	32.5 kHz	68.2 kHz
RGBa 12: 8,192 × 4 pixel	15.6 kHz	32.5 kHz	68.2 kHz
Mono 8: 8,192 × 1 pixel	100.0 kHz	100.0 kHz	100.0 kHz
Mono 10: 8,192 × 1 pixel	65.0 kHz	100.0 kHz	100.0 kHz
Mono 12: 8,192 × 1 pixel	65.0 kHz	100.0 kHz	100.0 kHz

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

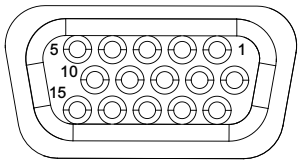
Digital I/O port

NOTE

Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS422 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

Micro USB

The Micro-USB connection is currently used for debugging information.

LED status indicator

CXP Interface LED

Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Solid orange	The system is booting.
	Flash_1_1red	The device is powered but not connected (not applicable to a device reliant on PoCXP power).
	AlternateFlash_12_5 green/orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is active.
	Flash_12_5 orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is not in use.
	AlternateFlash_0_5 red/green	The device/host is incompatible, PoCXP is active.
	AlternateFlash_0_5 red/orange	The device/host is incompatible, PoCXP is not in use.
	Solid red	PoCXP is over-current (host only).
	Solid green	The device/host is connected, but no data is transferred.
	Flash_1_ orange	The device/host is connected, waiting for event (e.g. trigger).
	Flash_12_5 green	The device/host is connected, data is being transferred.
	500ms red pulse	Error during data transfer (e.g. CRC error, single-bit error) is detected. In case of multiple errors, there shall be at least two green Flash_12_5 pulses, before the next error is indicated.
	AlternateFlash_0_5 green/orange	A connection test packet is being sent.
	AlternateFlash_0_5 red/green/orange	The compliance test mode is enabled (device only).
	Flash_12_5 red	A system error (e.g. internal error) ocurred.

Status LED

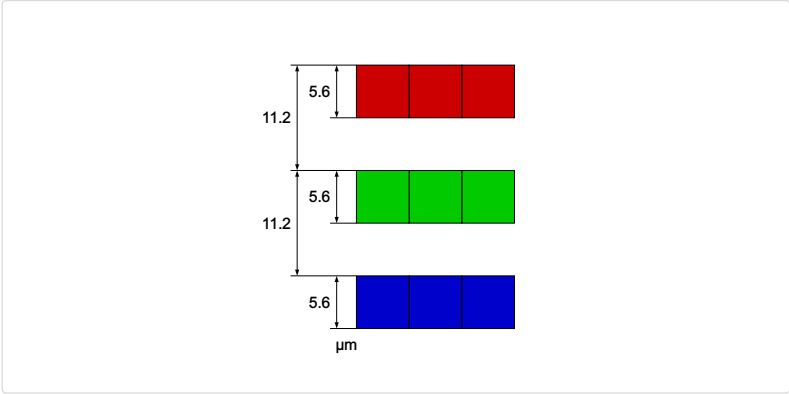
Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Blue continuous	The device is OK and provides image data. Between image gaps the LED is off.
	Green continuous	The device is in power-up mode.
	Green blinking	The device is OK and ready.
	Yellow continuous	Warning-state: The device is operational.
	Red continuous	Error-state: The device is not operational.

allPIXA evo 10k DXGE

Camera specifications

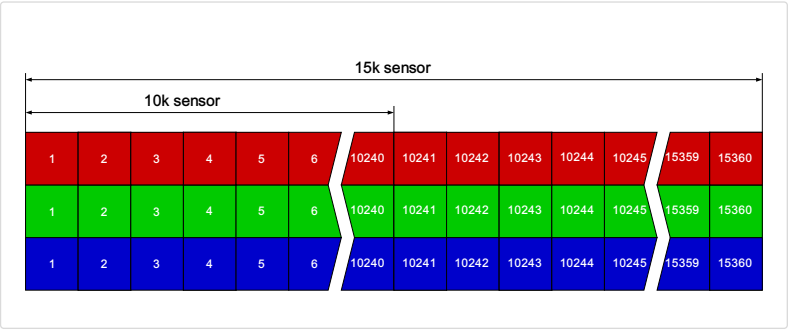
Sensor	Tri-linear CMOS color line sensor
Pixel size	5.6 µm × 5.6 µm
Line spacing	5.6 µm between R-G & G-B
Spectral sensitivity	360 nm – 960 nm
Resolution	10240 pixels × 3 lines
Video output	Single/Dual 10GigE, GigE Vision® 2.0 compliant
Data format	3 × 8/10/12 Bit color **or** 1 × 8/10/12 Bit mono
Trigger Mode	Frame Start / Frame Active / Line Start External trigger Line trigger / Encoder and Frame trigger
Video output port	2 × SFP+
Interface position	X
Digital I/O port	External I/O (15 pin HD D-Sub, fem.)
Power supply	6 pin Hirose, male 12 V – 24 V DC ± 10 %; 1 A @ 24 V
Debugging port	USB 2.0 (Micro USB)
Lens mount / adapter	M72 × 0.75 mm / F-mount
Housing dimensions	102 mm × 76 mm × 82 mm (W × H × D)
Weight	0.9 kg
Temperature during operation	0 °C – 60 °C; 32 °F – 140 °F
Humidity during operation	20 % – 85 % relative air humidity, non condensing
Temperature during transport and storage	-20 °C – +85 °C; -4 °F – +185 °F
Protection category	IP50
Certifications	CE, RoHS
General ambient conditions	
Transport	IEC 721-3-3:IE33
Operation	IEC 721-3-3:IE21
Storage	IEC 721-3-3:IE11

Line scan sensor



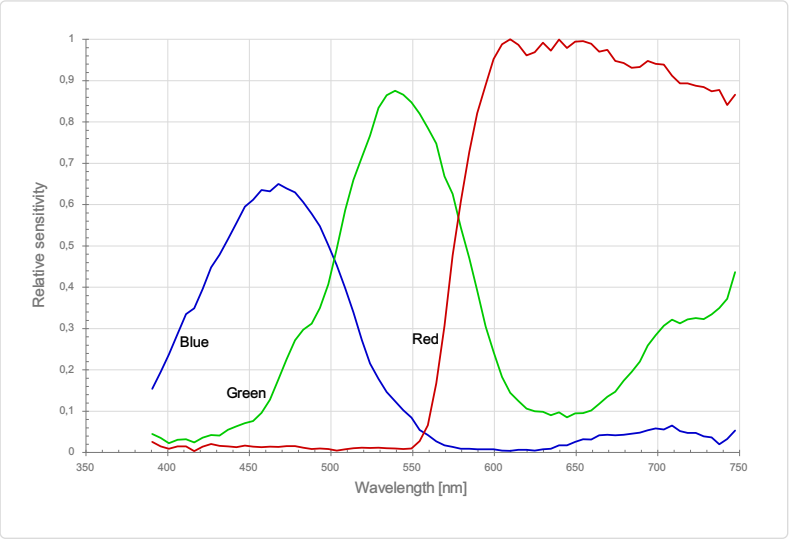
Sensor line spacing

Sensor pixel arrangement

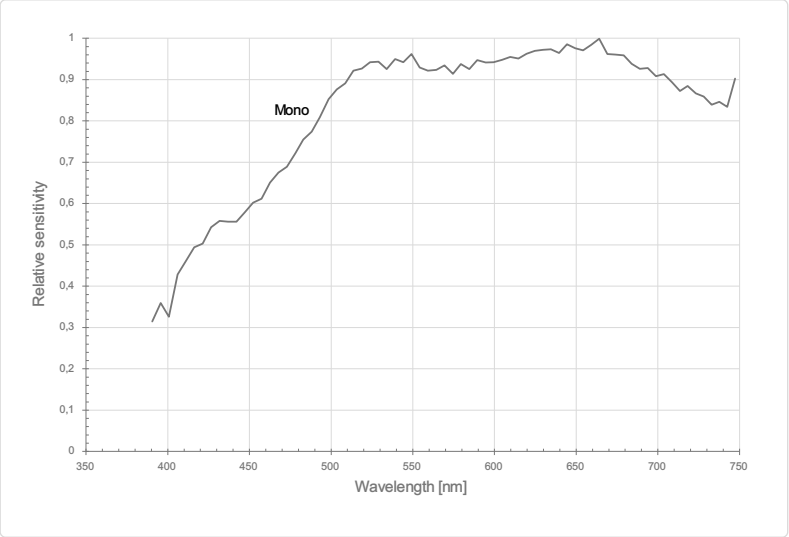


Sensor pixel arrangement

Spectral sensitivity

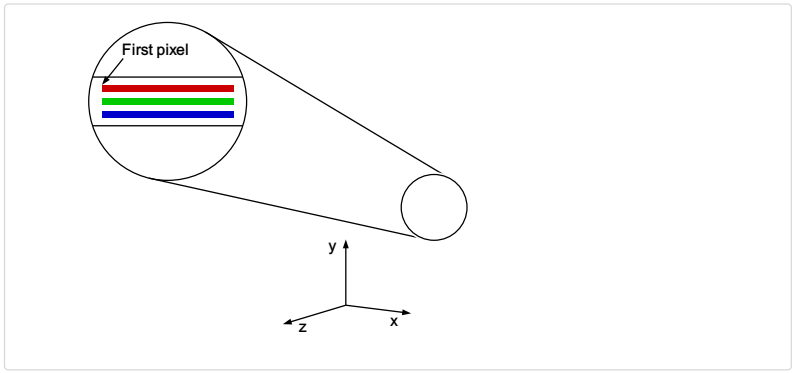


Measured relative spectral sensitivity of the 10k and 15k sensor - color



Measured relative spectral sensitivity of the 10k and 15k sensor - mono

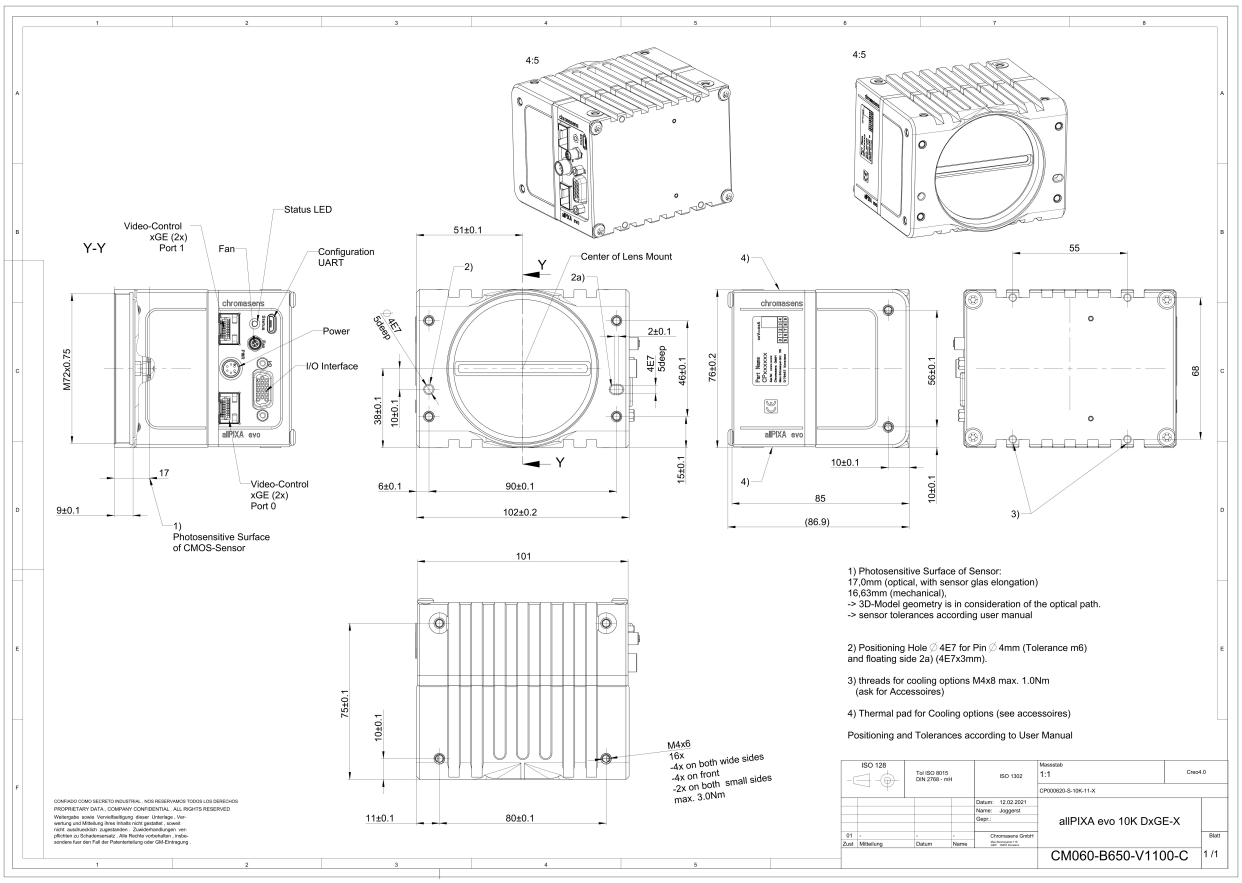
Sensor alignment and orientation



Alignment and orientation of the 10k sensor

Feature	Value
First pixel	Left side
Sensor position alignment	X: < ± 100 µm Y: < ± 100 µm Y: < ± 100 µm
Sensor rotation alignment	Y: < ± 0.1° Z: < ± 0.1°
Planarity of the sensor interface	< ± 0.5 µm
Sensor window thickness	1.1 mm
Refraction index	1.5
Optical path extension	0.55 mm

Mechanical dimensions

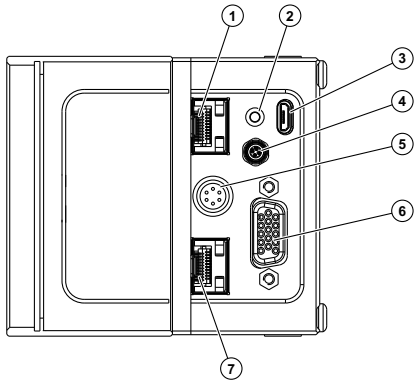


Dimensional drawing of the allPIXA evo 10k DXGE - interface position X

Download as pdf-file

Download dimensional drawing of the allPIXA evo 10k DXGE – interface position X

Interface specification



1	Video output SFP+ port 1 (10GigE)	**2**	Status LED
3	Debugging port	**4**	Connector for additional fan
5	Power supply	**6**	Digital I/O port
7	Video output SFP+ port 2 (10GigE)		

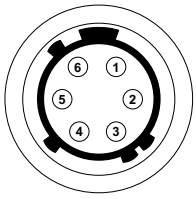
Line rate

Configuration	Single 10 GigE	Dual 10 GigE
RGB 8: 10,240 × 3 pixel	38.5 kHz	68.4 kHz
RGB 10: 10,240 × 3 pixel	19.3 kHz	34.7 kHz
RGB 12: 10,240 × 3 pixel	19.3 kHz	37.7 kHz
Mono 8: 10,240 × 1 pixel	68.4 kHz	68.4 kHz
Mono 10: 10,240 × 1 pixel	57.4 kHz	68.4 kHz
Mono 12: 10,240 × 1 pixel	57.4 kHz	68.4 kHz

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

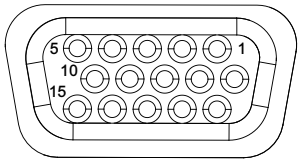
Digital I/O port

NOTE

Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS422 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

Micro USB

The Micro-USB connection is currently used for debugging information.

LED status indicator

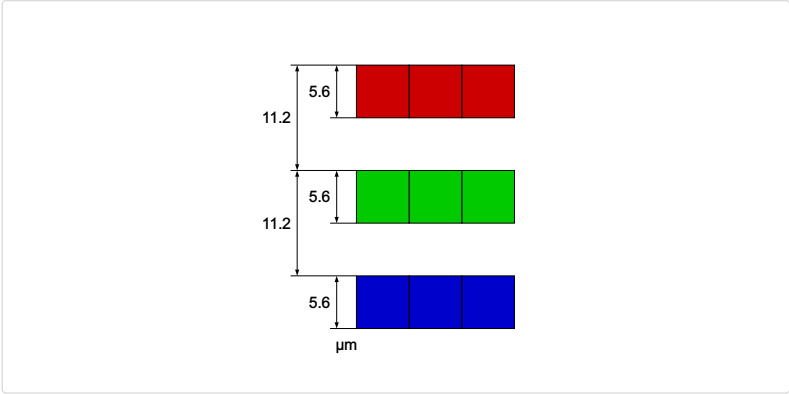
Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Blue continuous	The device is OK and provides image data. Between image gaps the LED is off.
	Green continuous	The device is in power-up mode.
	Green blinking	The device is OK and ready.
	Yellow continuous	Warning-state: The device is operational.
	Red continuous	Error-state: The device is not operational.

allPIXA evo 10k CXP

Camera specifications

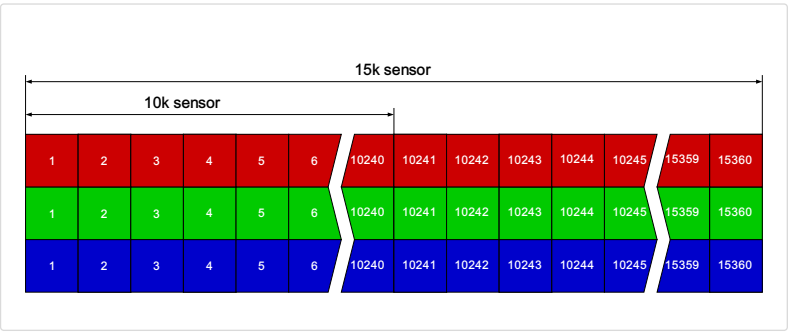
Sensor	Tri-linear CMOS color line sensor
Pixel size	5.6 µm × 5.6 µm
Line spacing	5.6 µm between R-G & G-B
Spectral sensitivity	360 nm – 960 nm
Resolution	10240 pixels × 3 lines
Video output	4 × CoaXPress 2.0
Data format	3 × 8/10/12 Bit color **or** 1 × 8/10/12 Bit mono
Trigger Mode	Frame Start / Frame Active / Line Start External trigger Line trigger / Encoder and Frame trigger
Video output port	4 × CXP-12 Micro-BNC
Interface position	Y, Z
Digital I/O port	External I/O (15 pin HD D-Sub, fem.)
Power supply	6 pin Hirose, male 12 V – 24 V DC ± 10 %; 1 A @ 24 V
Debugging port	USB 2.0 (Micro USB)
Lens mount / adapter	M72 × 0.75 mm / F-mount
Housing dimensions	102 mm × 76 mm × 82 mm (W × H × D)
Weight	0.9 kg
Temperature during operation	0 °C – 60 °C; 32 °F – 140 °F
Humidity during operation	20 % – 85 % relative air humidity, non condensing
Temperature during transport and storage	-20 °C – +85 °C; -4 °F – +185 °F
Protection category	IP50
Certifications	CE, RoHS
General ambient conditions	
Transport	IEC 721-3-3:IE33
Operation	IEC 721-3-3:IE21
Storage	IEC 721-3-3:IE11

Line scan sensor



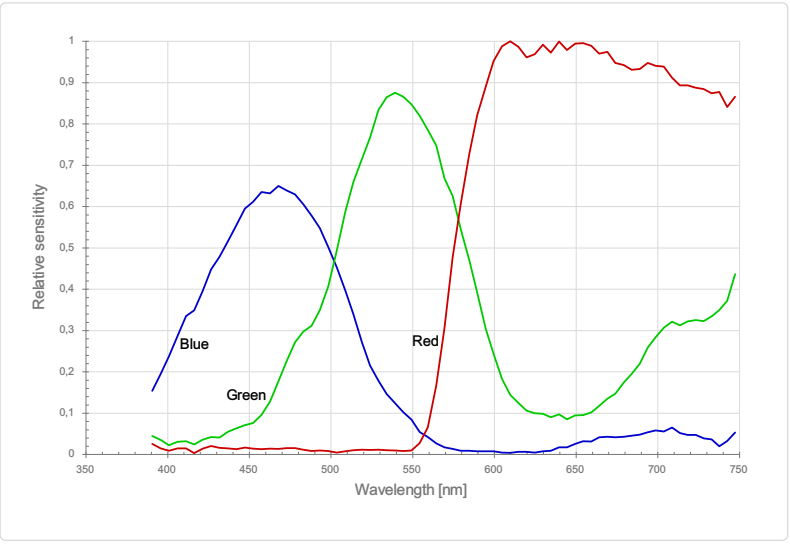
Sensor line spacing

Sensor pixel arrangement

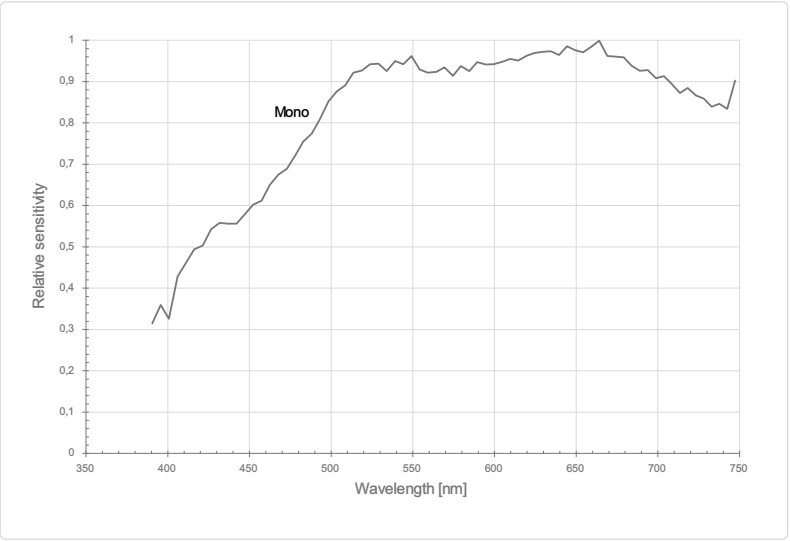


Sensor pixel arrangement

Spectral sensitivity

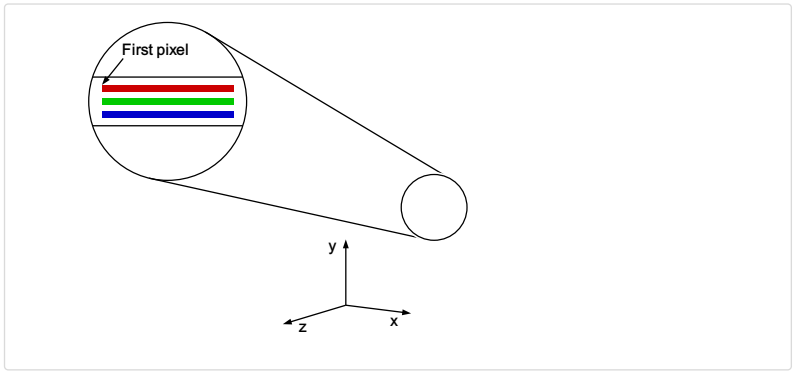


Measured relative spectral sensitivity of the 10k and 15k sensor - color



Measured relative spectral sensitivity of the 10k and 15k sensor - mono

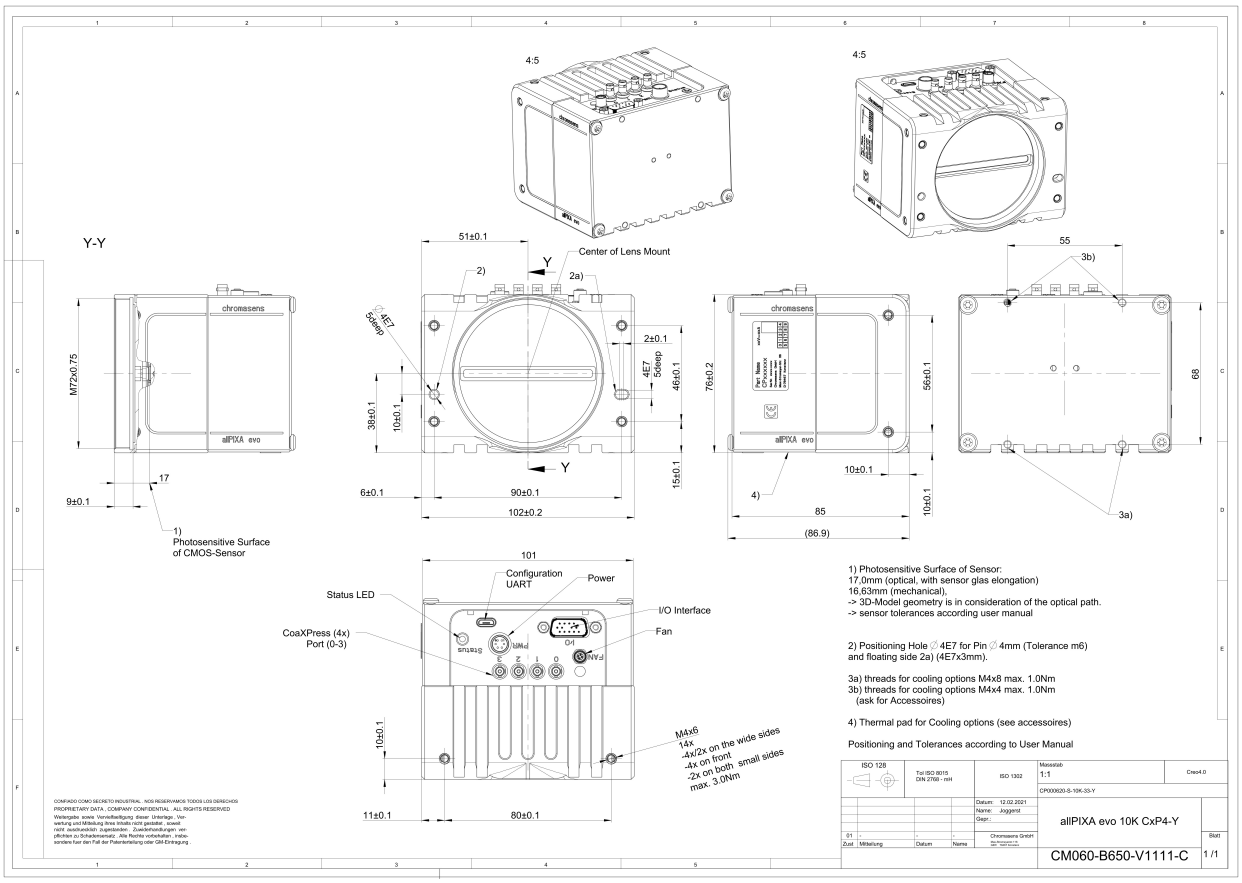
Sensor alignment and orientation



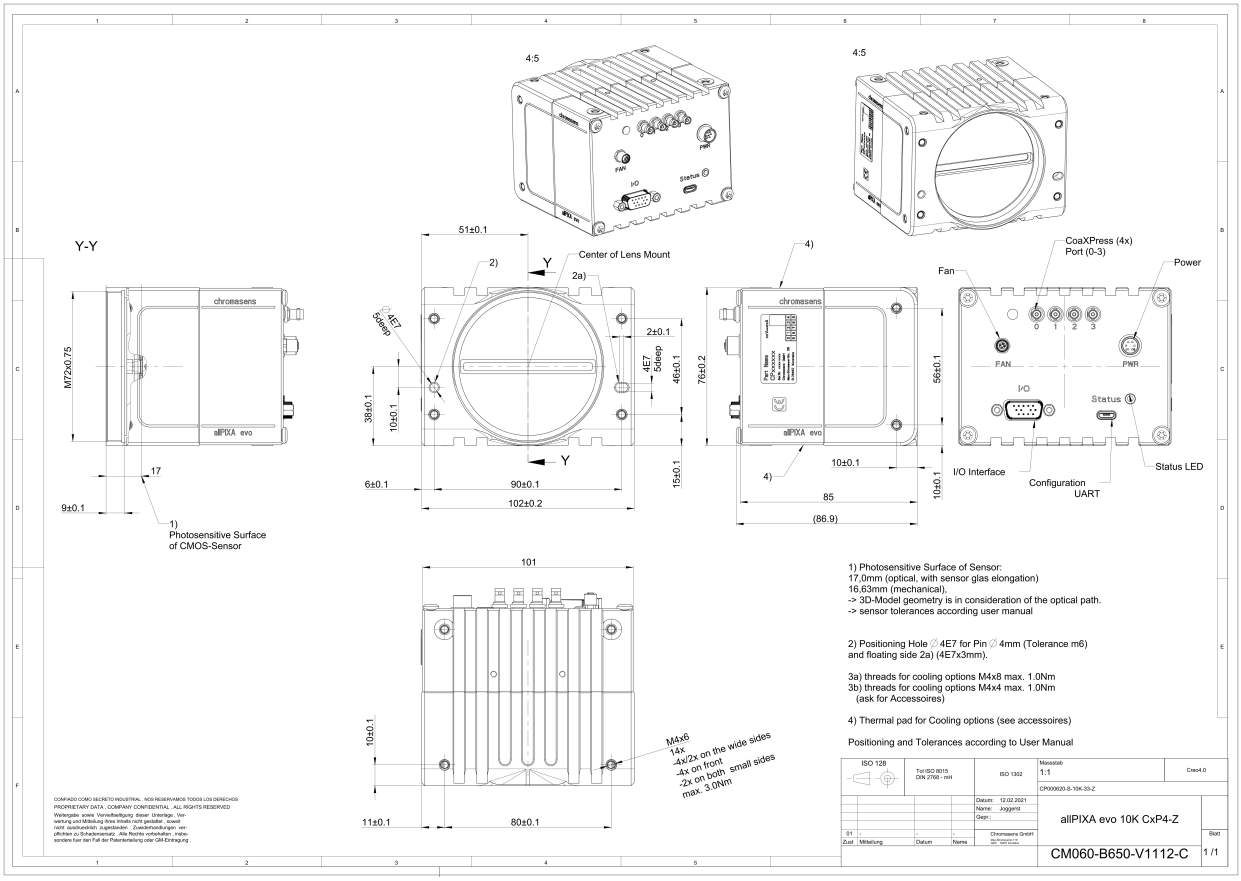
Alignment and orientation of the 10k sensor

Feature	Value
First pixel	Left side
Sensor position alignment	X: < ± 100 µm Y: < ± 100 µm Y: < ± 100 µm
Sensor rotation alignment	Y: < ± 0.1° Z: < ± 0.1°
Planarity of the sensor interface	< ± 0.5 µm
Sensor window thickness	1.1 mm
Refraction index	1.5
Optical path extension	0.55 mm

Mechanical dimensions



Dimensional drawing of the allPIXA evo 10k CXP - interface position Y



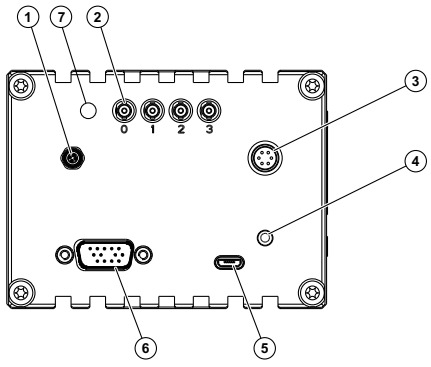
Dimensional drawing of the allPIXA evo 10k CXP - interface position Z

Download as pdf-file

[Download dimensional drawing of the allPIXA evo 10k CXP – interface position Y]

[Download dimensional drawing of the allPIXA evo 10k CXP interface position Z]

Interface specification



1	Connector for additional fan	**2**	Video output port (4 × CoaXPress 2.0)
3	Power supply	**4**	Status LED
5	Debugging port	**6**	Digital I/O port
7	CXP Interface LED		

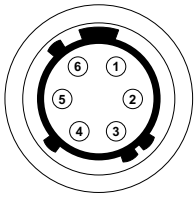
Line rate

Configuration	Line rate CXP one port (CXP12_X1)	Line rate CXP two ports (CXP12_X2)	Line rate CXP four ports (CXP12_X4)
RGB 8: 10,240 × 3 pixel	37.7 kHz	68.4 kHz	68,4 kHz
RGB 10: 10,240 × 3 pixel	16.4 kHz	34.7 kHz	68,4 kHz
RGB 12: 10,240 × 3 pixel	16.4 kHz	34.7 kHz	68.4 kHz
Mono 8: 10,240 × 1 pixel	68.4 kHz	68.4 kHz	68.4 kHz
Mono 10: 10,240 × 1 pixel	52.2 kHz	68.4 kHz	68.4 kHz
Mono 12: 10,240 × 1 pixel	52.2 kHz	68.4 kHz	68.4 kHz

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

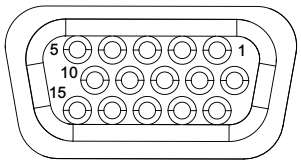
Digital I/O port

NOTE

Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS422 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

Micro USB

The Micro-USB connection is currently used for debugging information.

LED status indicator

CXP Interface LED

Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Solid orange	The system is booting.
	Flash_1_1red	The device is powered but not connected (not applicable to a device reliant on PoCXP power).
	AlternateFlash_12_5 green/orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is active.
	Flash_12_5 orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is not in use.
	AlternateFlash_0_5 red/green	The device/host is incompatible, PoCXP is active.
	AlternateFlash_0_5 red/orange	The device/host is incompatible, PoCXP is not in use.
	Solid red	PoCXP is over-current (host only).
	Solid green	The device/host is connected, but no data is transferred.
	Flash_1_ orange	The device/host is connected, waiting for event (e.g. trigger).
	Flash_12_5 green	The device/host is connected, data is being transferred.
	500ms red pulse	Error during data transfer (e.g. CRC error, single-bit error) is detected. In case of multiple errors, there shall be at least two green Flash_12_5 pulses, before the next error is indicated.
	AlternateFlash_0_5 green/orange	A connection test packet is being sent.
	AlternateFlash_0_5 red/green/orange	The compliance test mode is enabled (device only).
	Flash_12_5 red	A system error (e.g. internal error) ocurred.

Status LED

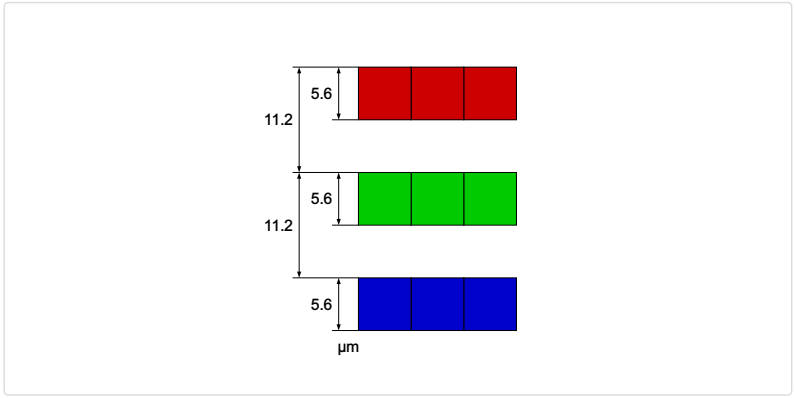
Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Blue continuous	The device is OK and provides image data. Between image gaps the LED is off.
	Green continuous	The device is in power-up mode.
	Green blinking	The device is OK and ready.
	Yellow continuous	Warning-state: The device is operational.
	Red continuous	Error-state: The device is not operational.

allPIXA evo 15k DXGE

Camera specifications

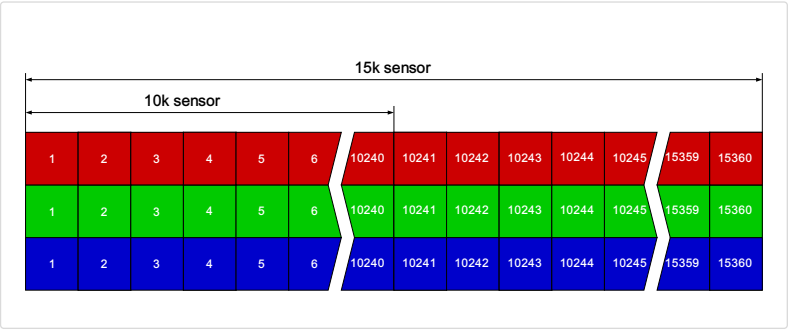
Sensor	Tri-linear CMOS color line sensor
Pixel size	5.6 µm × 5.6 µm
Line spacing	5.6 µm between R-G & G-B
Spectral sensitivity	360 nm – 960 nm
Resolution	15360 pixels × 3 lines
Video output	Single/Dual 10GigE, GigE Vision® 2.0 compliant
Data format	3 × 8/10/12 Bit color **or** 1 × 8/10/12 Bit mono
Trigger Mode	Frame Start / Frame Active / Line Start External trigger Line trigger / Encoder and Frame trigger
Video output port	2 × SFP+
Interface position	X
Digital I/O port	External I/O (15 pin HD D-Sub, fem.)
Power supply	6 pin Hirose, male 12 V – 24 V DC ± 10 %; 1 A @ 24 V
Debugging port	USB 2.0 (Micro USB)
Lens mount / adapter	M95 × 1 mm
Housing dimensions	102 mm × 101 mm × 82 mm (W × H × D)
Weight	0.9 kg
Temperature during operation	0 °C – 60 °C; 32 °F – 140 °F
Humidity during operation	20 % – 85 % relative air humidity, non condensing
Temperature during transport and storage	-20 °C – +85 °C; -4 °F – +185 °F
Protection category	IP50
Certifications	CE, RoHS
General ambient conditions	
Transport	IEC 721-3-3:IE33
Operation	IEC 721-3-3:IE21
Storage	IEC 721-3-3:IE11

Line scan sensor



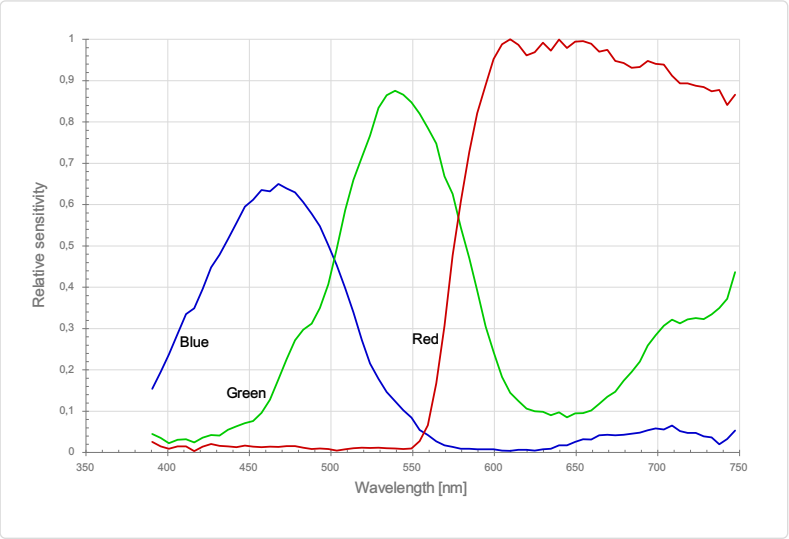
Sensor line spacing

Sensor pixel arrangement

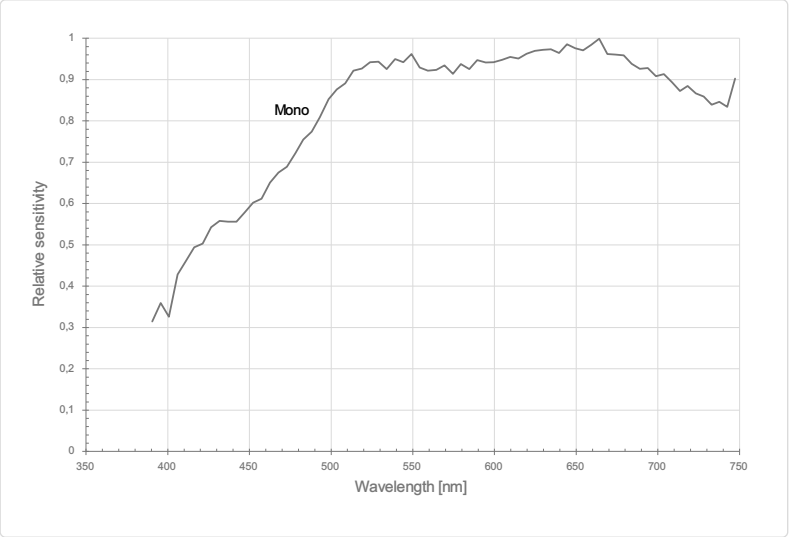


Sensor pixel arrangement

Spectral sensitivity

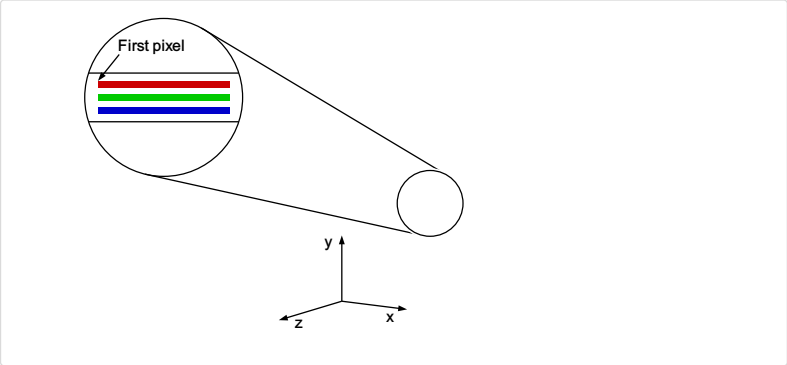


Measured relative spectral sensitivity of the 10k and 15k sensor - color



Measured relative spectral sensitivity of the 10k and 15k sensor - mono

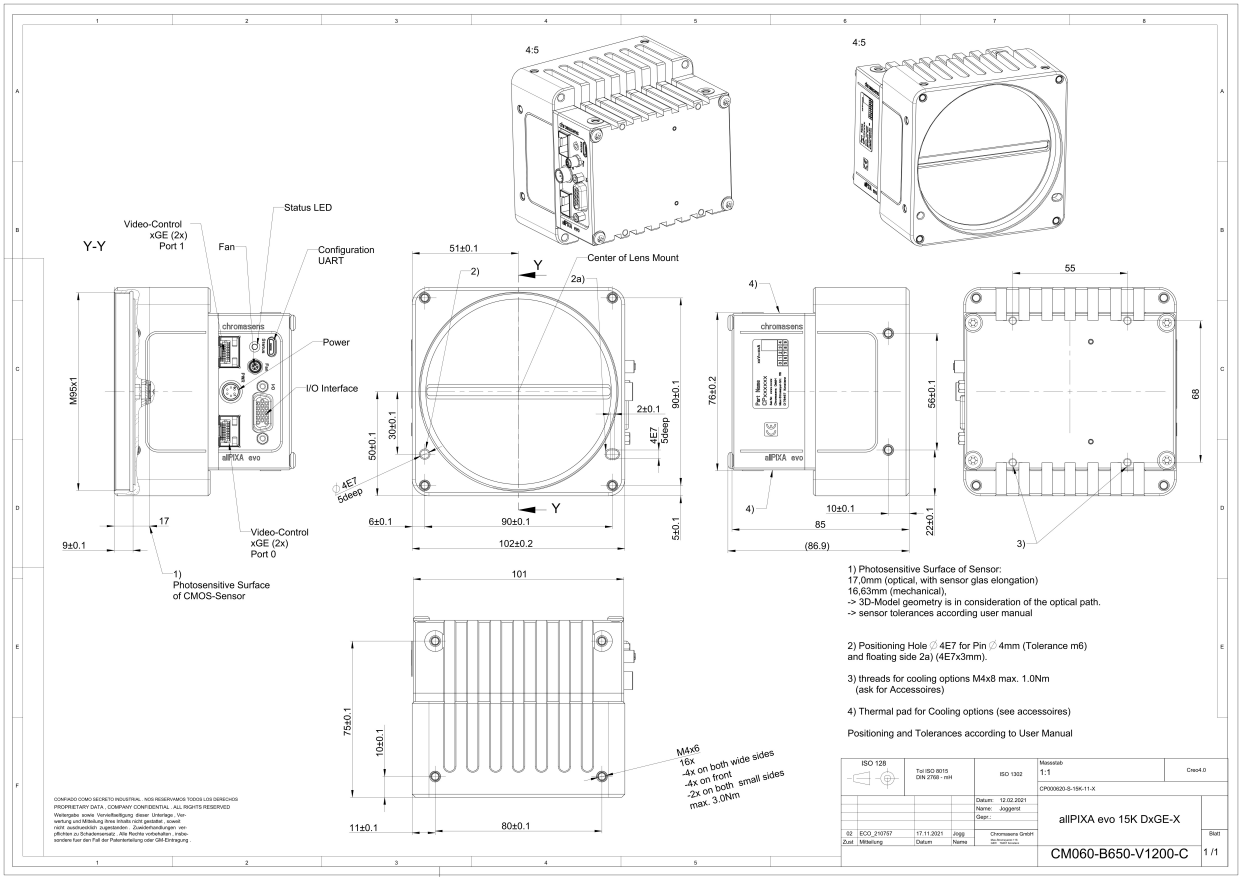
Sensor alignment and orientation



Alignment and orientation of the 15k sensor

Feature	Value
First pixel	Left side
Sensor position alignment	X: < ± 100 µm Y: < ± 100 µm Y: < ± 100 µm
Sensor rotation alignment	Y: < ± 0.1° Z: < ± 0.1°
Planarity of the sensor interface	< ± 0.5 µm
Sensor window thickness	1.1 mm
Refraction index	1.5
Optical path extension	0.55 mm

Mechanical dimensions

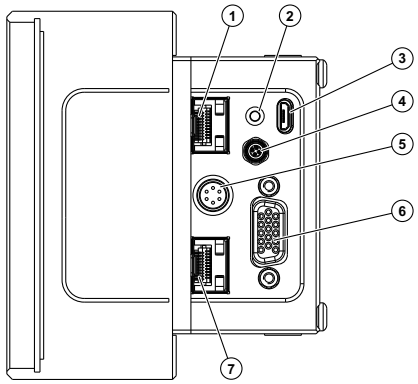


Dimensional drawing of the allPIXA evo 15k DXGE – interface position X

Download as pdf-file

Download dimensional drawing of the allPIXA evo 15k DXGE – interface position X

Interface specification



1	Video output SFP+ Port 1 (10GigE)	**2**	Status LED
3	Debugging port	**4**	Connector for additional fan
5	Power supply	**6**	Digital I/O port
7	Video output SFP+ Port 2 (10GigE)		

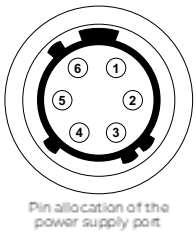
Line rate

Configuration	Single 10 GigE	Dual 10 GigE
RGB 8: 15,360 × 3 pixel	25.8 kHz	48.8 kHz
RGB 10: 15,360 × 3 pixel	12.9 kHz	23.3 kHz
RGB 12: 15,360 × 3 pixel	12.9 kHz	23.3 kHz
Mono 8: 15,360 × 1 pixel	68.4 kHz	68.4 kHz
Mono 10: 15,360 × 1 pixel	38.5 kHz	68.4 kHz
Mono 12: 15,360 × 1 pixel	38.5 kHz	68.4 kHz

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

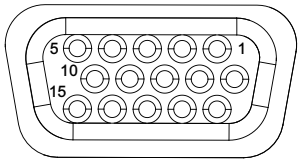
Digital I/O port

NOTE

Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS422 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

Micro USB

The Micro-USB connection is currently used for debugging information.

LED status indicator

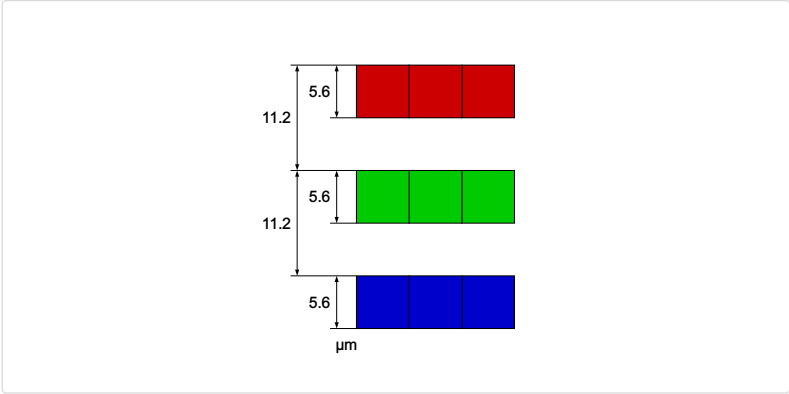
Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Blue continuous	The device is OK and provides image data. Between image gaps the LED is off.
	Green continuous	The device is in power-up mode.
	Green blinking	The device is OK and ready.
	Yellow continuous	Warning-state: The device is operational.
	Red continuous	Error-state: The device is not operational.

allPIXA evo 15k CXP

Camera specifications

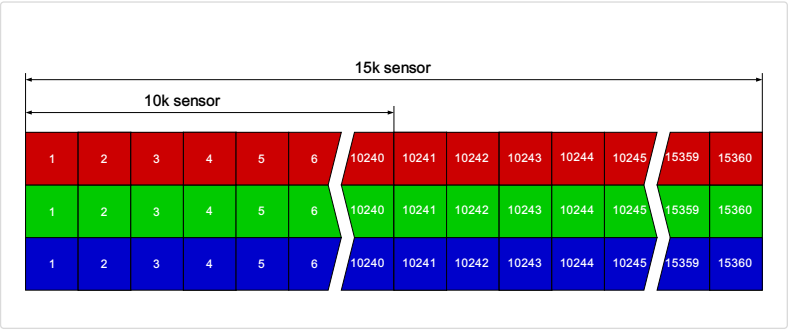
Sensor	Tri-linear CMOS color line sensor
Pixel size	5.6 µm × 5.6 µm
Line spacing	5.6 µm between R-G & G-B
Spectral sensitivity	360 nm – 960 nm
Resolution	15360 pixels × 3 lines
Video output	4 × CoaXPress 2.0
Data format	3 × 8/10/12 Bit color **or** 1 × 8/10/12 Bit mono
Trigger Mode	Frame Start / Frame Active / Line Start External trigger Line trigger / Encoder and Frame trigger
Video output port	4 × CXP-12 Micro-BNC
Interface position	Y, Z
Digital I/O port	External I/O (15 pin HD D-Sub, fem.)
Power supply	6 pin Hirose, male 12 V – 24 V DC ± 10 %; 1 A @ 24 V
Debugging port	USB 2.0 (Micro USB)
Lens mount / adapter	M95 × 1 mm
Housing dimensions	102 mm × 101 mm × 82 mm (W × H × D)
Weight	0.9 kg
Temperature during operation	0 °C – 60 °C; 32 °F – 140 °F
Humidity during operation	20 % – 85 % relative air humidity, non condensing
Temperature during transport and storage	-20 °C – +85 °C; -4 °F – +185 °F
Protection category	IP50
Certifications	CE, RoHS
General ambient conditions	
Transport	IEC 721-3-3:IE33
Operation	IEC 721-3-3:IE21
Storage	IEC 721-3-3:IE11

Line scan sensor



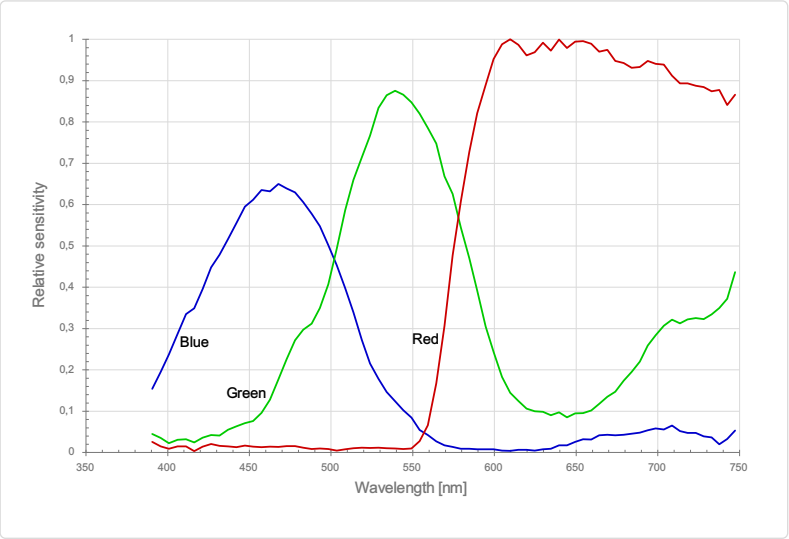
Sensor line spacing

Sensor pixel arrangement

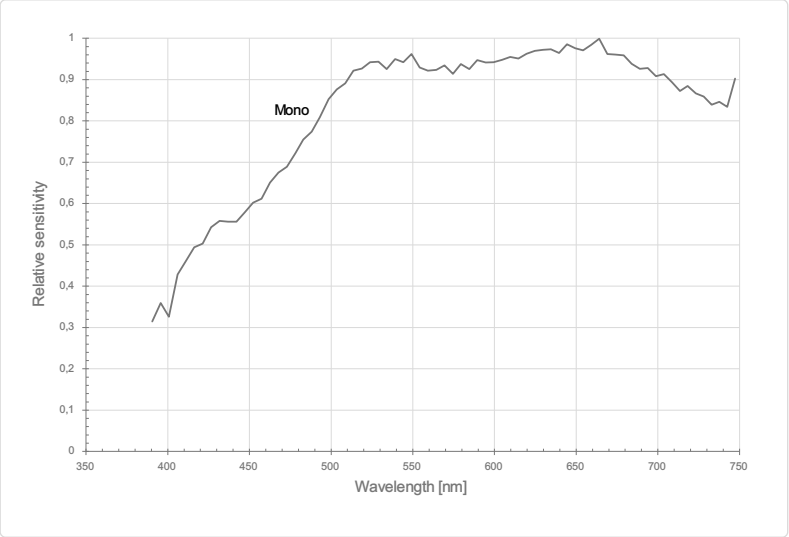


Sensor pixel arrangement

Spectral sensitivity

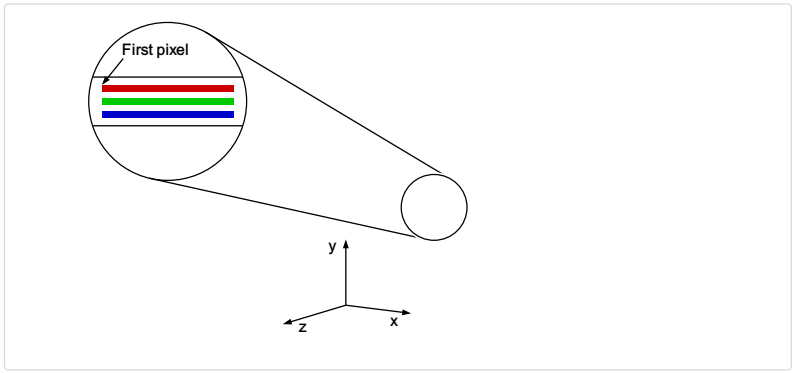


Measured relative spectral sensitivity of the 10k and 15k sensor - color



Measured relative spectral sensitivity of the 10k and 15k sensor - mono

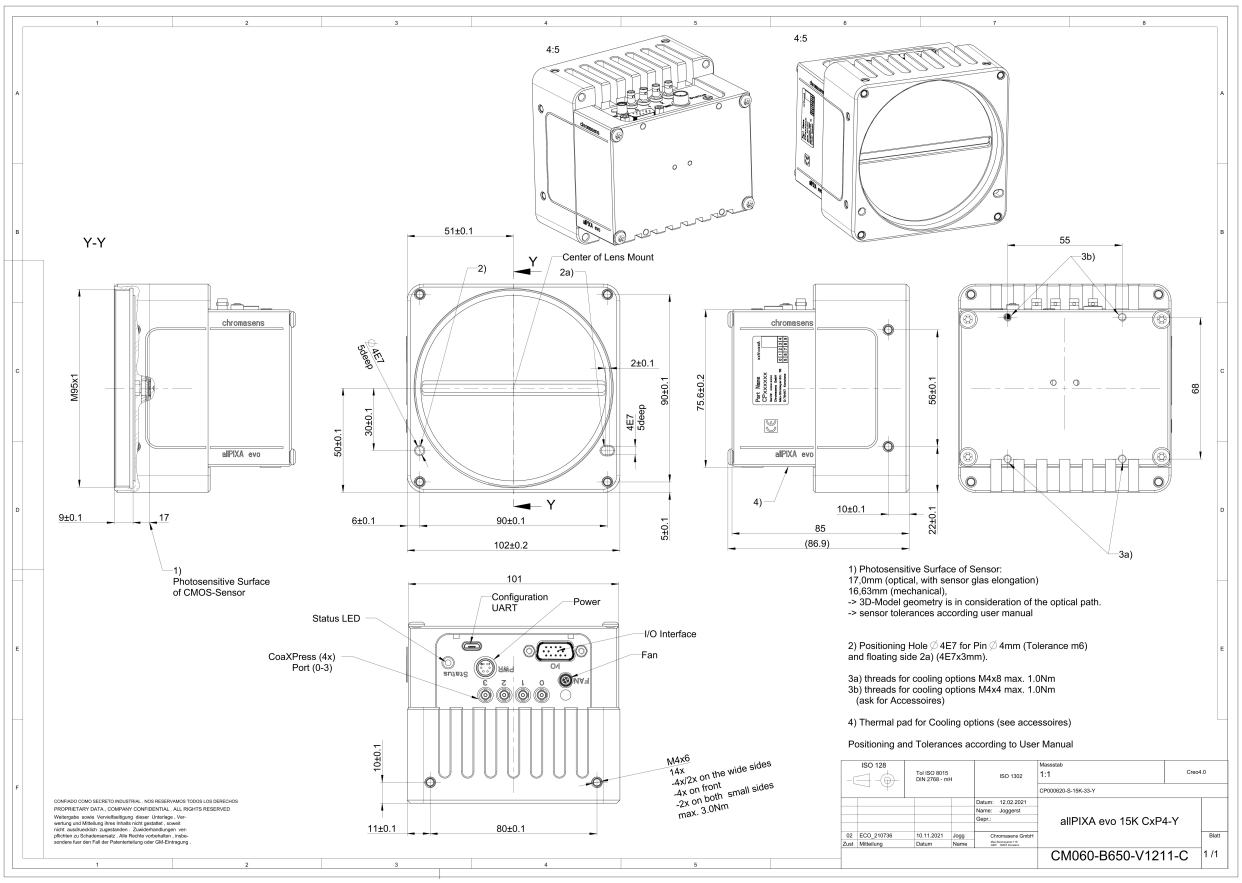
Sensor alignment and orientation



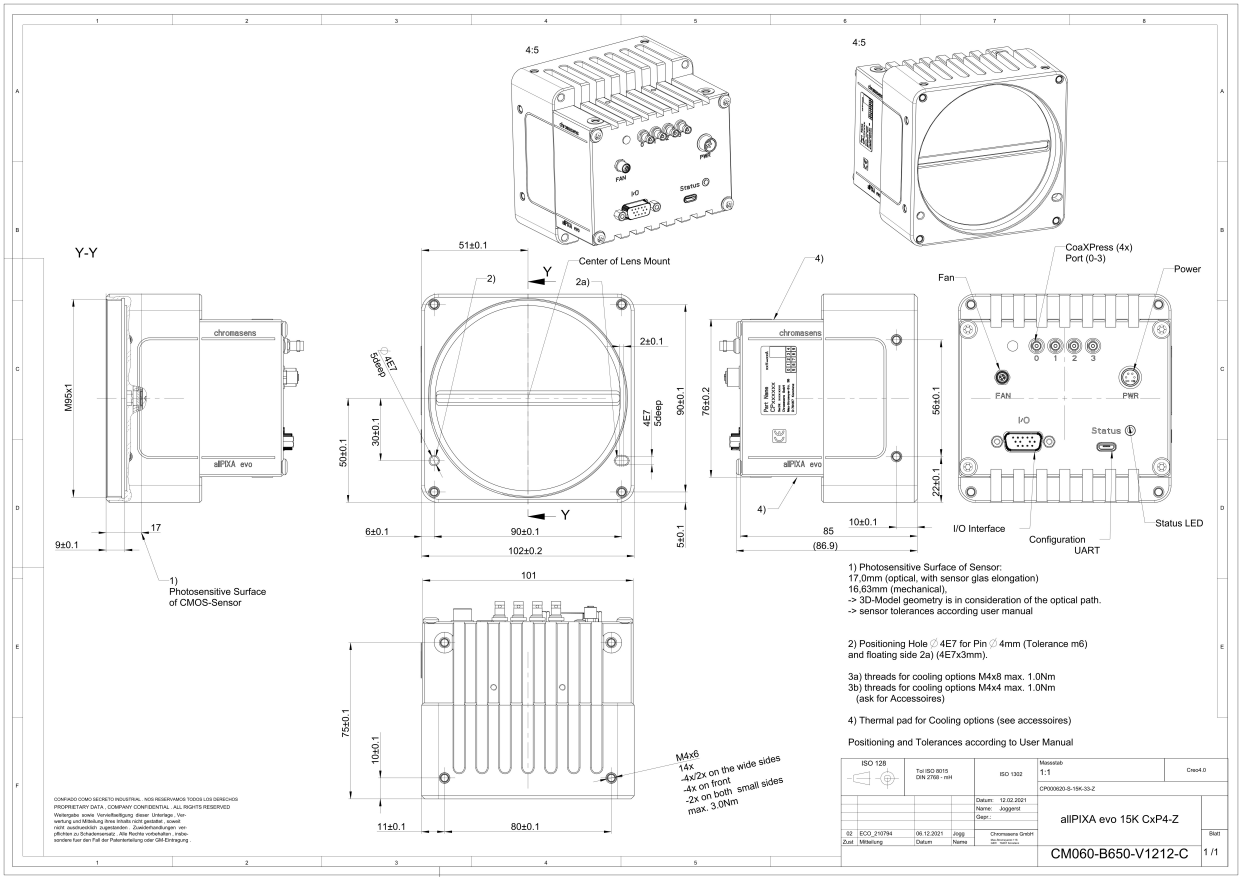
Alignment and orientation of the 15k sensor

Feature	Value
First pixel	Left side
Sensor position alignment	X: < ± 100 µm Y: < ± 100 µm Y: < ± 100 µm
Sensor rotation alignment	Y: < ± 0.1° Z: < ± 0.1°
Planarity of the sensor interface	< ± 0.5 µm
Sensor window thickness	1.1 mm
Refraction index	1.5
Optical path extension	0.55 mm

Mechanical dimensions



Dimensional drawing of the allPIXA evo 15k CXP - interface position Y



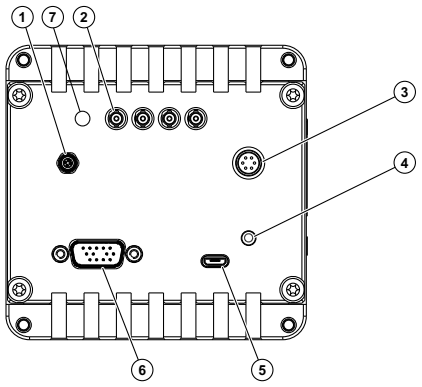
Dimensional drawing of the allPIXA evo 15k CXP - interface position Z

Download as pdf-file

[Download dimensional drawing of the allPIXA evo 15k CXP – interface position Y]

[Download dimensional drawing of the allPIXA evo 15k CXP interface position Z]

Interface specification



1	Connector for additional fan	**2**	Video output (4 × CoaXPress 2.0)
3	Power supply	**4**	Status LED
5	Debugging port	**6**	Digital I/O port
7	CXP Interface LED		

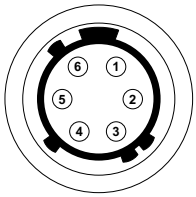
Line rate

Configuration	CXP 12 one port (CXP12_X1)	CXP 12 two ports (CXP12_X2)	CXP 12 four ports (CXP12_X4)
RGB 8: 15,360 × 3 pixel	23.3 kHz	48.6 kHz	68,4 kHz
RGB 10: 15,360 × 3 pixel	11.1 kHz	23.2 kHz	48.8 kHz
RGB 12: 15,360 × 3 pixel	11.1 kHz	23.2 kHz	48.8 kHz
Mono 8: 15,360 × 1 pixel	68.4 kHz	68.4 kHz	68.4 kHz
Mono 10: 15,360 × 1 pixel	35.0 kHz	68.4 kHz	68.4 kHz
Mono 12: 15,360 × 1 pixel	35.0 kHz	68.4 kHz	68.4 kHz

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

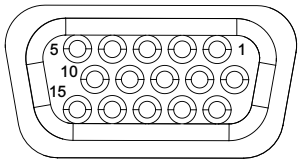
Digital I/O port

NOTE

Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS422 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

Micro USB

The Micro-USB connection is currently used for debugging information.

LED status indicator

CXP Interface LED

Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Solid orange	The system is booting.
	Flash_1_1red	The device is powered but not connected (not applicable to a device reliant on PoCXP power).
	AlternateFlash_12_5 green/orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is active.
	Flash_12_5 orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is not in use.
	AlternateFlash_0_5 red/green	The device/host is incompatible, PoCXP is active.
	AlternateFlash_0_5 red/orange	The device/host is incompatible, PoCXP is not in use.
	Solid red	PoCXP is over-current (host only).
	Solid green	The device/host is connected, but no data is transferred.
	Flash_1_ orange	The device/host is connected, waiting for event (e.g. trigger).
	Flash_12_5 green	The device/host is connected, data is being transferred.
	500ms red pulse	Error during data transfer (e.g. CRC error, single-bit error) is detected. In case of multiple errors, there shall be at least two green Flash_12_5 pulses, before the next error is indicated.
	AlternateFlash_0_5 green/orange	A connection test packet is being sent.
	AlternateFlash_0_5 red/green/orange	The compliance test mode is enabled (device only).
	Flash_12_5 red	A system error (e.g. internal error) ocurred.

Status LED

Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Blue continuous	The device is OK and provides image data. Between image gaps the LED is off.
	Green continuous	The device is in power-up mode.
	Green blinking	The device is OK and ready.
	Yellow continuous	Warning-state: The device is operational.
	Red continuous	Error-state: The device is not operational.

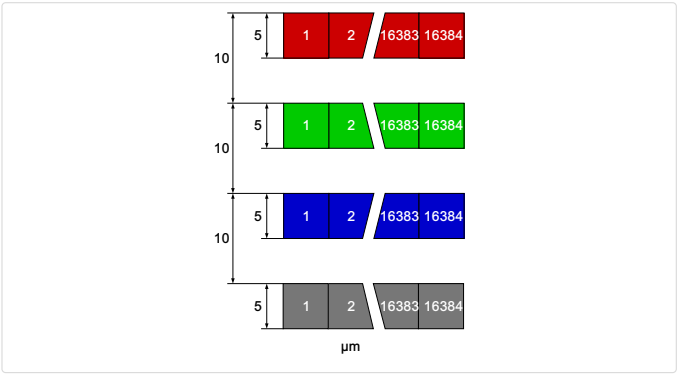
allPIXA evo 16k CXP

Camera specifications

Sensor	CMOS line scan sensor
Pixel size	5 µm × 5 µm
Line spacing	5 µm between R-G & G-B
Spectral sensitivity	
Resolution	16384 x 4 lines
Video output	4 × CoaXPress 2.0
Data format	3 × 8/10/12 Bit color **or** 1 × 8/10/12 Bit mono **or**
Trigger Mode	Frame Start / Frame Active / Line Start External trigger Line trigger / Encoder and Frame trigger
Video output port	4 × CXP-12 Micro-BNC
Interface position	Y, Z
Digital I/O port	External I/O (15 pin HD D-Sub, fem.)
Power supply	6 pin Hirose, male 12 V – 24 V DC ± 20 %; 1 A @ 24 V
Debugging port	USB 2.0 (Micro USB)
Lens mount / adapter	M95 × 1 mm
Housing dimensions	102 mm x 113 mm x 102 mm (W x H x D)
Weight	
Temperature during operation	0 °C – 60 °C; 32 °F – 140 °F
Humidity during operation	20 % – 85 % relative air humidity, non condensing
Temperature during transport and storage	-20 °C – +85 °C; -4 °F – +185 °F
Protection category	IP50
Certifications	CE, RoHS
General ambient conditions	
Transport	IEC 721-3-3:IE33
Operation	IEC 721-3-3:IE21
Storage	IEC 721-3-3:IE11

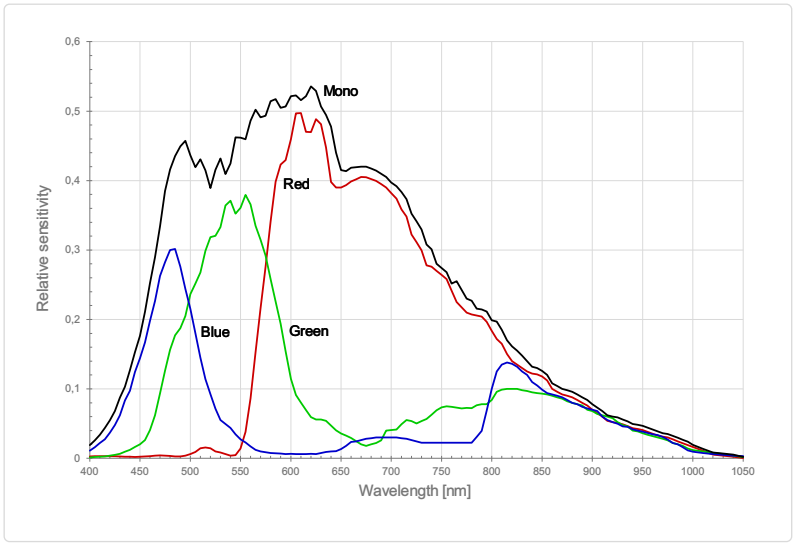
Line scan sensor

Sensor pixel arrangement



Sensor pixel arrangement

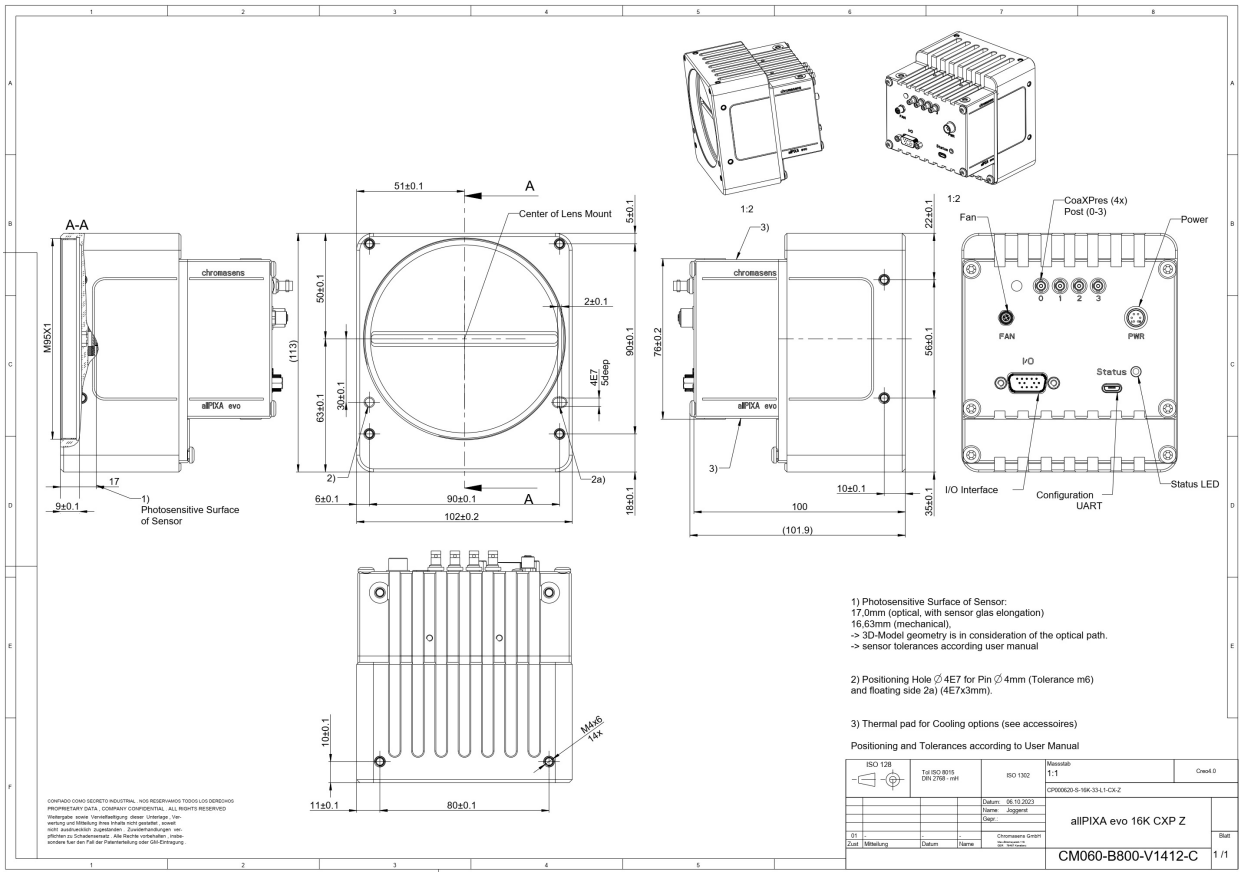
Spectral sensitivity



Measured relative sensitivity of the color and the mono sensor

Sensor alignment and orientation

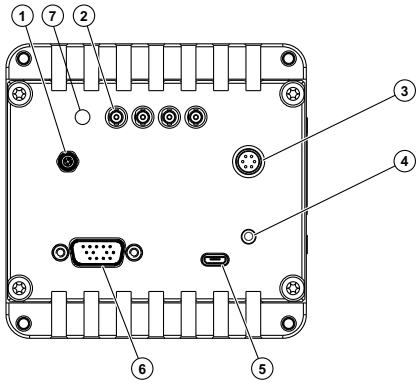
Mechanical dimensions



Dimensional drawing of the allPIXA evo 16k CXP - interface position Z

Download as pdf-file
[Dimensional drawing of the allPIXA evo 16k CXP – interface position Z]

Interface specification

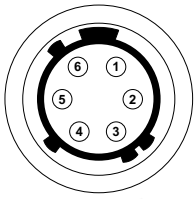


1	Connector for additional fan	**2**	Video output (4 × CoaXPress 2.0)
3	Power supply	**4**	Status LED
5	Debugging port	**6**	Digital I/O port
7	CXP Interface LED		

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

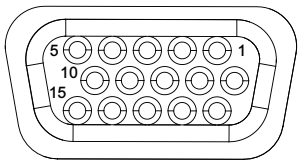
Digital I/O port

NOTE

Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS422 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

Micro USB

The Micro-USB connection is currently used for debugging information.

LED status indicator

CXP Interface LED

Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Solid orange	The system is booting.
	Flash_1_1red	The device is powered but not connected (not applicable to a device reliant on PoCXP power).
	AlternateFlash_12_5 green/orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is active.
	Flash_12_5 orange; shown for a minimum of 1s even if connection detection is faster	The Connection detection is in progress, PoCXP is not in use.
	AlternateFlash_0_5 red/green	The device/host is incompatible, PoCXP is active.
	AlternateFlash_0_5 red/orange	The device/host is incompatible, PoCXP is not in use.
	Solid red	PoCXP is over-current (host only).
	Solid green	The device/host is connected, but no data is transferred.
	Flash_1_ orange	The device/host is connected, waiting for event (e.g. trigger).
	Flash_12_5 green	The device/host is connected, data is being transferred.
	500ms red pulse	Error during data transfer (e.g. CRC error, single-bit error) is detected. In case of multiple errors, there shall be at least two green Flash_12_5 pulses, before the next error is indicated.
	AlternateFlash_0_5 green/orange	A connection test packet is being sent.
	AlternateFlash_0_5 red/green/orange	The compliance test mode is enabled (device only).
	Flash_12_5 red	A system error (e.g. internal error) ocurred.

Status LED

Color code	Behaviour	Description
	Off	No power supply or the input voltage is out of range.
	Blue continuous	The device is OK and provides image data. Between image gaps the LED is off.
	Green continuous	The device is in power-up mode.
	Green blinking	The device is OK and ready.
	Yellow continuous	Warning-state: The device is operational.
	Red continuous	Error-state: The device is not operational.

Unboxing

Check your device upon delivery to ensure that it is undamaged and complete.

The packaging includes the following items:

- Camera
- Licence dongle for Kithara TL (only for DXGE version)
- Information sheet

Additionally ordered and supplied accessories

- Lens adapters, extension rings, lenses and other accessories are not included in the standard scope of delivery. These items must be ordered separately as accessories.
- Check additionally ordered accessories for completeness and for damage, which may have occurred during transport.

Mechanical installation

	WARNING
	During lifting and setting down the device can fall and lead to injuries.
	Use foot protection.

Prepare the camera and lens

1. Select the correct lens and accessories to operate your camera in the desired environment.
2. Install the lens and adapters. For a detailed description of lens and mount installation, follow the Chromasens Camera Configurator.
3. Mount the optional cooling kit if necessary.

Thermal link and cooling

The camera operates within the defined housing temperature range of 0 °C to 60 °C.
If this range is exceeded, use cooling kits.
For more information on cooling kits and fans, see Cooling kits and fans (heat sink).

Overview Camera with cooling kit, adapters and lens

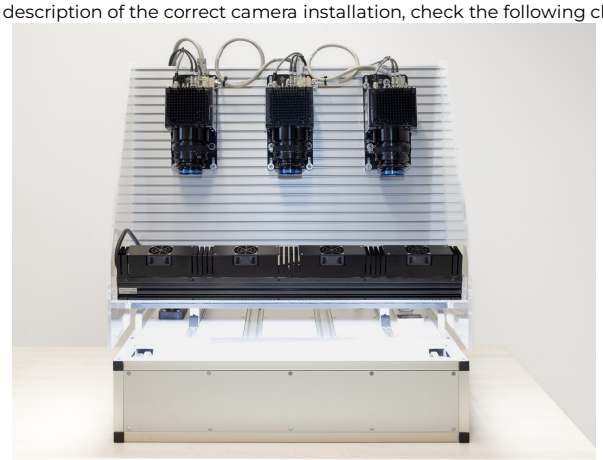
Adjust and install your illumination

It is recommended to use a Chromasens Corona II illumination.
Follow the instructions of the Corona II manual for correct installation.

Download
https://chromasens.de/de/corona-downloads

Install the camera in your system

Adjust the sensor line horizontally to the transport direction. The camera has to look perpendicular to the inspection area. For a detailed description of the correct camera installation, check the following chapter.



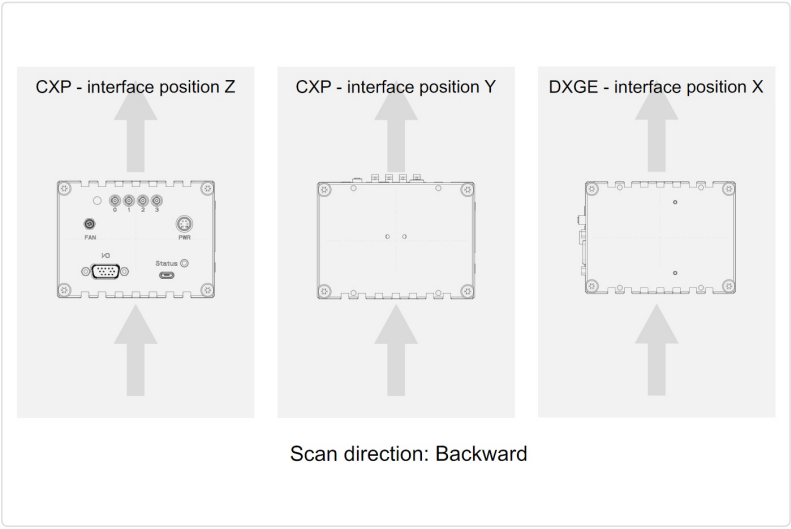
Exemplary installation method of 3 cameras

Mounting

The camera housing provides various mounting options. For information about the exact mechanical dimensions refer to specification of your camera model.

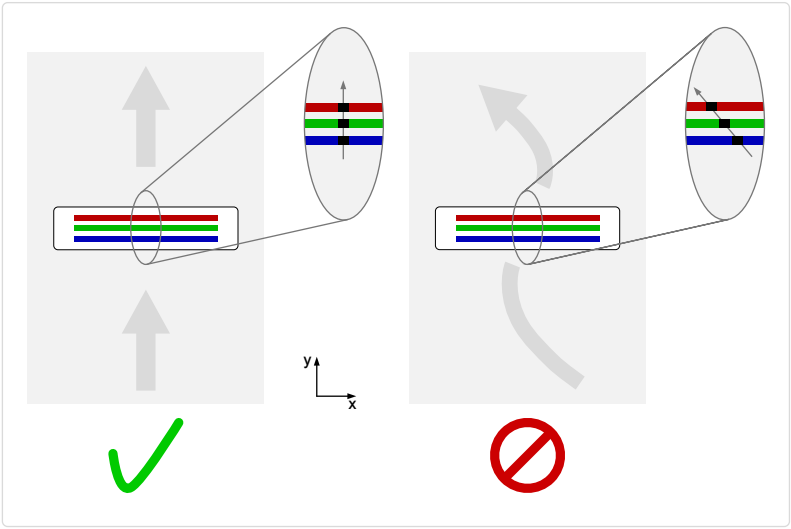
Scan Direction

The following image shows the scan direction *Backward* of the allPIXA evo cameras.



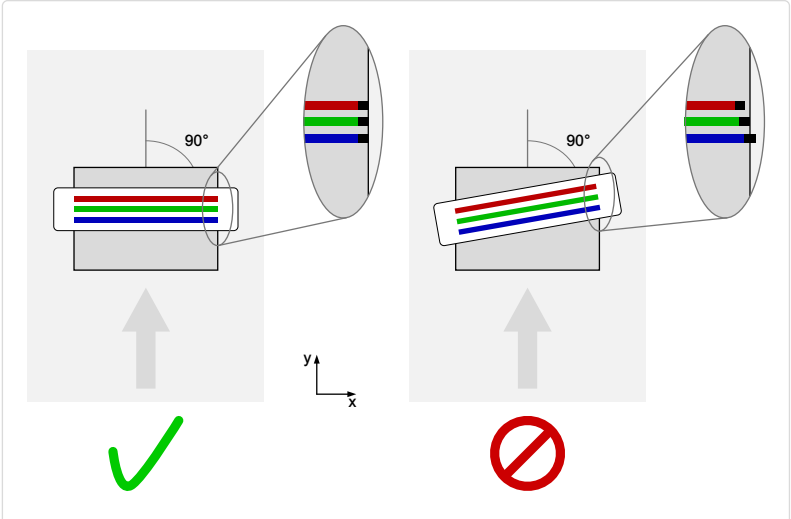
Conveyor belt tracking

The conveyor belt on which the object is transported must run absolutely straight as shown in the following graphic. Misalignment can cause image artifacts.



Perpendicularity of the sensor to the direction of transport

Align the camera at a right angle (perpendicularly) to the transport direction as shown in the following graphic. Misalignment can cause chromatic aberration in the image.

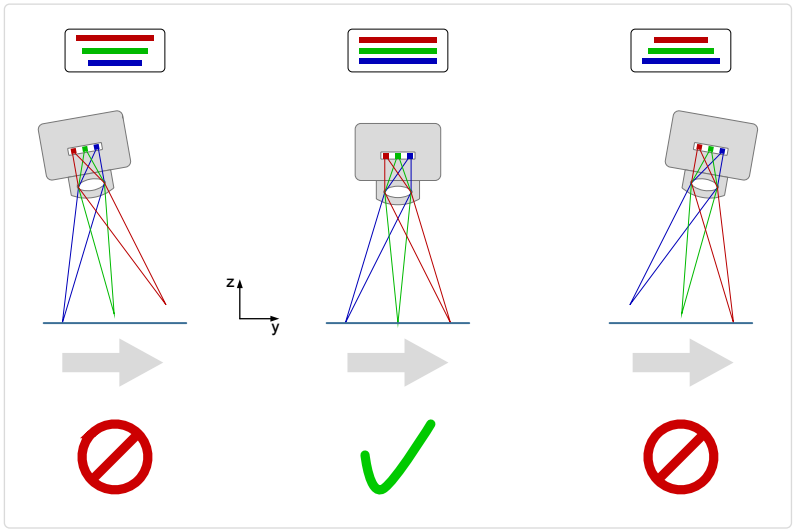


Rotation around the longitudinal axis of the sensor

NOTE

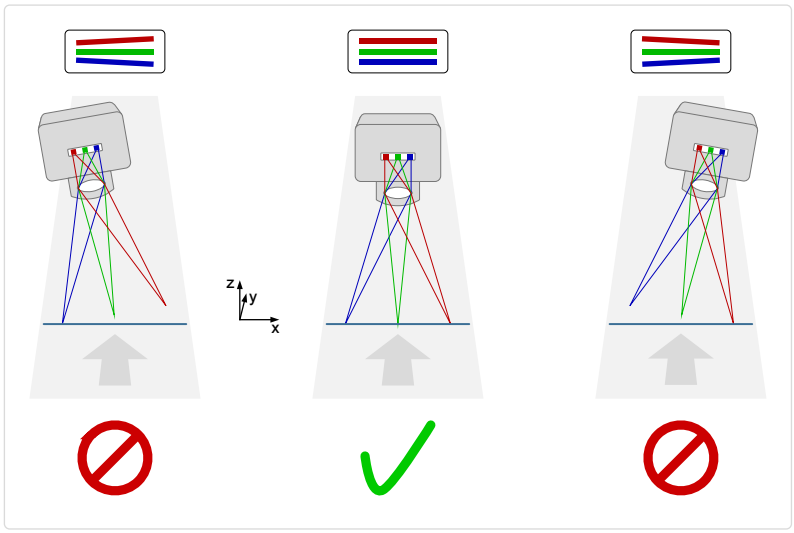
If you are willing to use this installation method please contact **chromasens support** for further information.

Make sure that the longitudinal axis of the camera is parallel to the transport direction as shown in the following graphic. Misalignment can cause scale change and chromatic aberration in the image.



Rotation around the transverse axis of the sensor

The transverse axis of the camera must run parallel to the transport direction as shown in the following graphic. Misalignment can cause scale change and chromatic aberration in the image.



Electrical installation

DXGE interface

The SFP+ 10 GigE connectors permit to use (direct attach) copper cables or optical fiber cables with lengths of up to 400 m (10GBASE-SR).

- Use a single port for data rates up to 10 Gbit/s.
- For higher data rates connect both ports using Link Aggregation.

Network adapter

To establish a DXGE connection a network adapter with one or two SFP+ 10 GigE inputs must be installed and configured on the PC. The installation of a network adapter is explained in the GCT documentation. For more information, see Installation GigE.
For more information about the tested network adapters and the transceivers, see Tested Network adapters and Transceivers.

Cabling

	WARNING
	Electric shock due to improper connection to a power supply.
	Use a 12 V – 24 V DC power supply.

1. Connect one or both video output ports.
2. Connect the digital I/O port.
3. Connect the power supply.

CXP interface

The interface allows you to connect up to four CXP cables. Micro BNC (for CXP12) connectors for the camera and suitable connectors for the frame grabber are required. The maximum cable length is 35 m.

Frame grabber

To establish a CXP connection a frame grabber must be installed and configured on the PC. Refer to the manual of your frame grabber.
For more information about the tested frame grabbers, see Tested frame grabbers.

Cabling

	WARNING
	Electric shock due to improper connection to a power supply.
	Use a 12 V – 24 V DC power supply.

1. Connect port 0 (master port) of the video output port.

   NOTE
   For the maximum line rate connect all four ports.
   Make sure that port 0 of the camera is connected to port 0 (or A) of the frame grabber. Otherwise, no connection to the camera can be established.

2. Connect the digital I/O port.

Option 1: Power over CoaXPress (PoC)

To use the power-over-CXP function two connections are needed.
Connect port 0 and port 1 of the video output port.

Option 2: Power supply port

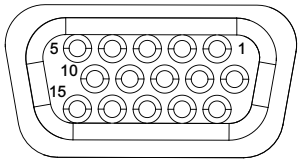
Connect the power supply.

Digital I/O port

NOTE
Ensure a proper GND connection of the digital camera I/O port and your trigger.

The following connector is required for the digital I/O port:

- 15-pin HD D-Sub (male)



Pin allocation D-Sub connector (female) of the camera

Pin	GenICam	Signal	Level	In/Out	Example/Remark
1	Line 1	Enc0_InP (+)	RS 422	Differential input	Encoder0 or LineTrigger
2	Line 2	Enc1_InP (+)	RS 422	Differential input	Encoder1 or Frametrigger
3	Line 3	IO_0P	LVCMOS	Input	single-ended
4	-	RT	RS 485	-	-
5	Line 5	IO_2P	LVCMOS	Out	LED-Out1
6	Line 1	Enc0_InN (-)	RS 422	Differential input	Encoder0
7	Line 2	Enc1_InN (-)	RS 422	Differential input	Encoder1
8	Line 4	IO_1N	LVCMOS	Input single-ended	Trigger or Master-Slave Cascaded
9	-	RTN	RS 485	Out	To LightController XLC4
10	Line 6	IO_3	LVCMOS	Out	LED-Out2
11	-	GND	-	GND	-
12	Line 7	IO_4_SDA	LVCMOS	Out	LED-Out3
13	-	GND	GND	-	-
14	Line 9	Master/Slave	LVCMOS	Bi-directional	Master/Slave
15	Line 8	IO_5_SCL	LVCMOS	Out	LED-Out4

LVCMOS and RS22 levels

I/O standard	V_IL		V_IH		V_OL	V_OH
	V_min	V_max	V_min	V_max	V_max	V_min
LVCMOS	–0.5	0.7	1.7	3.6	0.4	2.1
RS422	–6	0.8	2	6	-	-

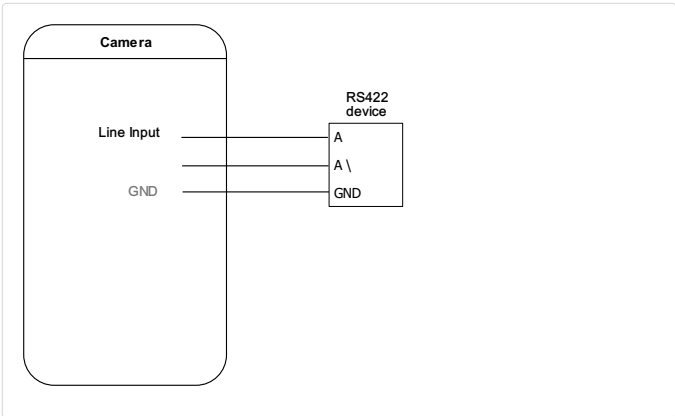
NOTICE

Non compliance may cause irreparable damages to the device.

The maximum input level of the LVCMOS is 3.6 V.
Use a level converter if necessary (e.g. 74 LVC14).

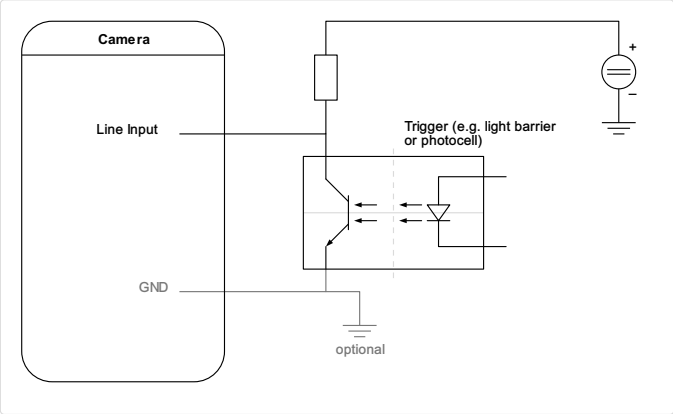
Circuit Diagrams

RS422 configuration

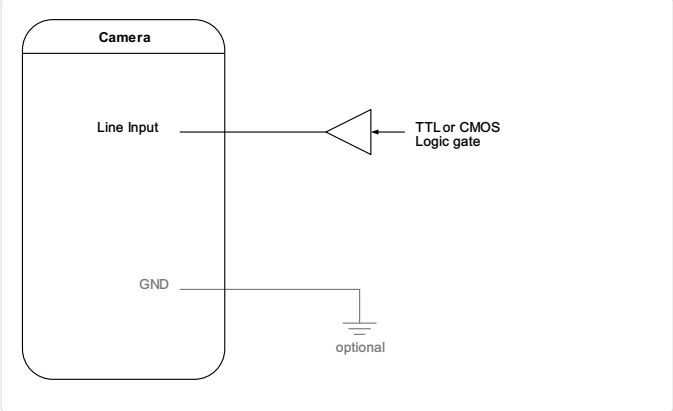


External circuit: RS422 device

Single-Ended configuration



External circuit: Optocoupler

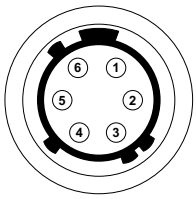


External circuit: TTL or CMOS logic gate

Power supply

The following connector is required for the power supply cable:

- Manufacturer: Hirose
- Article no.: HR10A-7P-6S female

	Pin	Description
 Pin allocation of the power supply port	1	Power +24 V
	2	Power +24 V
	3	Not connected
	4	Not connected
	5	Ground
	6	Ground

Software installation and configuration

We recommend using the Chromasens GCT tool to acquire the first images. For information about the installation and use of GCT, refer to the GCT documentation.

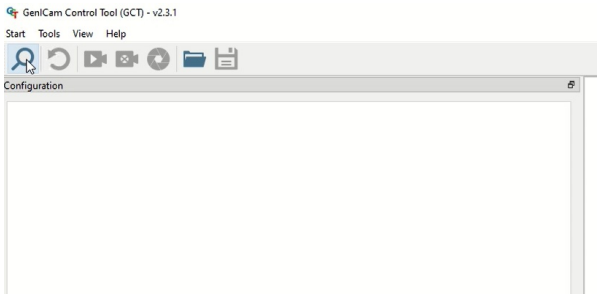
1. Connect your camera to the PC.
2. Turn on the camera.

The installation and configuration of your PC are described in the GCT documentation.

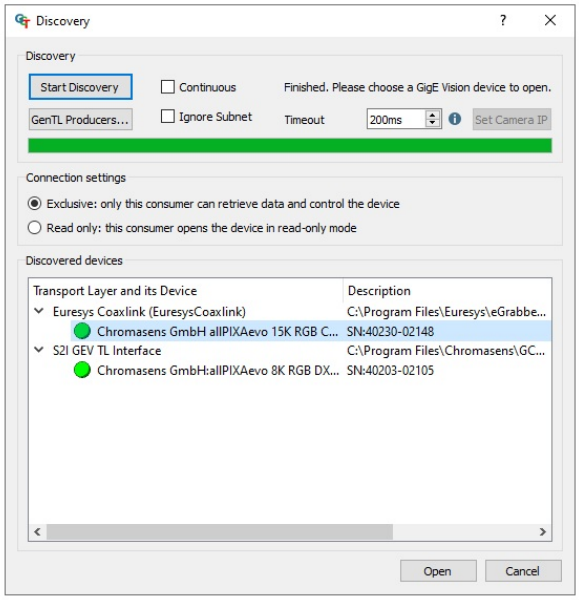
Acquire the first image

Connect the camera

1. Open GCT2.
2. Click on the **magnifying glass icon**.

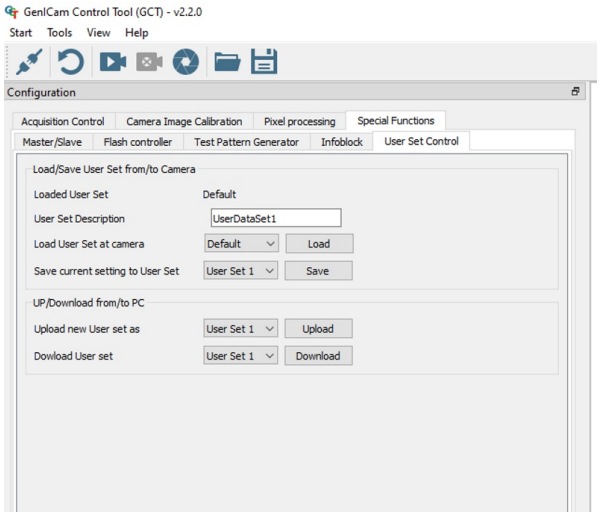


3. In the Discovery window click **Start Discovery**.
4. Select your camera and click **Open**.

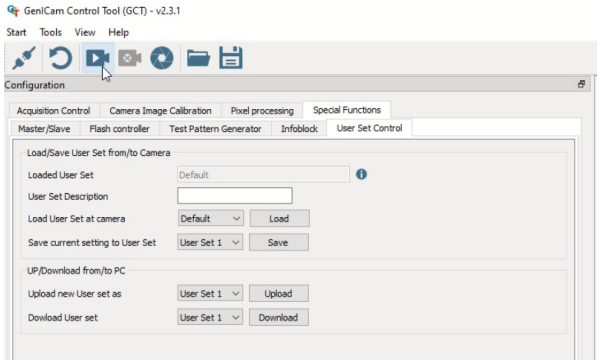


Load the default user set

1. In the Configuration window navigate to *Special Functions → User Set Control*.
2. Click **Load**.



Acquire an image

Click on the **camera sign** to acquire the first image.	

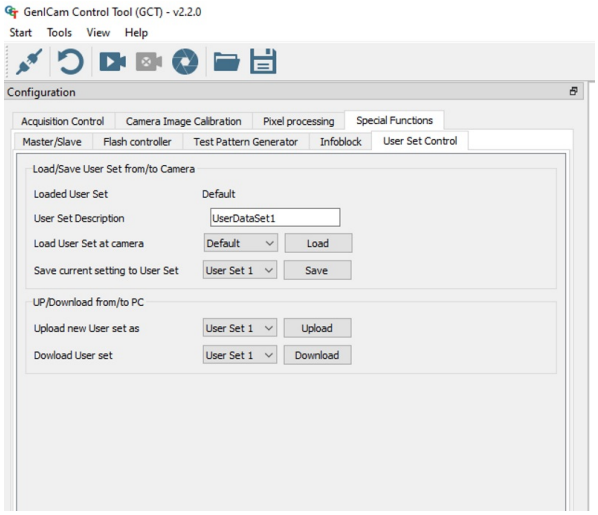
Video description

Click here to download a video

Acquire a test pattern

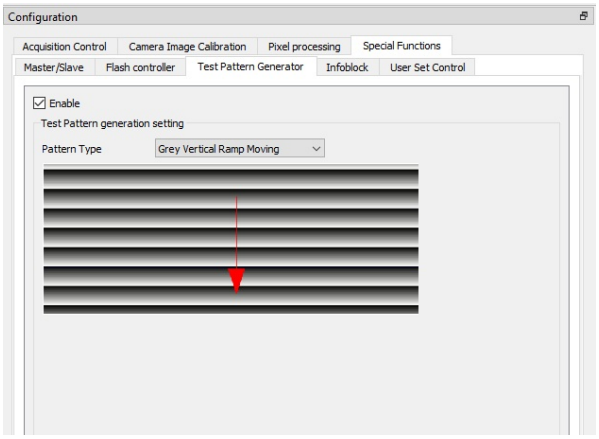
Load the default user set

1. In the Configuration window navigate to *Special Functions → User Set Control*.
2. Click **Load**.



Generate a test pattern

1. In the Configuration window navigate to *Special Functions → Test Pattern Generator*.
2. Select the **Enable** checkbox.



Compare the template to the generated image

1. Aquire an image.
2. Compare the template to the generated image.
3. Disable the test pattern if it matches with the generated image.

Video description

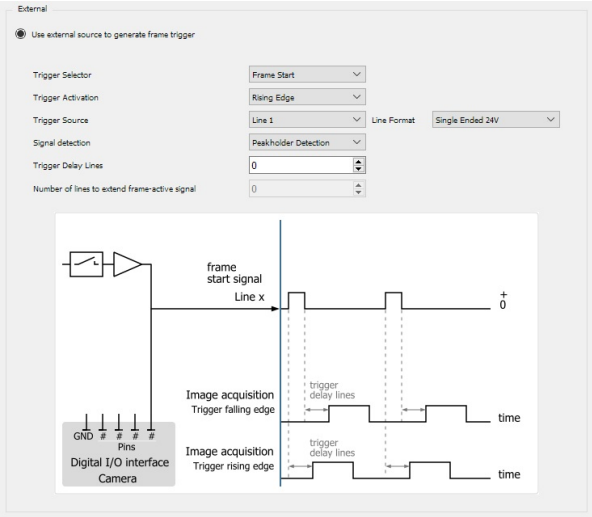
Click here to download a video

Acquire images with frame and line trigger

Set up the frame trigger

1. In the Configuration window navigate to *Acquisition Control → Frame Trigger*.
2. Set up the frame trigger.

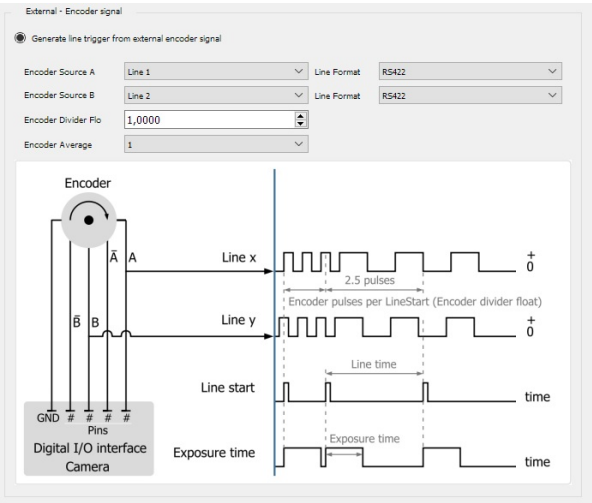
Refer to Set a frame trigger.



Set up the line trigger

1. In the Configuration window navigate to *Acquisition Control → Line Trigger*.
2. Set up the line trigger.
3. Acquire an image.

Check your cabling if you do not receive an image.
Refer to Set a line trigger.



Introduction

To ensure a correct image calibration follow the articles in order.
Begin with *Perform white balancing* and end with *Check the image quality*.

Exposure optimization of camera and light

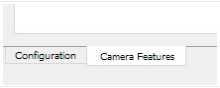
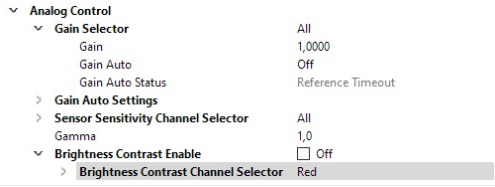
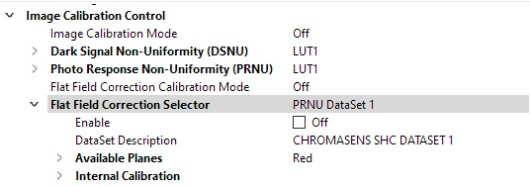
> **NOTE: Finding camera and illumination parameter**
>
> This method of finding a starting point for a standard camera and illumination system. The operating point may have to be determined iteratively (requirement of the application).

At the beginning of the calibration process, the brightness of the camera output image must be in a reasonable range. Otherwise, the white balancing will most likely fail or the result quality will be poor. White balancing is an automatic camera gain adjustment algorithm. It sets the gains (amplification factors) for the single color channels in a way, that the brightness of the color channels equals the defined target brightness level for a given object. However, to achieve the best image quality these gains should be always kept as low as possible (In the best case between 1 and 2). To achieve a brightness level of 200DN@8bit with an amplification factor <2, the brightness of the single color channels must be >100DN@8bit for the default gain of 1. It should be mentioned again that a factor of less than 2 is preferable but not required and often not possible.

Camera Parameter

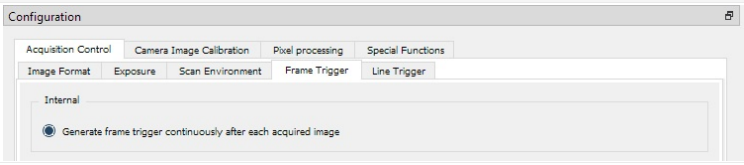
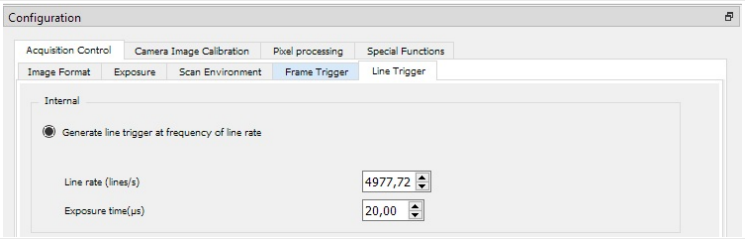
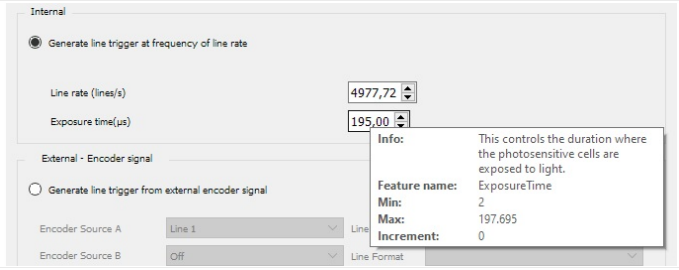
Before starting, set the following parameter.

> **NOTE**
>
> You can also load the “Default” user set.

1. In *GCT* navigate to *Camera features*	
2. Navigate to *Analog Control*	
3. Set **Gain selector** to **all** 4. Set **Gain = 1.00**	
5. Set **Gamma = 1.00**	
6. Set **Brightness Contrast Enable** to **Off**	
7. Navigate to *Image Calibration*	
8. In *Flat Field Correction Selector* set **PRNU DataSet 1, PRNU DataSet 2, DSNU DataSet1, DSNU DataSet2** to **Off**	

Exposure time

> **NOTE**
>
> Always set the exposure time as high as possible. The exposure time is limited by the line time. There are 2 cases for the line time.

Case 1: Freerun	
1. Navigate to *Aquisition Control → Frame Trigger* 2. Set to **Internal**	
3. Navigate to *Line Trigger* 4. Set to **Internal**	
5. Set the **Exposure time** as close as possible to the line time 6. Hover with the Courser over the *Exposure time* Parameter	

Case 2: Line trigger mode	
1. Set your **Line trigger**	
2. a, Calculate the expected Line Time	Transport speed / Optical resolution in transport direction
2. b, Alternative, Measure the line time	Measure the **line time** 1. Navigate to **Trigger selector → Line Start** 2. Start your **Linear stage** or **conveyor belt** 3. **Read** the parameter **Line Time (Measured)** **Trigger Selector** Line Start Trigger Mode On Trigger Source Encoder 0 Trigger Activation Rising Edge Trigger Divider 1 Line Time (Measured) 200,91 us
3. Evaluate the Configuration	1. Navigate to **Trigger Selector → Line Start** 2. Start your **Linear Stage** or **Conveyor belt** 3. **Read** the parameter **Line Trigger Status** **Trigger Selector** Line Start Trigger Mode On Trigger Source Encoder 0 Trigger Activation Rising Edge Trigger Divider 1 Line Time (Measured) 200,91 us Line Trigger Status Speed To High If the Status is *Speed to High* your exposure time is too high

Sensor Sensitivity

NOTE

“SensorSensitivity” is a GenIcam parameter to change the analog amplification and the full well capacity of the sensor. It is better to have a high sensor sensitivity than high gains since the amplification is earlier in the camera signal processing chain. Therefore, fewer sources of noise are amplified. However, a high sensor sensitivity nevertheless increases the noise of the resulting image.

1. Navigate to **Analog Control**	
2. Set the *Sensor Sensitivity Channel Selector* to **All** 3. The *Sensor Sensitivity* = **0** is the high full well and a low sensitivity	**Analog Control** **Gain Selector** All **Gain Auto Settings** **Sensor Sensitivity Channel Selector** All Sensor Sensitivity 1

Lens aperture

NOTE

Choosing the lens f-stop is always a compromise between the available amount of light and depth of field. Reducing the f-number by one step (e.g. from f/8 to f/5.6) doubles the amount of light of increases the DOF.

Chromasens approch

This is a Chromasens approch, it does not fit to all setups

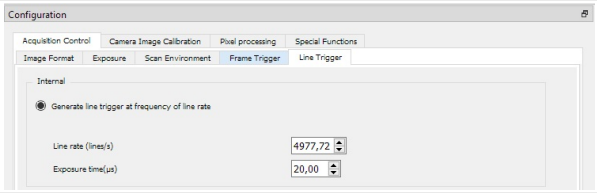
- Start as a starting point f = 5.6
- If a higher depth of field is required set f = 8.0 (half amout of light)

Illumination

Alignment

NOTE

Always mount the illumination regarding the mechanical specifications. Especially for strongly focused illuminations (darkfield C and B focus), it is recommended to fine-tune the alignment.
It's important to start with a well-aligned illumination to avoid wasting light.

1. Place a white reference under the camera	
2. Set the exposure time and line time	
3. Enable the histogram view in GCT	
4. Start the image acquisition	
5. Turn on the illumination	
6. Rotate the corona illumination until the histogram shows the maximum values **Note** If the peak of the histogram is close to 255 DN@8bit, reduce illumination current or sensor sensitivity.	

Click here to download a video

Current

NOTE

For the image quality in terms of image noise, it is beneficial to use a high illumination current. However, a high illumination current also has disadvantages caused by the high temperature of the light source.

- Reduces the lifetime of the LEDs.
- Can harm the scanned object.
- Causes heat inducted turbulences which can locally distort the image which is disadvantageous for high precision measurement tasks.
- Can lead to overheating of the illumination if it is not cooled actively.

1. Set the illumination current and switch the light on	For a passive cooling, start with 600 mA For an active cooling, start with 1200 mA
2. Navigate to GCT and enable the horizontal lineplot	
3. Set the exposure time, line time and start the image acquisition	
4. Change the illumination current until you get a signal in the lineplot between 100 and 200 DN@8bit	

Perform white balancing

The adjustment of a camera system is an iterative process. It might be necessary to do the white balancing step twice.

NOTE: The white reference must be clean and in the focusing plane of the camera.

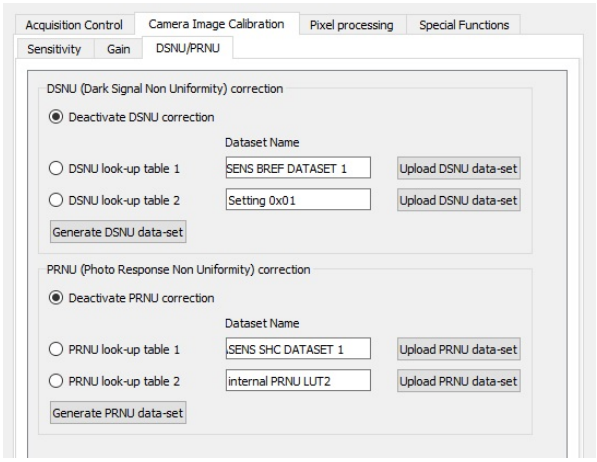
Use a professional white reference, e.g. a clean white ceramic or plastic material.
For the best result use a moving white reference to diminish the effects on any optical variations in the white reference.

Prepare your system

1. Place a white reference under the camera.
2. Set the lens aperture f-stop on the camera lens.
3. Load the default user set.
4. Set the maximum exposure time.
5. Set the line time.
6. Switch on the illumination and set the light current.

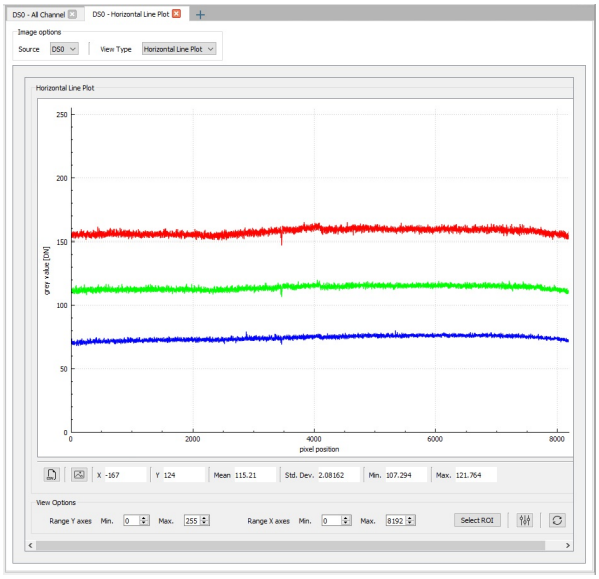
Deactivate DSNU and PRNU correction

7. In the Configuration window navigate to *Camera Image Calibration → DSNU/PRNU*.
8. Select the **Deactivate DSNU correction** checkbox.
9. Select the **Deactivate PRNU correction** checkbox.



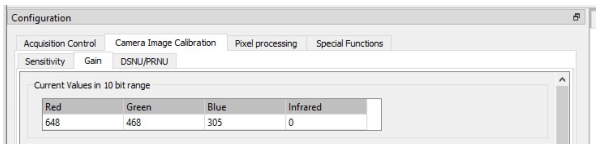
Configure the gain settings

1. Click on the **plus sign** in the right window to add a new tab.
2. Select **Horizontal Line Plot**.
3. **Start Image acquisition**



3. In the Configuration window navigate to *Camera Image Calibration → Gain*.

The current values in the 10 bit range are displayed.



4. Select the **Enable** checkbox in *Automatic gain control settings*.
5. Set the reference mark position and size:
   Below *ROI for automatic gain control* set the values for **Offset X**, **Offset Y**, **Width** and **Height**.

   HINT

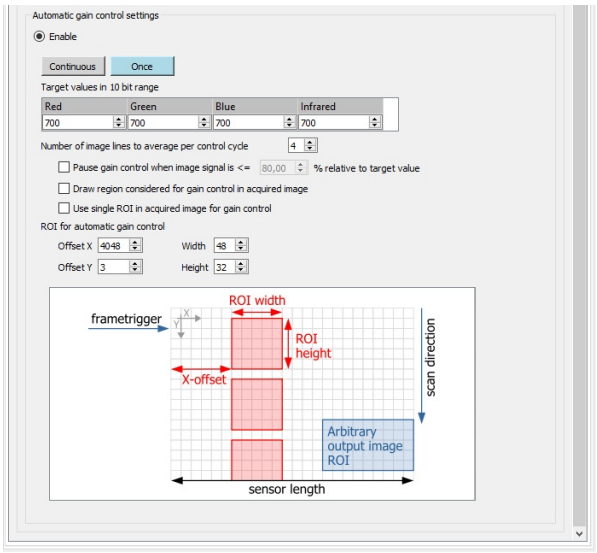
   To control the position in images you can temporarily select the **Visible feature**.

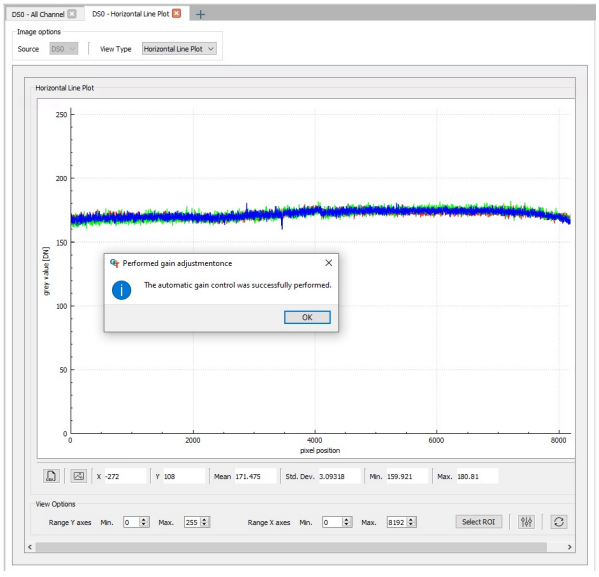
6. Make sure that the reference mark position is at the brightest region of the image (at the center).
7. Set the target white reference values:
   Below *Target values in 10 bit range* set the values for **Red**, **Green**, **Blue** and **Infrared**.

   NOTE

   The target values should be between 800 – 880 to get values between 200 – 220 in the horizontal line plot.

8. Click on **Once** in *Automatic gain control settings*.





The camera performs a white balancing with the current settings.
After successful balancing *Gain Auto Status* returns **Control Successful**.

NOTE: If the white balancing was not successful, you have the following options:

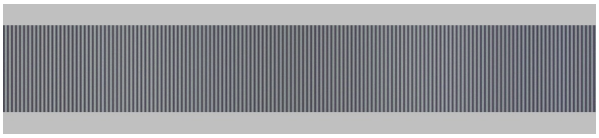
- Modify the exposure time
- Modify the illumination current
- Modify the f-stop of your lens
- Modify the sensor sensitivity

NOTE: Repeat the white balancing in the following cases

If you change the f-stop of the camera lens or the setting of the illumination repeat the white balancing.

Adjust the lens

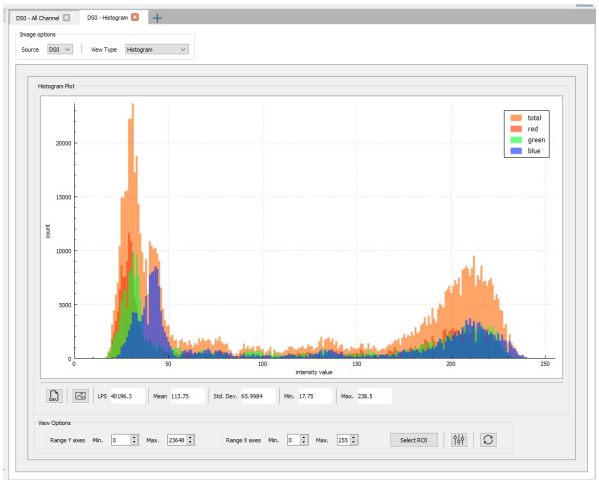
1. Place a line pattern target under the camera.
2. Acquire an image which looks like this.



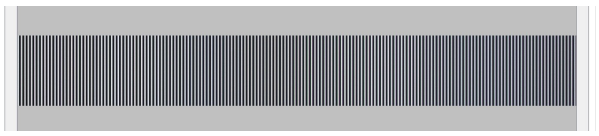
3. Click on the **plus sign** in the right window to add a new tab.
4. Select **Histogram**.

The values of intensity are spread between 60 – 170.

5. Adjust the lens to achieve the values spread in the whole spectrum.



The image of the line pattern has a high contrast.



Create a black-reference (DSNU)

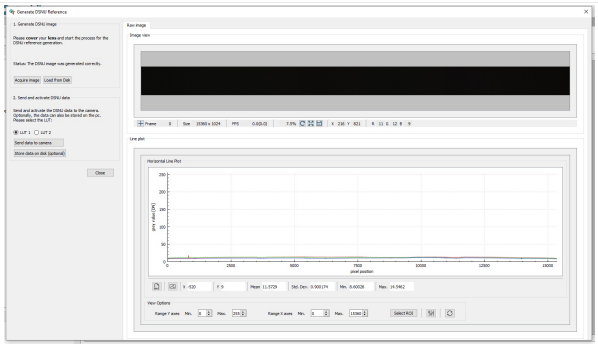
Create a black-reference with DSNU.

1. Switch off the illumination.
2. Cover the lens with a black or dark piece of cardboard or plastic.
   No light may reach the sensor.

3. In the *menu bar* navigate to *Tools* → *Calibration*.
4. Click **Generate DSNU Reference**.

The *Generate DSNU Reference* wizard opens.

5. Click **Acquire image** to generate the DSNU directly from the camera
   or
   click **Load from Disk** to load an image from the hard drive.

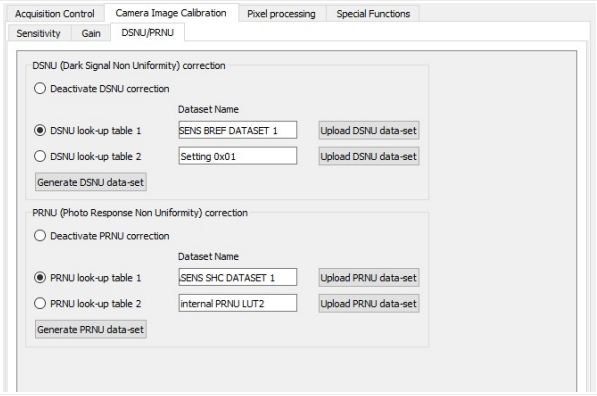


> **NOTE: Load from Disk**
>
> Make sure that the image has been taken with active image calibration mode by using the wizard.

The raw image and the line plot of the image is displayed.
Send the calculated DSNU to the camera:

6. Select **LUT 1** or **LUT 2**.
7. Click **Send data to camera**.

8. In the Configuration window navigate to *Camera Image Calibration* → *DSNU/PRNU*.
9. Make sure that DSNU is enabled.



Create a shading-reference (PRNU)

Calculation of PRNU

The following equation describes the calculation of the PRNU

$Calibrated_{Image} = (Raw_{Image} - DSNU) / PRNU$

$PRNU = (PRNU_{Image}-DSNU)/Target_{Value}$

$Calibrated_{Image}$ = Camera output with applied DSNU and PRNU

Raw_{Image} = Camera output image without any correction

$Target_{Value}$ = Target Value of PRNU, default value is 255

$PRNU_{Image}$ = Acquired image of the white-reference

PRNU = Photo response non-uniformity

DSNU = Dark signal non-uniformity

Standard PRNU reference generating

Create a shading-reference with PRNU.

1. Place a moving white target.
   If using a stationary target, place it slightly out of focus.

Acquire an image:

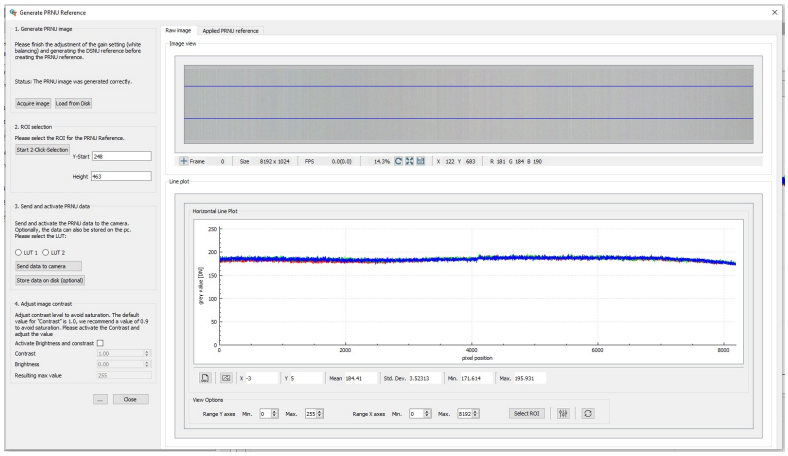
2. In the toolbar click **Acquire a single frame**
   or
   click **Start grabbing**, wait until an image ist displayed,
   click **Stop grabbing**.

3. In the *menu bar* navigate to *Tools* → *Calibration*.
4. Click **Generate PRNU Reference**.

The *Generate PRNU Reference* wizard opens.

5. Click **Acquire image** to generate the PRNU directly from the camera
   or
   click **Load from Disk** to load an image from the hard drive.

> **NOTE: Load from Disk**
> Make sure that the image has been taken with active image calibration mode by using the wizard.



The raw image and the line plot of the image is displayed.

6. Click **Start 2-Click-Selection**.
7. Click **on the image** to select the ROI.

Send the calculated PRNU to the camera:

8. Select **LUT 1** or **LUT 2**.
9. Click **Send data to camera**.

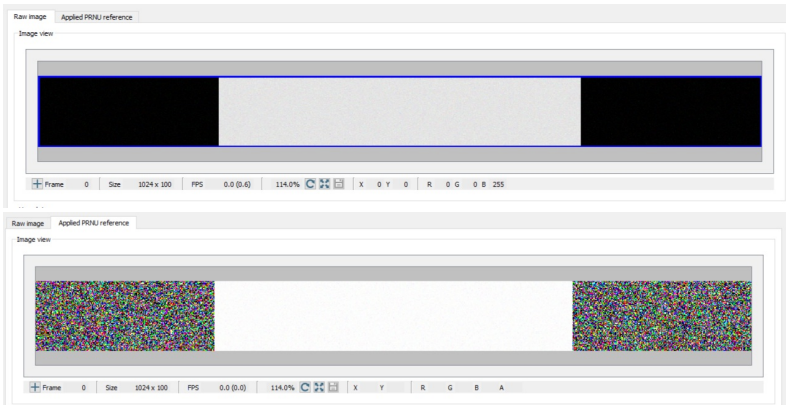
Activate brightness and contrast:

10. Select the **Activate Brightness and contrast** checkbox.
11. Set the contrast to 0.9.

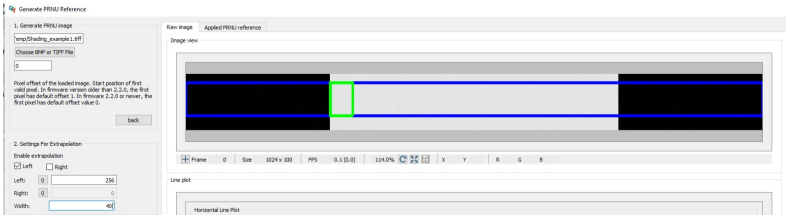
Extrapolation function

If the white reference does not cover the entire FOV, the extrapolation function can be used to generate it. In this case, a straight line is fitted to the gradient. Therefore follow the description below.

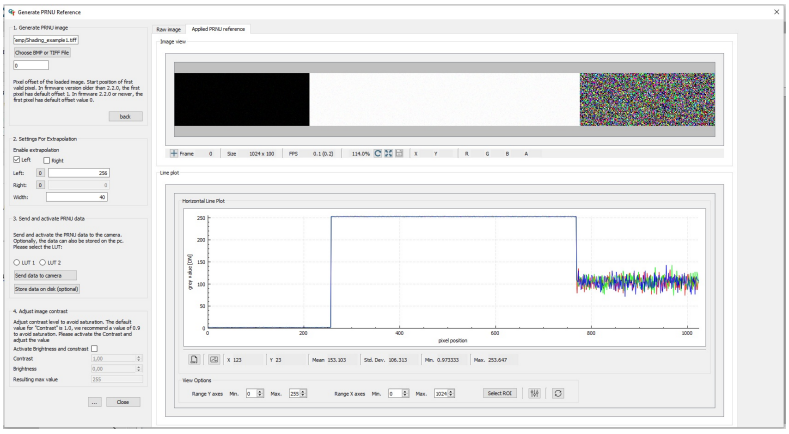
On the right side, you can see the *raw image* and the *Applied PRNU reference* without the extrapolation function.
In the area with low image content, the *Applied PRNU reference* shows some artifacts.



1. Select the ROI, by using the **Start-2-Click-Selection**.
2. Press the button with the **three dots** on the bottom.
3. **Enable** your option, in this example the left extrapolation.
4. Select the **start position** of your extrapolation. The width defines the area where the extrapolation is created. From the start position to column 0, the extrapolation is applied.



5. Check the applied PRNU in the ***Applied PRNU*** *reference* tab.



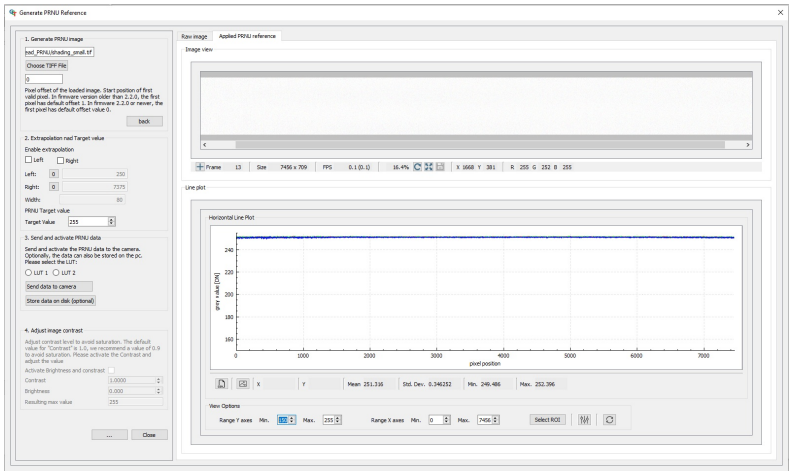
Target Value

The Target Value limits the maximum intensity of your $Calibrated_{Image}$.

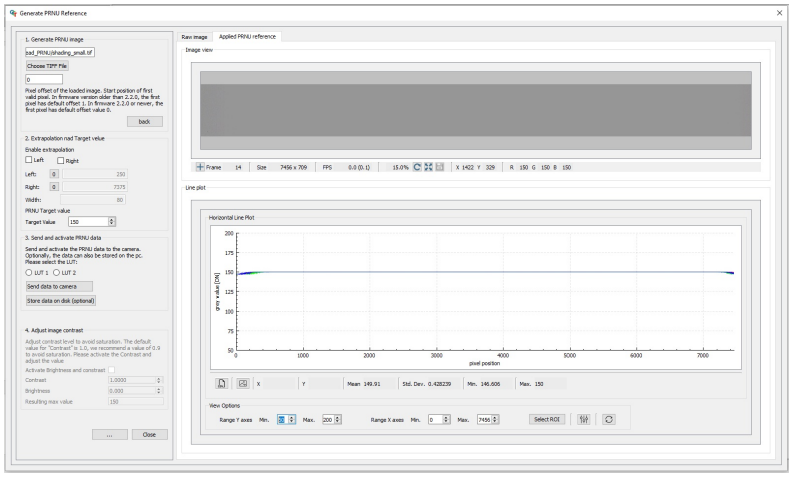
Note

Make sure that the Values of your $PRNU_{Image}$ are smaller than your $Target_{Value}$

1. Press the button with the **three dots** on the bottom.

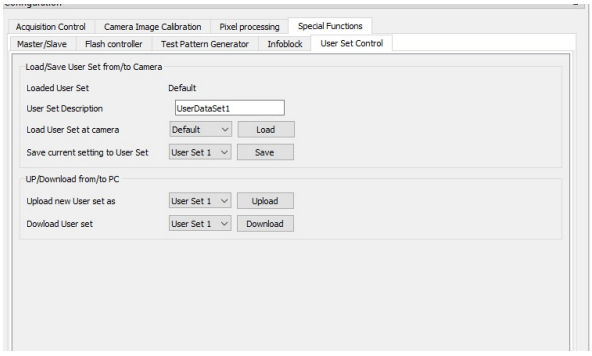


2. Change the **Target Value**.
3. Check the applied PRNU in the ***Applied PRNU*** *reference* tab.

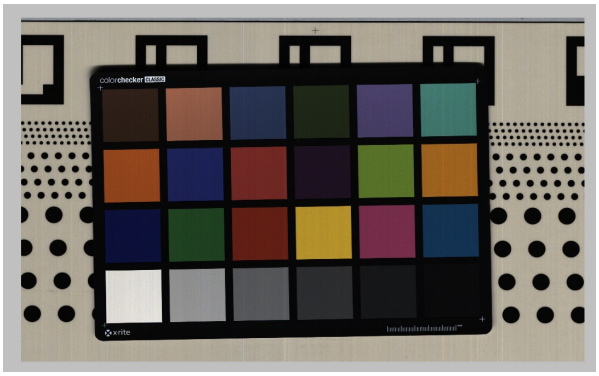
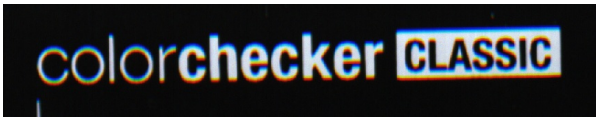
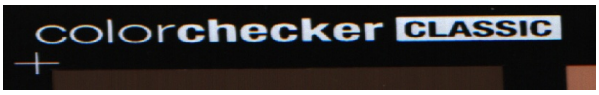
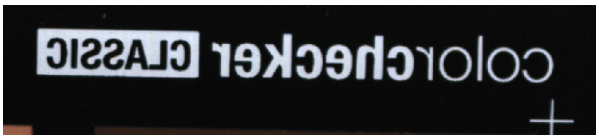
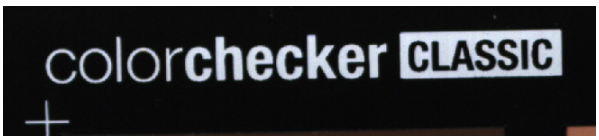


Save the setting

1. In the Configuration window navigate to *Special Functions → User Set Control*.
2. In *Save current setting to User Set* choose **User Set 1**.
   The default user setting is always User Set 1.
3. Click **Save**.



Check the image quality

1. Place an image target under the camera, e.g. a colorchecker classic. 2. Acquire an image. 3. Analyze the image: If the image is covered with vertical stripes you may have not used a **moving shading reference**.	
4. If the image has color shifts check the **scan direction**.	
5. If the image is compressed in transport direction adapt the **encoder divider float value** or **the acquisition line rate**.	
6. If the image is shown mirror-inverted, use the **ReserveX parameter**.	
This is an example of a good image quality.	

Set exposure time

Note

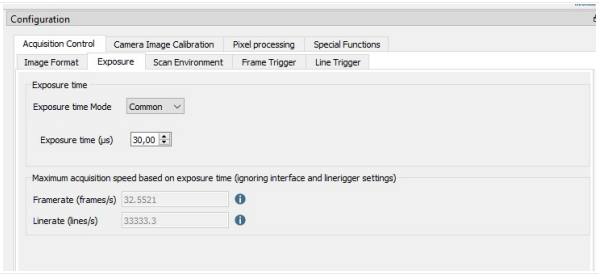
The exposure time must be smaller than the Acquisition Line Time plus an offset.
The minimum difference between the Acquisition Line Time and the Exposure Time is camera variant specific. Therefore, query the min and max entries of this feature.

In the Configuration window navigate to *Acquisition Control → Exposure*.

8k sensor

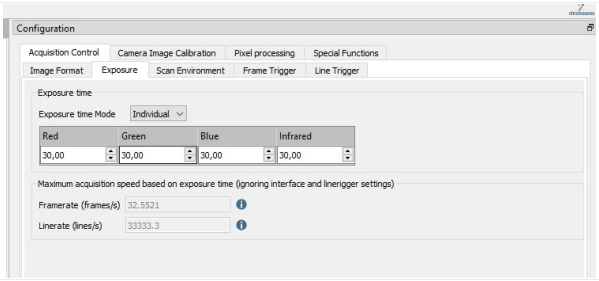
Common exposure time

1. In *Exposure time mode* select **Common**.
2. Set one exposure time for all sensor lines.



Individual exposure time

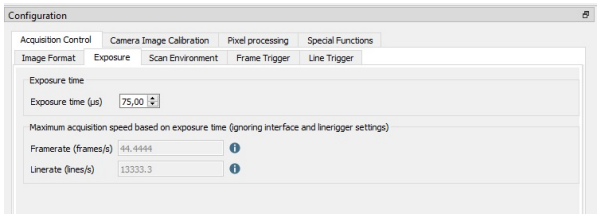
1. In *Exposure time mode* select **Individual**.
2. Set an individual exposure time for each sensor line.



15k and 10k sensor

Common exposure time

The 15k and 10k sensors only support one common exposure time.

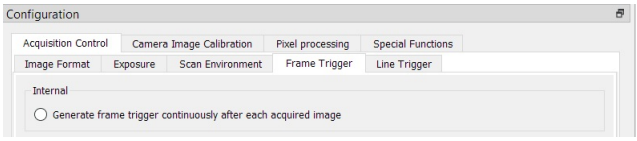


Set a frame trigger

Internal frame trigger

The internal frame trigger provides a continuous signal after each acquired image.

1. In the Configuration window navigate to *Acquisition Control → Frame Trigger*.
2. Below *Internal* select the **Generate frame trigger continuously after each acquired image** checkbox.



Internal frame trigger

Alternatively, you can set the internal frame trigger in the camera feature tree by executing the following steps:

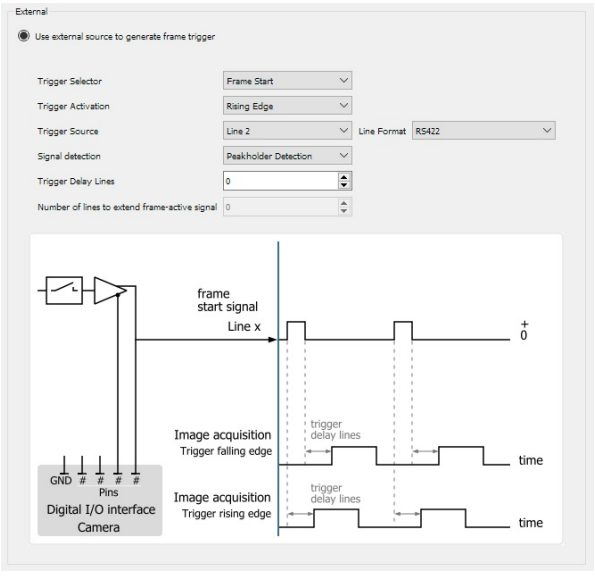
Step	Feature name	Value
1	Trigger Selector	FrameActive
2	Trigger Mode	Off
3	Trigger Selector	FrameStart
4	Trigger Mode	Off
5	Trigger Selector	LineStart
6	Trigger Mode	Off

External frame trigger

The external frame trigger can be provided by a light barrier.

1. In the Configuration window navigate to *Acquisition Control → Frame Trigger*.
2. Below *External* select the **Use external source to generate frame trigger** checkbox.

1. In *Trigger Selector* select the desired activation mode. Refer to trigger selector.
2. In *Trigger Activation* select the desired trigger activation mode.
3. In *Trigger Source* select the desired input Line. Refer to electrical installation.
4. In *Line Format* select the electrical input signal. Refer to electrical installation.
5. In *Signal detection* select the detection mode. Refer to trigger signal detection.
6. In *Trigger Delay Lines* input the delay of the trigger in lines.



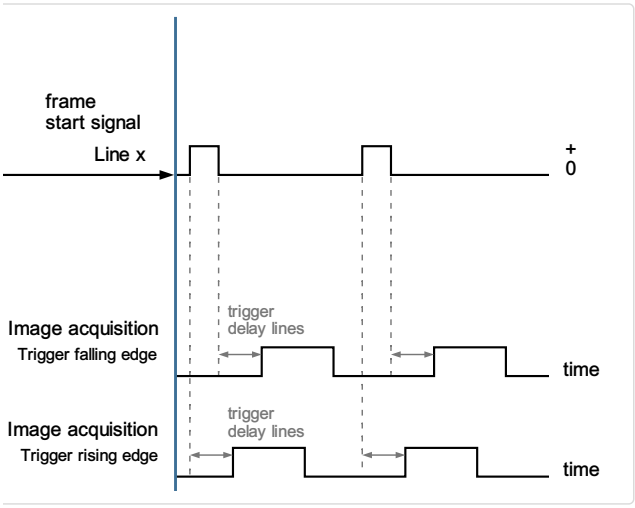
Alternatively, you can set the external frame trigger in the camera feature tree by executing the following steps:

Step	Feature name	Value
1	TriggerSelector	FrameStart, FrameActive or FrameBurstStart
	TriggerMode	On
2	TriggerSource	e.g. Line 3 **or** Line 4
3	TriggerActivation	level high/level low, rising edge **or** falling edge
4	TriggerDelayLines	<number of lines>
5	TriggerSignalDetectionMode	peakholder detection, debouncing 4 clocks, debouncing 4 lines, debouncing 60 lines
6	Digital I/O Line Selector	select the trigger source
7	Line Format	open the drop-down menu and change the Line Format to your input signal

Trigger Selector

Frame start

The *Input signal activation → Frame start* triggers the image acquisition after the *Trigger delay lines* and depending on the *Trigger signal detection mode* configuration for the duration of the image height setting. One frame trigger creates one image with a constant image height.



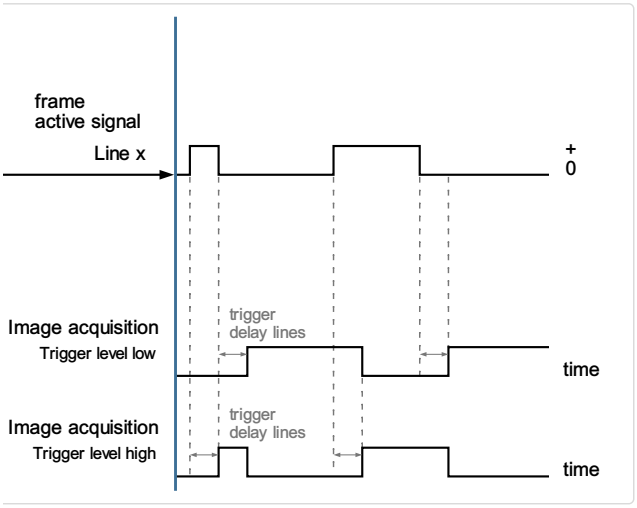
Input signal activation: Framestart

Frame active

Note

This configuration is only for the GigE Version available. CxP does not support this configuration.

The *Input signal activation → Frame active* triggers the image acquisition after the *Trigger delay lines* and depending on the *Trigger signal detection mode* configuration for the duration of the Trigger signal. One Frame trigger creates one image with the length of the frame active signal.



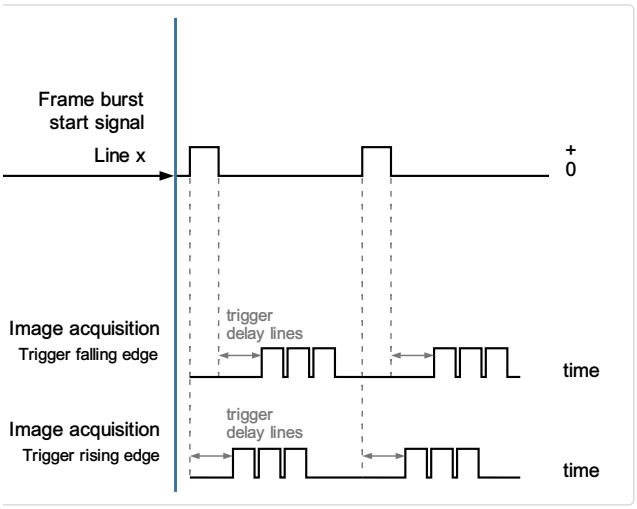
Input signal activation: Frame active

Frame burst start

Note

In *Frame burst start* mode the camera acquires multiple gapless images.

The *Input signal activation → Frame burst start* triggers the image acquisition after the *Trigger delay lines* and depending on the *Trigger signal detection mode* configuration for multiple times the duration of the image height setting. One frame burst creates multiple images with a constant image height.
The number of acquired images is set under *Acquisistion Control → Acquisistion Burst Frame Count*.



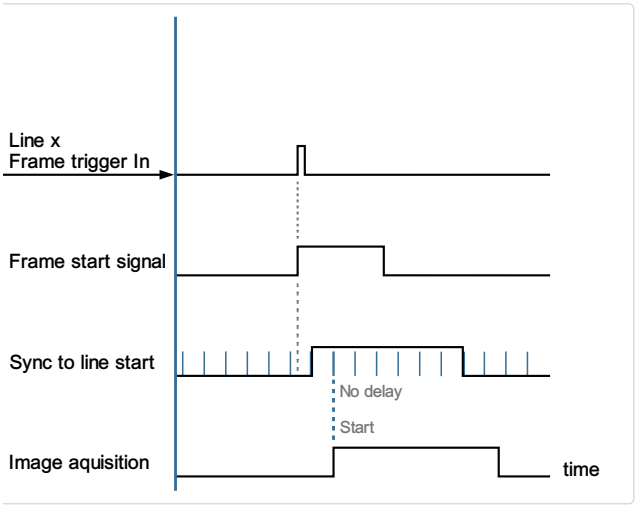
Input signal activation: Frame burst

Trigger signal detection mode

The camera supports four different Trigger signal detection modes. This configuration parameter defines the signal debouncing of the frame trigger input signal.
To set the *Trigger signal detection* navigate to the *camera feature tree → Acquisition control → Trigger selector*. The following 4 options are available:

PeakholderDetection

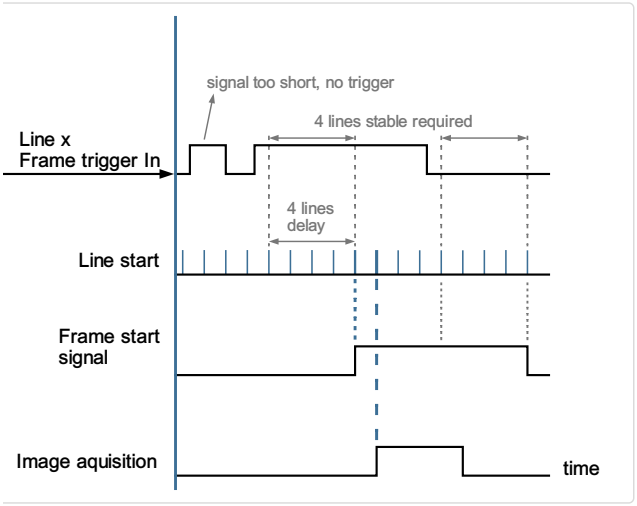
The *Trigger signal detection mode → PeakholderDetection* detects every small input signal and starts the image acquisition immediately.



Peakholder Detection

Debouncing4Lines

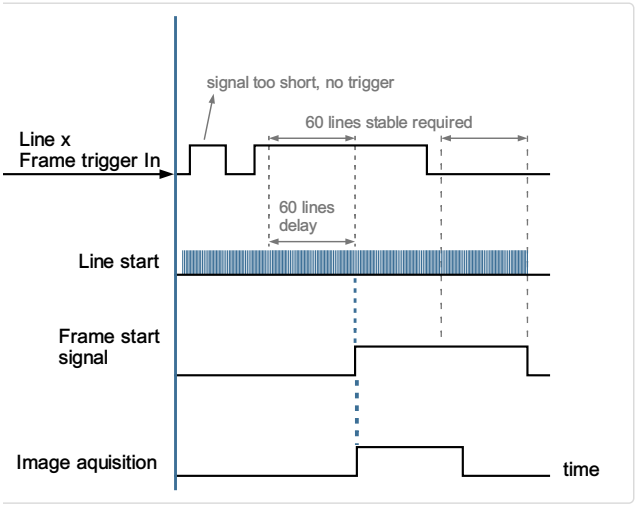
The *Trigger signal detection mode → Debouncing4Lines* requires a 4 line stable trigger input signal, this leads to an image delay of 4 lines.



Debouncing4Lines

Debouncing60Lines

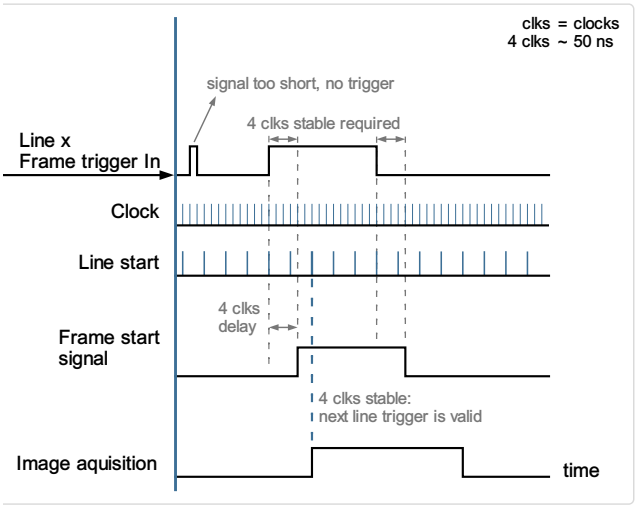
The *Trigger signal detection mode → Debouncing60Lines* requires a 60 line stable trigger input signal, leading to an image delay of 60 lines.



Debouncing60Lines

Debouncing4Clocks (not recommended)

The *Trigger signal detection mode → Debouncing4Clocks* requires a 4 clocks (clks) stable trigger input signal, leading to an image delay of 4 clocks.



Debouncing4Clocks

Set a line trigger

Internal line trigger

The internal line trigger provides a continuous signal in the frequency of the exposure time.

1. In the Configuration window navigate to *Acquisition Control → Line Trigger*.
2. Below *Internal* select the **Generate line trigger at frequency of line rate** checkbox.

Alternatively, you can set the internal line trigger in the camera feature tree by executing the following step:

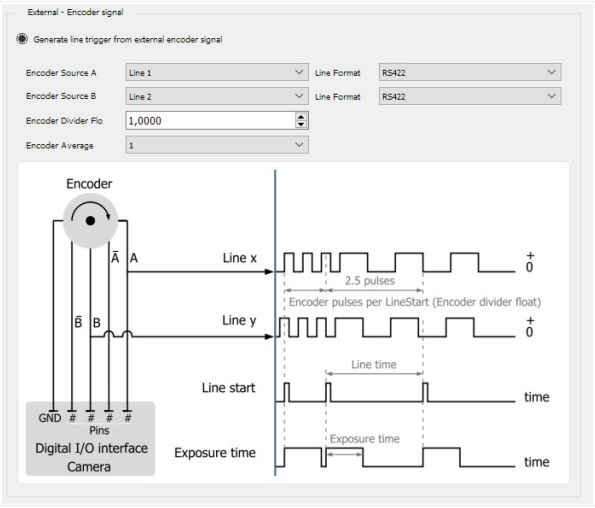
Step	Feature name	Value
1	Trigger Selector	LineStart
	Trigger Mode	Off

External line trigger

The external line trigger can be provided by an encoder signal or a signal generator. Refer to Trigger Selector.

1. In the Configuration window navigate to *Acquisition Control → Line Trigger*.
2. Below *External* select the **Generate line trigger from external encoder signal** checkbox.

1. In *Encoder Source A* and *B* select the desired input Line. Refer to electrical installation.
2. In *Line Format* select the electrical input signal. Refer to electrical installation.
3. In *Encoder Divider float* input the number of encoder impulses to generate one *LineStart* signal. Refer to Encoder divider float.
4. In *Encoder Average* input the number of averaged input signals.



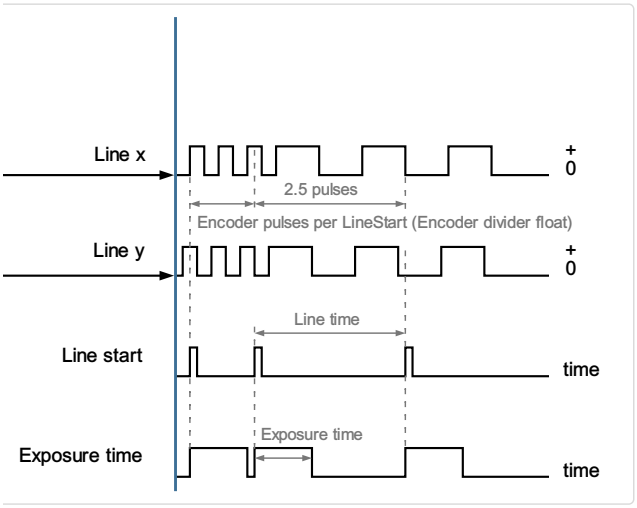
Alternatively, you can set the external line trigger in the camera feature tree by executing the following steps:

Step	Feature name	Value
1	TriggerSelector	LineStart
	TriggerMode	On
2	TriggerSource	Encoder0 **or** Line1 **or** Line3 **or** Line4
3	EncoderSelector	Encoder0
4	EncoderSource A	Line1
5	EncoderSource B	Line2
6	EncoderDividerFloat	0.05 – 255
7	EncoderAverage	0-16
8	Digital I/O Line Selector	select the Trigger Source
9	Line Format	open the drop-down menu and change the Line Format to your input signal

Trigger Selector

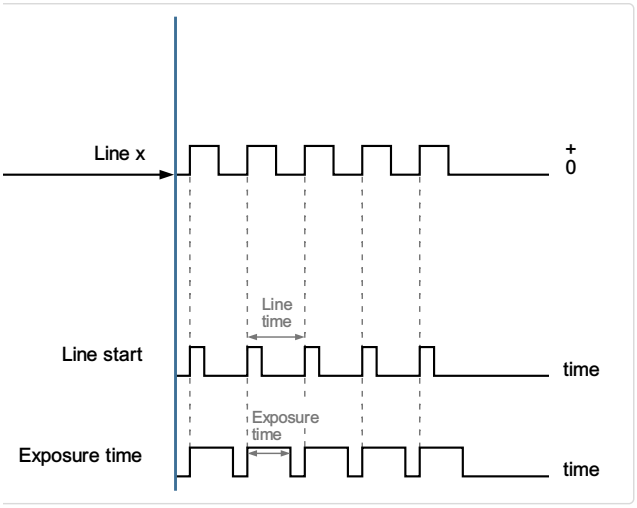
Encoder0

The *Trigger Source → Encoder0* triggers the *LineStart* of the image acquisition. A certain number of encoder (Encoder divider float) impulses creates one *LineStart* signal.



Line

The *Trigger Source* → *Line* triggers the *LineStart* of the image acquisition. Each impulse generates one *LineStart* signal.



Encoder divider float

An encoder typically does not have an integer ratio to the camera resolution. Arbitrary ratios of encoder pulses per sensor line are possible, for example, 2.25. The value range is 0.05 – 255 pulses per line.

Example

- Linear Stage with a tread pitch of 1 mm
- Encoder with a resolution of 1000 Impulses per turnaround (I/U) → 1 Impuls per µm
- Optical lateral Camera resolution of 10 µm

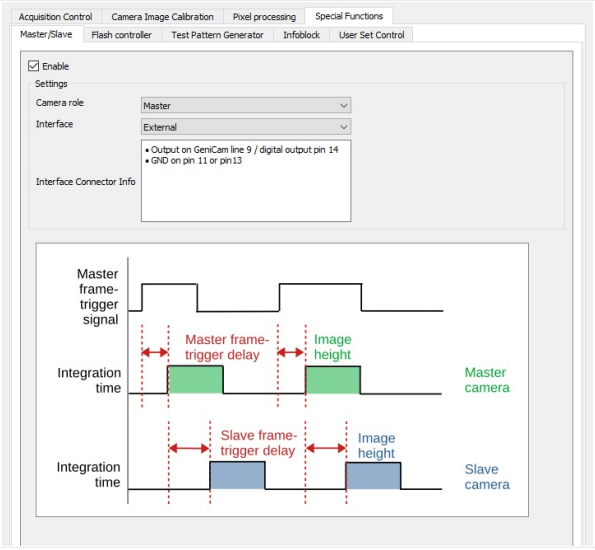
Encoder divider float = Optical resolution × encoder transport resolution = 10 µm × 1 I/µm = 10 I

Set up master slave operation

The master slave mode synchronizes a master camera with several slave cameras.
The frame trigger and line trigger are only connected to the master camera. The trigger information and additional timing signals are transferred to the slave cameras via the master-slave interface. All cameras run with exactly the same timing for lines and optional frames.

Set up the master camera

1. In the Configuration window navigate to *Special Functions → Master/Slave*.
2. Select the **Enable** checkbox.
3. In *Camera role* select the defined camera as **Master**.
4. In *Interface* select **External**.

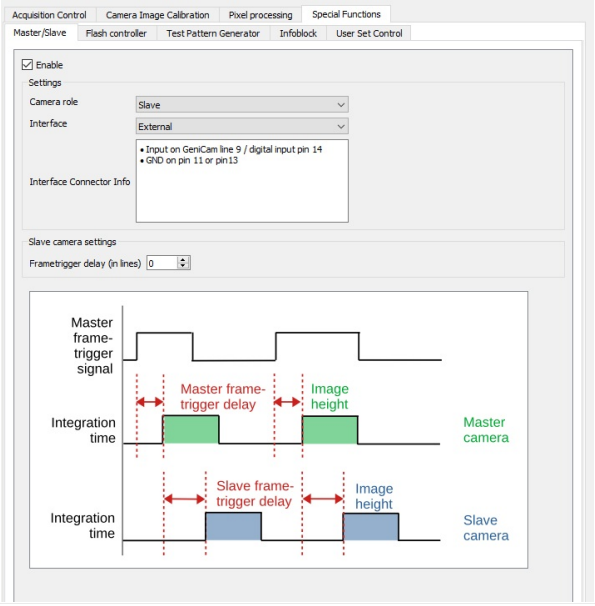


Alternatively you can set the camera as the master camera in the camera feature tree by executing the following steps:

Step	Feature name	Value
1	Master Slave Mode	Master
2	Master Slave Interface	External
3	Maste Slave Interface Enable	On

Set up the slave camera

1. In the Configuration window navigate to *Special Functions → Master/Slave*.
2. Select the **Enable** checkbox.
3. In *Camera role* select the defined camera as **Slave**.
4. In *Interface* select **External**.
5. As an option in *Slave camera settings* set the **frame trigger delay**.



Alternatively you can set the camera as the slave camera in the camera feature tree by executing the following steps:

Step	Feature name	Value
1	Master Slave Mode	Slave
2	Master Slave Interface	External
3	Maste Slave Interface Enable	On
4	Master Slave Delay Lines	<number of lines for delay>

Connect master and slave camera

The master/slave interface consists of a single timing signal for standard setup.
Use suitable Chromasens cables:

Cable type	Order number
Master Slave Hub cable allPIXA evo (0.5 m and 1.0 m)	CP000715
Trigger Cable allPIXA evo (5 m)	CP000716

The connection is established through the digital I/O interface.

1. Connect **pin 14 (line 9)** of the master camera to **pin 8 (line 4)** of the slave camera.
2. Connect **pin 13 (GND)** of the master camera to **pin 13 (GND)** of the slave camera.

Set the color transformation

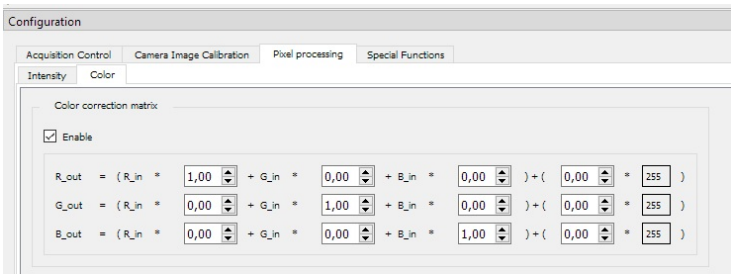
Set Color to Color (CCM)

The color transformation, or color correction matrix (CCM) can be used to apply a 3×3 or 3×4 correction matrix to the acquired image (Examples @8bit).

$$\begin{bmatrix} R_{out} \\ G_{out} \\ B_{out} \end{bmatrix} = \begin{bmatrix} Gain_{00} Gain_{01} Gain_{02} \\ Gain_{10} Gain_{11} Gain_{12} \\ Gain_{20} Gain_{21} Gain_{22} \end{bmatrix} \times \begin{bmatrix} R_{in} \\ G_{in} \\ B_{in} \end{bmatrix} + \begin{bmatrix} Offset_0 \times 255 \\ Offset_1 \times 255 \\ Offset_3 \times 255 \end{bmatrix}$$

Configuration widget

1. In the configuration window navigate to *Pixel processing → Color.*
2. Below *Color correction matrix* select the **Enable** checkbox.
3. The CCM can be changed by making **adjustments** in the spin boxes.



Feature tree

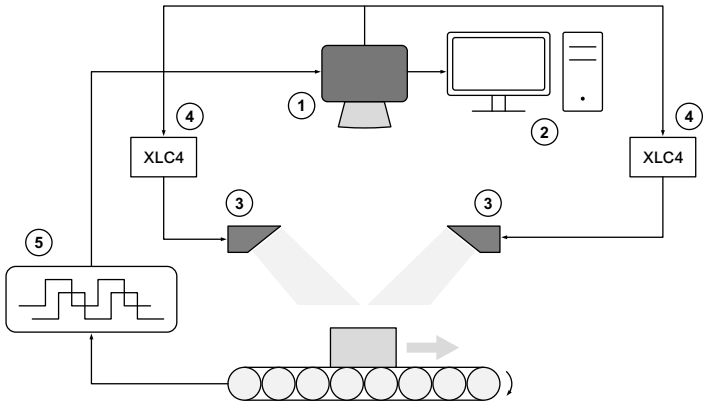
Step	Feature name	Value
1	*Navigate to* **Color Transformation Control**	
2	*Select* **Color Transformation Selector**	*Set* **Color to Color**
3	*Navigate to* **Color Transformation Enable**	*Set* **On**
4	*Select the* **Color Transformation Value Selector**	Gain00... Gain33 Offset0...Offset3
5	*Set your value in* **Color Transformation Value**	

Configure multi-channel flash control

The camera can be used to trigger up to four different flash controller channels synchronized to their line acquisition. You can acquire several images with different illumination colors simultaneously in a single scan using line-multiplexing. The camera starts a complete LED pattern sequence after each line trigger or after a sequence time in free-running mode.

The multi flash setup

The setup contains two Corona II illuminations which are controlled by the camera.



1	Line scan camera: scans the image line by line and communicates with the PC.	**2**	PC: performs subsequent processing of the image data and can control the illumination system.
3	Illumination: lights up the scan area.	**4**	Illumination controller: controls and monitors the illumination unit.
5	Speed detection: the encoder detects the speed of the conveyor belt and communicates with the camera.		

Connect the camera with the XLC4 controller

Any flash controller compatible to the electrical and timing specifications of the camera output interface can be synchronized. For best compatibility use the Chromasens illumination controller XLC4 (CP000411) illuminations from the Corona II product line.
Refer to the XLC4 controller manual.

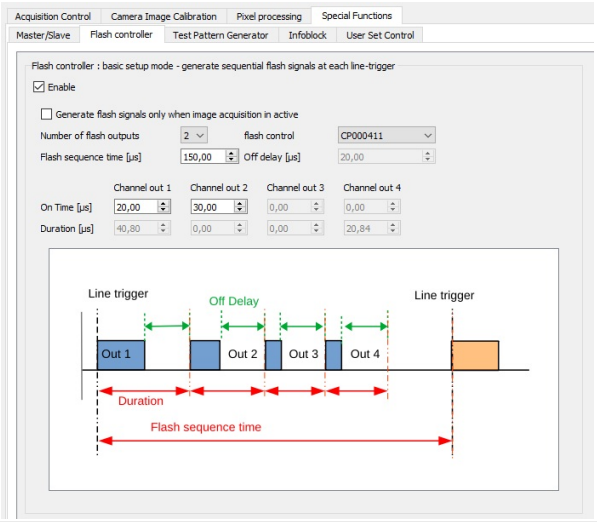
Set up the flash controller

The camera provides up to four different outputs which can be operated individually to control flash controllers. Several flash outputs can be individually configured.

Flash controller: basic mode

The basic mode is a sequential flash with up to four channels.

1. In the *Configuration window* navigate to *Special Functions → Flash Controller*.
2. Below *Flash controller: basic setup mode* select the **Enable** checkbox.
3. Adjust the parameters to your needs.



Alternatively you can set up the basic flash controller in the camera feature tree by executing the following steps:

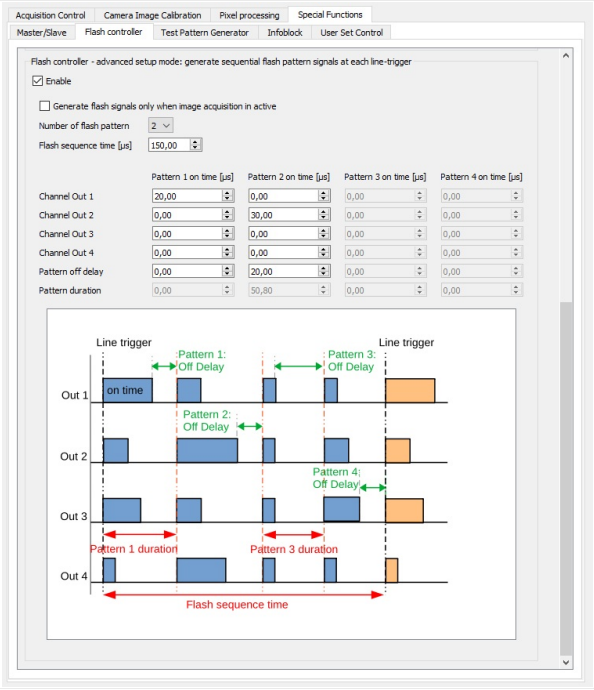
Step	Feature name	Value
1	Led Flash Control Led Flash Enable	On
2	Led Flash Number of Pattern	<number of Pattern>
3	Led Flash Pattern Selector	Led Flash Pattern <1>
4	Out1 on Time	<on time in µs>
5	Pattern of Delay	<delay time in µs>
6	Led Flash Pattern Selector	Led Flash Pattern <n>
7	Out-n on Time	<on time in µs>
8	Pattern of Delay	<delay time in µs>
9	Flash frame control	–
10	Led Flash sequence time	–

Flash controller: advanced mode

The advanced mode is a sequential flash with up to four channels and four patterns for each channel. The patterns are executed in a sequence. The sequence is repeated as long as scanning or triggering is active.

1. In the *Configuration window* navigate to *Special Functions → Flash Controller*.
2. Scroll down to *Flash controller - advanced setup mode*.
3. Below *Flash controller - advanced setup mode* select the **Enable** checkbox.
4. Adjust the parameters to your needs.

In this example two flash patterns are selected. The duration for each line pattern is set individually. All output channels are used.

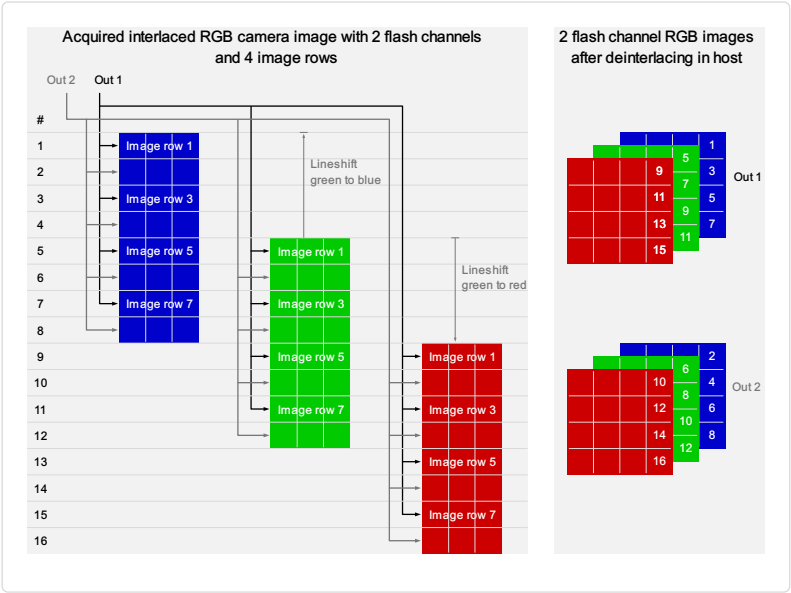


Alternatively you can set up the advanced flash controller in the camera feature tree by executing the following steps:

Step	Feature name	Value
1	Led Flash Control Led Flash Enable	On
2	Led Flash Number of Pattern	<number of Pattern>
3	Led Flash Pattern Selector	Led Flash Pattern <1>
4	Out1 – 4 on Time	<on time in µs>
5	Pattern of Delay	<delay time in µs>
6	Led Flash Pattern Selector	Led Flash Pattern <n>
7	Out1 – 4 on Time	<on time in µs>
8	Pattern of Delay	<delay time in µs>
9	Flash frame control	–
10	Led Flash sequence time	–

Deinterlace the image

The following image shows how to separate the flash channels on an example of two flash channels.


Acquired interlaced RGB camera image with 2 flash channels and 4 image rows
Out 2
Out 1
#
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Image row 1
Image row 3
Image row 5
Image row 7
Lineshift green to blue
Lineshift green to red
2 flash channel RGB images after deinterlacing in host
Out 1
Out 2

Create a black-reference (DSNU)

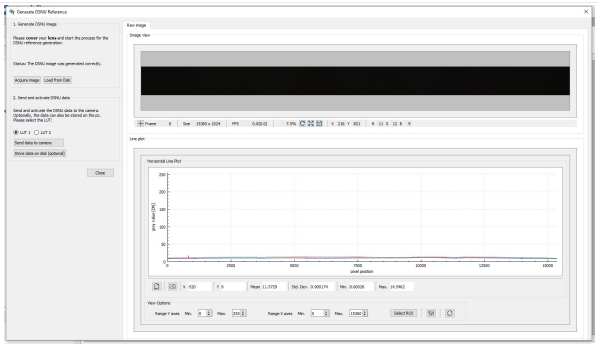
Create a black-reference with DSNU.

1. Switch off the illumination.
2. Cover the lens with a black or dark piece of cardboard or plastic.
   No light may reach the sensor.

3. In the *menu bar* navigate to *Tools* → *Calibration*.
4. Click **Generate DSNU Reference**.

The *Generate DSNU Reference* wizard opens.

5. Click **Acquire image** to generate the DSNU directly from the camera
   or
   click **Load from Disk** to load an image from the hard drive.

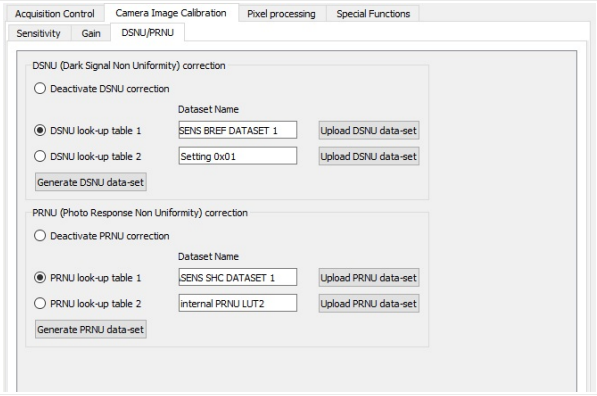


> **NOTE: Load from Disk**
>
> Make sure that the image has been taken with active image calibration mode by using the wizard.

The raw image and the line plot of the image is displayed.
Send the calculated DSNU to the camera:

6. Select **LUT 1** or **LUT 2**.
7. Click **Send data to camera**.

8. In the Configuration window navigate to *Camera Image Calibration* → *DSNU/PRNU*.
9. Make sure that DSNU is enabled.



Create a shading-reference (PRNU)

Calculation of PRNU

The following equation describes the calculation of the PRNU

$Calibrated_{Image} = (Raw_{Image} - DSNU) / PRNU$

$PRNU = (PRNU_{Image}-DSNU)/Target_{Value}$

$Calibrated_{Image}$ = Camera output with applied DSNU and PRNU

Raw_{Image} = Camera output image without any correction

$Target_{Value}$ = Target Value of PRNU, default value is 255

$PRNU_{Image}$ = Acquired image of the white-reference

PRNU = Photo response non-uniformity

DSNU = Dark signal non-uniformity

Standard PRNU reference generating

Create a shading-reference with PRNU.

1. Place a moving white target.
   If using a stationary target, place it slightly out of focus.

Acquire an image:

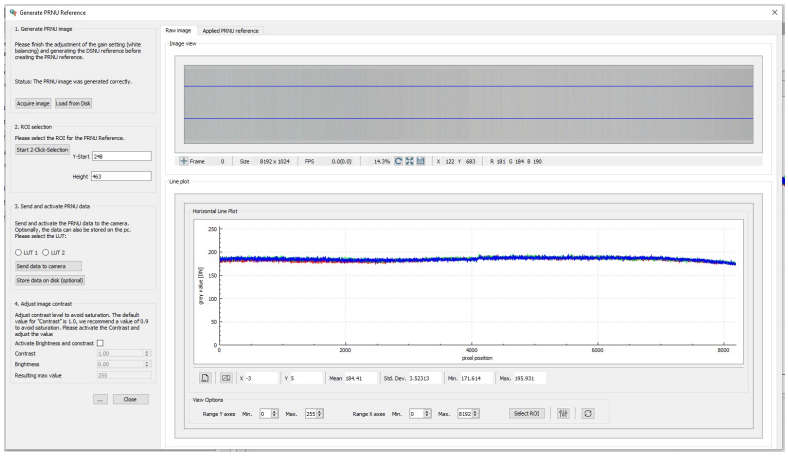
2. In the toolbar click **Acquire a single frame**
   or
   click **Start grabbing**, wait until an image ist displayed,
   click **Stop grabbing**.

3. In the *menu bar* navigate to *Tools* → *Calibration*.
4. Click **Generate PRNU Reference**.

The *Generate PRNU Reference* wizard opens.

5. Click **Acquire image** to generate the PRNU directly from the camera
   or
   click **Load from Disk** to load an image from the hard drive.

> **NOTE: Load from Disk**
> Make sure that the image has been taken with active image calibration mode by using the wizard.



The raw image and the line plot of the image is displayed.

6. Click **Start 2-Click-Selection**.
7. Click **on the image** to select the ROI.

Send the calculated PRNU to the camera:

8. Select **LUT 1** or **LUT 2**.
9. Click **Send data to camera**.

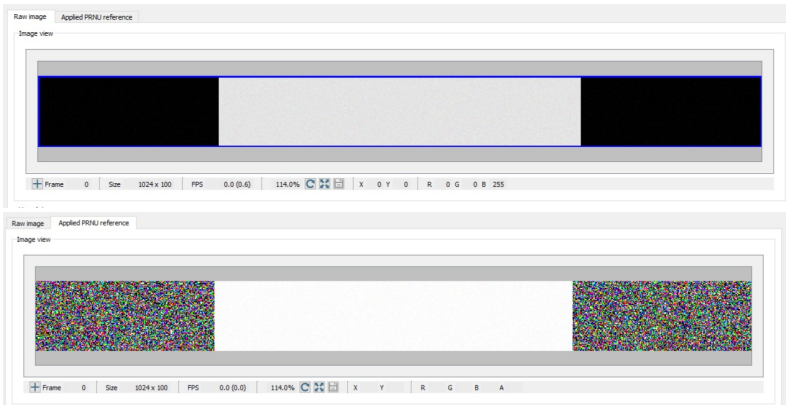
Activate brightness and contrast:

10. Select the **Activate Brightness and contrast** checkbox.
11. Set the contrast to 0.9.

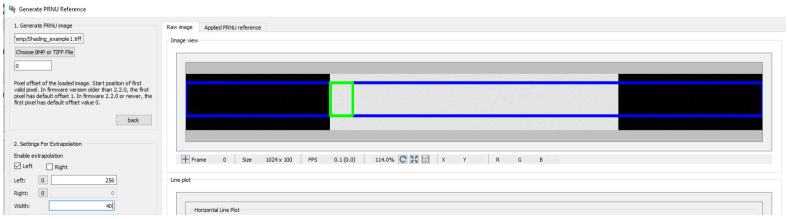
Extrapolation function

If the white reference does not cover the entire FOV, the extrapolation function can be used to generate it. In this case, a straight line is fitted to the gradient. Therefore follow the description below.

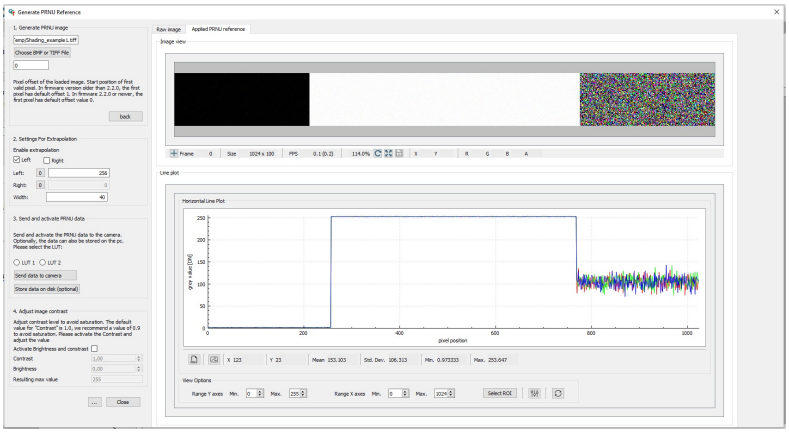
On the right side, you can see the *raw image* and the *Applied PRNU reference* without the extrapolation function.
In the area with low image content, the *Applied PRNU reference* shows some artifacts.



1. Select the ROI, by using the **Start-2-Click-Selection**.
2. Press the button with the **three dots** on the bottom.
3. **Enable** your option, in this example the left extrapolation.
4. Select the **start position** of your extrapolation. The width defines the area where the extrapolation is created. From the start position to column 0, the extrapolation is applied.



5. Check the applied PRNU in the ***Applied PRNU*** *reference* tab.



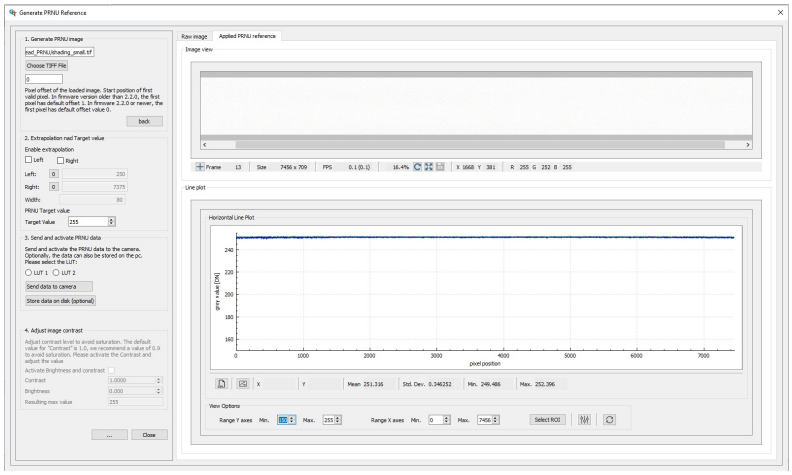
Target Value

The Target Value limits the maximum intensity of your $Calibrated_{Image}$.

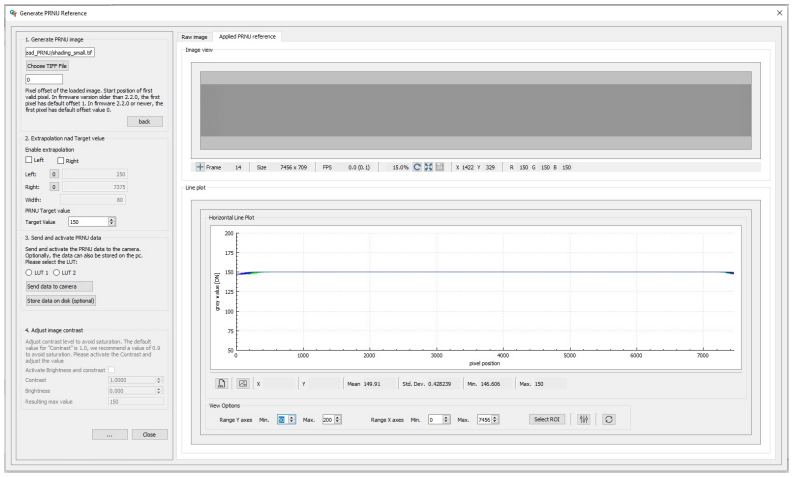
Note

Make sure that the Values of your $PRNU_{Image}$ are smaller than your $Target_{Value}$

1. Press the button with the **three dots** on the bottom.



2. Change the **Target Value**.
3. Check the applied PRNU in the ***Applied PRNU*** *reference* tab.



Adjust the sensor sensitivity

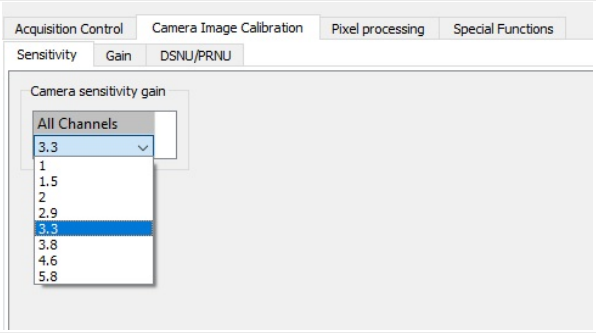
NOTE

When modifying the sensor sensitivity the PRNU and DSNU reference data become invalid.

1. Deactivate DSNU and PRNU references.
2. Create new data sets for shading and black reference.

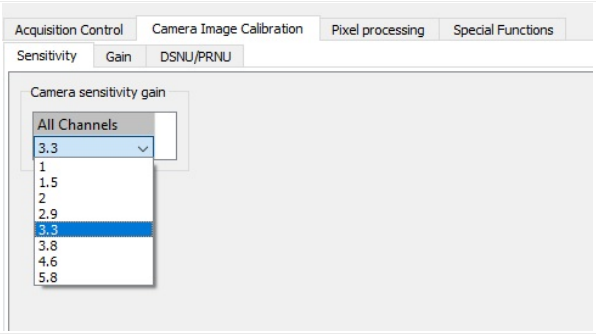
Low speed of the inspected object and good illumination

1. In the Configuration window navigate to *Camera Image Calibration → Sensitivity*.
2. Below *Camera sensitivity gain* select **a low sensitivity gain**:
   Achieve the highest dynamic range for areas with high contrast (completely dark to absolutely reflective).
   → E.g. pin inspection in electrical connectors.



High speed of the inspected flat object and bad illumination

1. In the Configuration window navigate to *Camera Image Calibration → Sensitivity*.
2. Below *Camera sensitivity gain* select **a high sensitivity gain**:
   Achieve a good image quality for flat objects.
   → E.g. solar cell, web or wafer inspection.



Sensitivity values

8k sensor

Sensitivity	Description	Full-well capacity
0	Low sensitivity for optimal SNR	–
1	Measured value	13 ke
2	–	–
3	–	–
4	–	–
5	–	–
6	–	–
7	Maximum sensitivity	–

ke: kilo-electrons

10k and 15k sensor

Sensitivity	Description	Full-well capacity
0	Low sensitivity for optimal SNR	40 ke
1	Medium sensitivity / high SNR	20 ke
2	Maximum sensitivity / standard SNR	10 ke

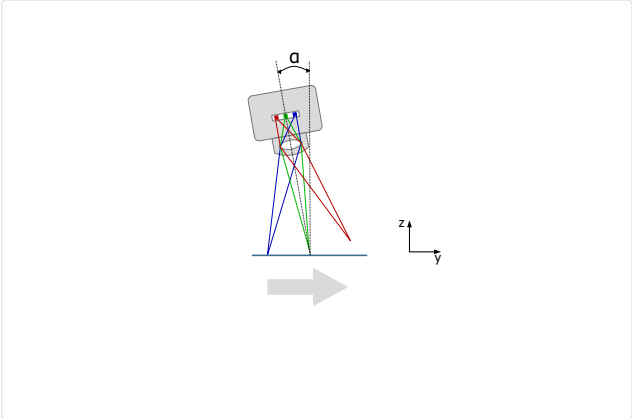
ke: kilo-electrons

Adjust the camera arrangement

Line Distance (ImageCalibrationLineDistance)

What is line distance?

allPIXA color linescan cameras have 3 color lines (RGB) to provide the best possible image quality. Therefore, a real sensor value is available for each pixel in all 3 color channels, no demosaicing with the resulting loss of resolution is necessary.
All lines are physically arranged at different positions on the sensor. This results in a shift of the 3 color channels in the raw image. All allPIXA cameras provide an internal correction function for this physically caused effect.



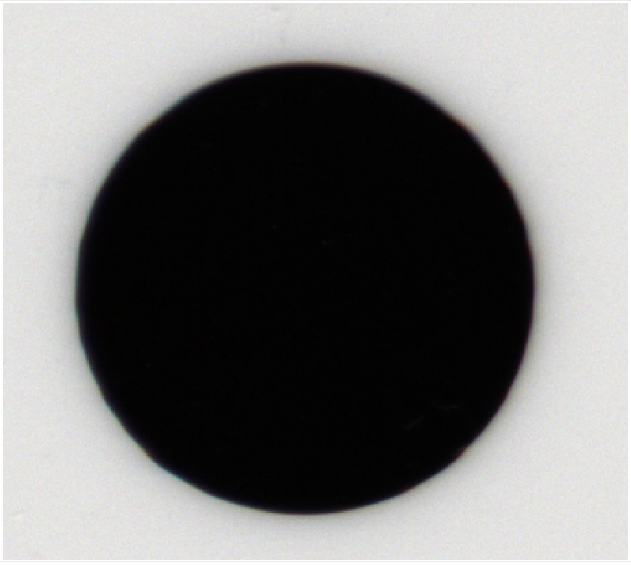
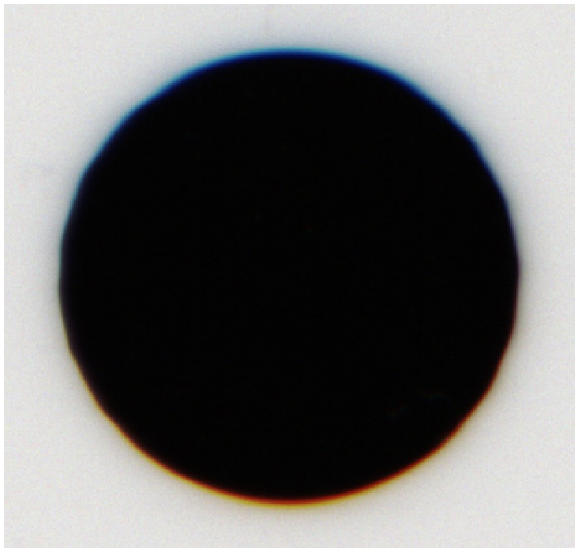
Setting up the parameters

In a standard setup where the camera is aligned perpendicular to the object and the resolution in the sensor direction equals the resolution in the transport direction, the Line Distance parameter is 2.

Step	Description
1. Calculate the *LineDistance* parameter	$\text{Line distance} = \frac{\text{Transport Resolution (dpi)} \times 2}{\text{Optical Resolution (dpi)} \times \cos(\alpha)}$ or $\text{Line distance} = \frac{\text{Optical Pixel Size}\left(\frac{\text{mm}}{\text{pixel}}\right) \times 2}{\text{Transport Pixel Size}\left(\frac{\text{mm}}{\text{pixel}}\right) \times \cos(\alpha)}$
2. Navigate in the feature tree to *Image Calibration Control → Camera Arrangement*	
3. Set the *LineDistance* parameter *ImageCalibrationLineDistance*	
4. There are different options available to set the transport direction with the parameter *ScanDirectionSource* and *ScanDirection*	

Effect of the Line Distance parameter

> **NOTE**
>
> An incorrect ScanDirection also produces a subpixel shift or colored fringes.

With correct *LineDistance (subpixel compensation)*	Without correct *LineDistance (subpixel compensation)*
	

Scan Direction Source

The camera has various options for automatically detection the scanning direction. The configuration can be done in the **camera feature tree** by executing the following steps:

Step	Description
1. Navigate in the feature tree to *Image Calibration Control → Camera Arrangement*	
2. Set the *ScanDirectionSource*	**Internal**: Specifies internal scanning direction source **Line3**: Specifies scanning direction source by the level of Line3 **Encoder0**: Specifies scanning direction source by Encoder0, therefore EncoderSourceA and EncoderSourceB must be connected.

Scan Direction

With the **Scan Direction** parameter the camera is able to control the processing of the output. It depends on the camera sensor and the mounting position. The configuration can be done in the **camerea feature tree** by executing the following steps:

Step	Description
1. Navigate in the feature tree to *Image Calibration Control → Camera Arrangement*	
2. Set the *ScanDirection*	**Forward:** Specified the forward scanning direction, for example RGB output. **Backward:** Specified the backward scanning direction, for example BGR output.

Read first line info block

Decoding of the first line info block

Pixel	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Line 0	Marker	Serial number				Marker	Image count		Exposure time		Marker	Line time			Encoder clocks				Error code		Time stamp			Marker

Serial number

Structure

The serial number consists of two parts.

SN first part		SN second part	
Byte 3	Byte 2	Byte 1	Byte 0
P_{x1}	P_{x2}	P_{x3}	P_{x4}

Decoding

The decoding of the serial number is:

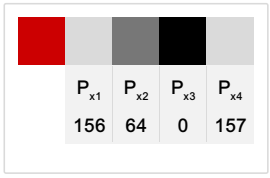
The first part of the serial number $S_1 = P_{x1} \times 256 + P_{x2}$

The second part of the serial number $S_2 = P_{x3} \times 256 + P_{x4}$

Example

$S_1 = 156 \times 256 + 64 = 40000$

$S_2 = 0 \times 256 + 157 = 157$



Example: decoding of SN: 40000-00157

Image count

Structure

Image count	
Byte 1	Byte 0
P_{x6}	P_{x7}

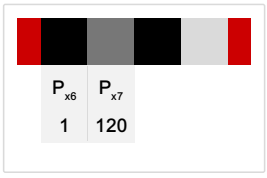
Decoding

The decoding of the image count is:

$I_c = P_{x6} \times 256 + P_{x7}$

Example

$I_c = 1 \times 256 + 120 = 376$



Example: image count 376

Exposure time

Structure

Exposure time clocks	
Byte 1	Byte 0
P_{x8}	P_{x9}

Decoding

The decoding of the exposure time is:

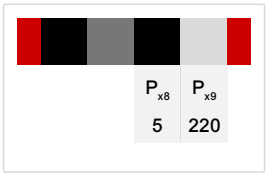
$E_t = (P_{x8} \times 256 + P_{x9}) / f_a$

f_a (10k, 15k) = 50 Mhz

f_a (8k) = 80 Mhz

Example

$E_t = (5 \times 256 + 220) / 50 = 50\ \mu s$



Example: Decoding of exposure time

Line time

Structure

Line time clocks		
Byte 2	Byte 1	Byte 0
P_{x11}	P_{x12}	P_{x13}

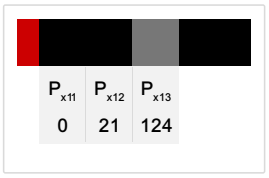
Decoding

The decoding of the Line time is:

$L_t = (P_{x11} \times 2^{16} + P_{x12} \times 2^8 + P_{x13}) / 100$

Example

$L_t = (0 \times 2^{16} + 21 \times 2^8 + 124) / 100 = 55\ \mu s$



Example: Decoding of line time

Encoder clocks

Structure

Encoder clocks			
Byte 3	Byte 2	Byte 1	Byte 0
P_{x14}	P_{x15}	P_{x16}	P_{x17}

Decoding

The decoding of the encoder clocks is:

$E_c = P_{x14} \times 2^{32} + P_{x15} \times 2^{16} + P_{x16} \times 2^8 + P_{x17}$

Time stamp

Structure

Time [s]		Time [¼ ms]
Byte 2	Byte 1	Byte 0
P_{x19}	P_{x20}	P_{x21}

Decoding

The decoding of the time stamp is:

$T_s = (P_{x19} \times 2^{16} + P_{x20} \times 2^8 + P_{x21}) / 4$

Read each line info block

Decoding of the each line info block

Pixel	0	1	2	3	4	5	6	7	8	9
Red	Marker	Error code	Speed2high	Encoder clocks	Next line position	Time stamp	Unsupported	Unsupported	Unsupported	Marker
Green	Continuous line count	Line count	Line time							
Blue										

Continuous line count

Structure

	Continuous line count	
–	Byte 1	Byte 0
P_{x0Red}	$P_{x0Green}$	P_{x0Blue}

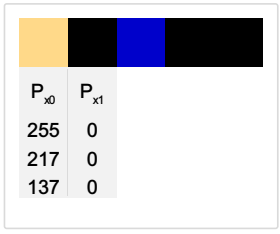
Decoding

The decoding of the continuous line count is:

$C_{lc} = P_{x0Green} \times 256 + P_{x0Blue}$

Example

$C_{lc} = 217 \times 256 + 127 = 55679$



Example: Decoding of continuous line count

Line count

Structure

	Line count	
–	Byte 1	Byte 0
P_{x1Red}	$P_{x1Green}$	P_{x1Blue}

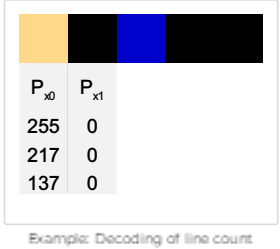
Decoding

The decoding of the line count is

$L_c = P_{x1Green} \times 256 + P_{x1Blue}$

Example

$L_c = 0 \times 256 + 0 = 0$



Example: Decoding of line count

Speed too high

Structure

Speed2high	–
Bit 7	Bit 6 – Bit 0
P_{x2Red}	

Line time

Structure

	Line time clocks		
Bit 7 – Bit 4	Bit 3 – Bit 0	Byte 1	Byte 0
P_{x2Red}		$P_{x2Green}$	P_{x2Blue}

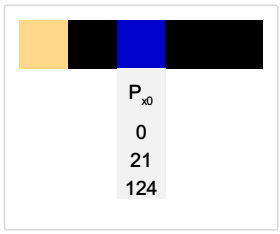
Decoding

The decoding of the line time is:

$L_t = (P_{x2Red} \times 2^{16} + P_{x2Green} \times 2^8 + P_{x2Blue}) / 100$

Example

$L_t = (0 \times 2^{16} + 21 \times 2^8 + 124) / 100 = 55\ \mu s$



Example: Decoding of line time

Encoder clocks

Structure

Encoder clocks		
Byte 2	Byte 1	Byte 0
P_{x3Red}	$P_{x3Green}$	P_{x3Blue}

Decoding

The decoding of the encoder clocks is:

$E_c = P_{x3Red} \times 2^{16} + P_{x3Green} \times 2^8 + P_{x3Blue}$

Next line trigger position

Structure

Next lt pos raw		
Byte 2	Byte 1	Byte 0
P_{x4Red}	$P_{x4Green}$	P_{x4Blue}

Decoding

The decoding of the encoder clocks is:

$N_{lp} = (P_{x4Red} \times 2^{16} + P_{x4Green} \times 2^8 + P_{x4Blue}) / 256$

Time stamp

Structure

Time [s]		Time [¼ ms]
Byte 2	Byte 1	Byte 0
P_{x5Red}	$P_{x5Green}$	P_{x5Blue}

Decoding

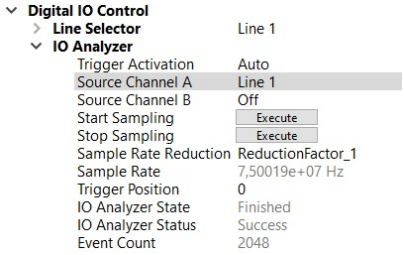
The decoding of the time stamp is:

$T_s = (P_{x5Red} \times 2^{16} + P_{x5Green} \times 2^8 + P_{x5Blue}) / 4$

IO Analyzer

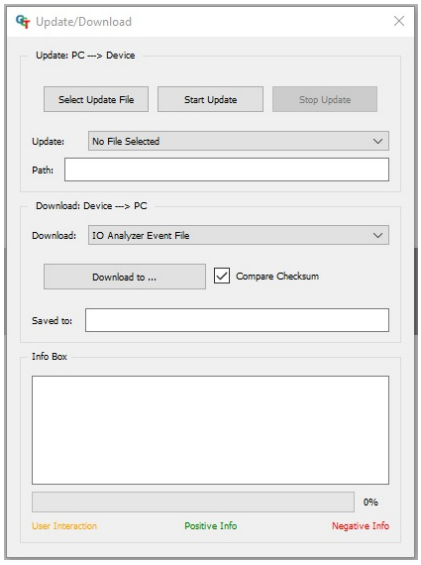
The IO Analyzer allows you to sample the IO input signal of the camera. In a case where you have problems with the input signal, for example with the frame trigger, you can use the IO Analyzer to scan the signals.

Setup and scan the IO Analyzer

1. Connect the IO's of the camera. 2. Start the camera and open GCT.	
3. Navigate to *Digital IO Control, IO Analyzer* .	
4. Set the Trigger Activation to **Auto** (default). 5. Select the Input Source.	
6. To start the sampling, enable the external **Input Source**,in this example, it is Line1 which is in the Encoder mode. 7. Press the **Execute** button of the Start sampling. 8. After a few seconds you can stop the sampling by clicking the **Execute** button of the Stop sampling.	

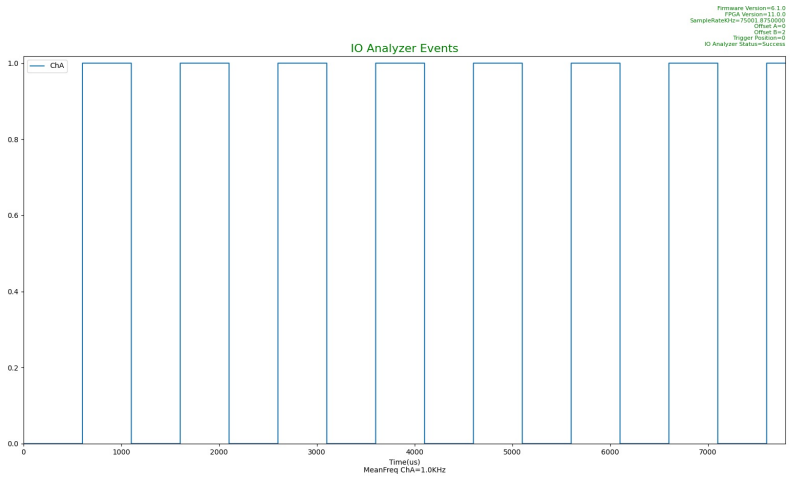
Read out the IO Analyzer data

The data of the *IO Analyzer* are stored in the camera and can be read out via the *Up/Download* dialog.

1. Navigate to *Tool* and click **Up-/Download**.	
2. In the area *Download: Device ---> PC,* select in the drop-down menu the **IO Analyzer Event File** and press **Download to**.	
3. Store the file on your PC, use a *.csv* suffix.	

Analyze the IO Analyzer data

The output of the *IO Analyzer is a CSV* file. You can either read in Excel or you can use the following Python script.
The Output of the Python script is a Plot with the signals and the calculated mean frequency.



Output of the Python script

Bash Copy

```
DisplayIOAnalyzerEvent.py -f YOUR_PATH\pathLog.csv

DisplayIOAnalyzerEvent.py -h
usage: DisplayIOAnalyzerEvent.py [-h] [-f F] [-s S] [-e E]

optional arguments:
  -h, --help  show this help message and exit
  -f F        -f This is the path to the io analyzer event file to display(Mandatory)
  -s S        -s This is the start time of the plot in us(Optional)
  -e E        -e This is the end time of the plot in us(Optional)
```

DisplayIOAnalyzerEvent.py

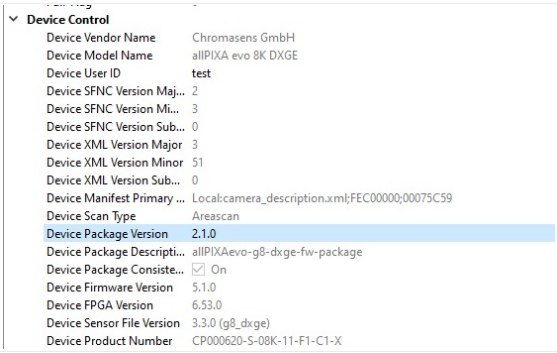
Update the firmware

NOTICE
Irreparable damage to the camera
If the camera ist powered down during firmware update it may get into a non-functional state. Recovery may not be possible.

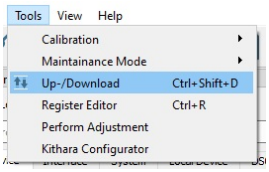
Update your firmware only to change camera functions or fix known bugs.
Any firmware update may not only add new features to a camera or fix known issues. It may also replace previous features or change camera characteristics. See firmware release notes for details.

1. Download firmware from the Chromasens website or use the firmware file provided by Chromasens.

2. Note the **Device Package Version** of the currently installed firmware displayed in the *Device Control feature* group.

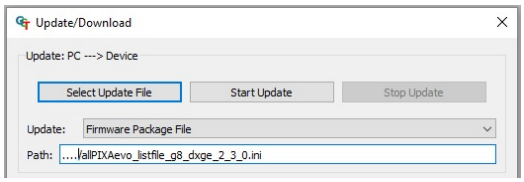


3. In the *menu bar* navigate to *Tools*.
4. Click **Up-/Download**or use the hotkey **Ctrl+Shift+D**.



The *Update/Download* wizard opens.

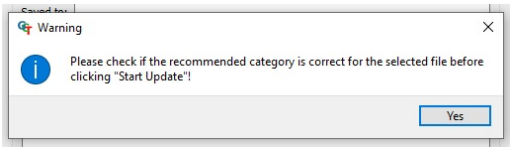
5. Click **Select Update File** and select the *Firmware Package file* to upload and click **Open.**



> **NOTE: Firmware Package file**
> For allPIXA evo select the allPIXAevo_listfile_.....ini file.
> For allPIXA neo select the allPIXAneo_listfile_.....ini file.

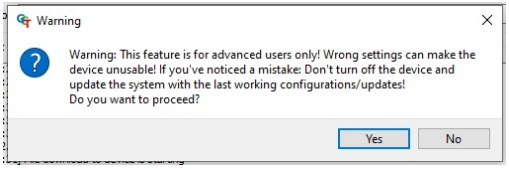
GCT shows a warning message.

6. Check if the *Update* field shows the *Firmware Package file* type.
7. Click **Start Update**.



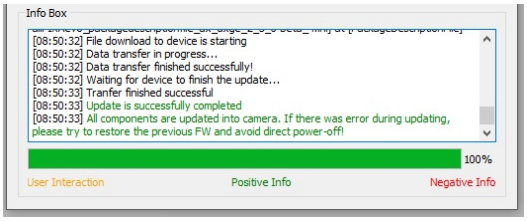
GCT shows a warning message.

8. Click **Yes** to start the Upload.



> **NOTE: Time for Update**
> Depending on the file size, firmware upload may take up to several minutes.

9. Check the text in the Info Box: If the update was successful, it contains a green confirmation message “Update is successfully completed”.



> **NOTE: Update Status**
> If the update was unsuccessful, do not switch off the camera, try to restore the previous state by uploading the correct file for the previously selected file type.

10. Power Cycle and Reconnect the camera

> **NOTE: Power Cycle**
> It is recommended to disconnect the power supply for 30 seconds.

11. Check the **Device Package Version** in the *Device Control feature* group to make sure that the camera successfully booted with the new firmware.

Click here to download a video

Overview

Release 2.7.0 (July 2024)

Camera	New features
allPIXA evo 16K CXP	Initial Release

Release 2.6.0 (July 2024)

Camera	New features
allPIXA evo 8k DXGE	Internal refactoring Improvement of the internal voltage control Monitor the g8 training state at runtime
allPIXA evo 8k CXP	Please refer to the release notes
allPIXA evo 10K/15K DXGE	Internal refactoring Improvement of the internal voltage control
allPIXA evo 10K/15K CXP	Please refer to the release notes

Release 2.5.0 (April 2024)

Camera	New features
allPIXA evo 8k DXGE	Added the DeviceLogLevel feature Support non-volatile logging for better debugging of customer issues The log is accessible by the LogFile in the File Access Control Exposure Time can be changed during grabbing now Changed GevMACAddressConfigReg from MaskedIntReg to IntReg type, to avoid GCT/GenAPI issue Improved order of pixel format initialization during user set load Support FPGA-XADC Added new features for the flat field correction (DSNU/PRNU)
allPIXA evo 8k CXP	Release skipped
allPIXA evo 10k DXGE	Added the DeviceLogLevel feature Support non-volatile logging for better debugging of customer issues The log is accessible by the LogFile in the File Access Control Exposure Time can be changed during grabbing now Changed GevMACAddressConfigReg from MaskedIntReg to IntReg type, to avoid GCT/GenAPI issue Improved order of pixel format initialization during user set load Support FPGA-XADC Added new features for the flat field correction (DSNU/PRNU)
allPIXA evo 10k CXP	Release skipped
allPIXA evo 15k DXGE	Added the DeviceLogLevel feature Support non-volatile logging for better debugging of customer issues The log is accessible by the LogFile in the File Access Control Exposure Time can be changed during grabbing now Changed GevMACAddressConfigReg from MaskedIntReg to IntReg type, to avoid GCT/GenAPI issue Improved order of pixel format initialization during user set load Support FPGA-XADC Added new features for the flat field correction (DSNU/PRNU)
allPIXA evo 15k CXP	Release skipped

Release 2.4.0 (October 2023)

Camera	New features
allPIXA evo 8k DXGE	Support of RGB TDI, Added new Feature to Support different TDI Modes HighSensitivity (new), HighSNR (same as before). Only available for cameras with serial numbers greater than SN: 2278
allPIXA evo 8k CXP	Support of RGB TDI, Added new Feature to Support different TDI Modes HighSensitivity (new), HighSNR (same as before). Only available for cameras with serial numbers greater than SN: 2278
allPIXA evo 10k DXGE	Release skipped
allPIXA evo 10k CXP	Release skipped
allPIXA evo 15k DXGE	Release skipped
allPIXA evo 15k CXP	Release skipped

Release 2.3.0 (July 2023)

Camera	New features
allPIXA evo 8k DXGE	IO Analyzer, Optimized black-level control, Support of RGB10, RGB12, Mono10, and Mono12 pixel format
allPIXA evo 8k CXP	IO Analyzer, Optimized black-level control
allPIXA evo 10k DXGE	IO Analyzer, Optimized black-level control, Support of RGB10, RGB12, Mono10, and Mono12 pixel format
allPIXA evo 10k CXP	IO Analyzer, Optimized black-level control
allPIXA evo 15k DXGE	IO Analyzer, Optimized black-level control, Support of RGB10, RGB12, Mono10, and Mono12 pixel format
allPIXA evo 15k CXP	IO Analyzer, Optimized black-level control

Release 2.2.0 (Mai 2023)

Camera	New features
allPIXA evo 8k DXGE	FrameBurstStart
allPIXA evo 8k CXP	FrameBurstStart Trigger over CXP, LinkTrigger0 and LinkTrigger1
allPIXA evo 10k DXGE	Release skipped
allPIXA evo 10k CXP	Release skipped
allPIXA evo 15k DXGE	Release skipped
allPIXA evo 15k CXP	Release skipped

Troubleshooting

During Installation

Error description	Possible cause	Action
The PowerShell script for setting up the 10 Gige Network adapter replies with an error: "10 GigE network connection is not found. Please check the hardware device."	The Network adapter is not supported.	Setup the Network adapter manually, refer to 10 GigE with s2i transport layer.
	The Network adapter is not installed.	Install the Network adapter, refer to Network adapters and transceivers.
	The camera is not connected to the PC.	Connect the camera to the PC.
	The Camera is turned off.	Switch the camera on.
	The Camera interface is CXP.	Skip the script.
	The interface cables of the camera are not connected properly.	Connect the cables again.
	Transceiver which is not configured for the network adapter.	Use a correctly configured transceiver, refer to Network adapters and transceivers.

During device discovery

Error description	Possible cause	Action
No Camera was found during the device discovery.	The correct GenTL Producer is not selected.	Change GenTL Producer, refer to Connection and disconnection of Camera.
	The IP address of the Network adapter is not correct.	Change the IP address of the camera or the Network adapter, refer to Configure the network adapter.
	The camera is not connected to the PC.	Connect the camera to the PC.
	The Camera is turned off.	Switch the camera on.
	The interface cables of the camera are not connected properly.	Connect the cables again.

During Streaming

Error description	Possible cause	Action
GCT shows a black image with an image content in R = 0, G = 0 and B = 0.	The Network adapter was not configured correctly.	Setup the Network adapter manually, refer to 10 GigE with s2i transport layer.

Status LED

Status LED	Device error code	Possible cause	Action
It does not turn green immediately after switching on the power supply.	–	The fuse has been tripped due to an incorrect input voltage.	1. Switch off the power supply. 2. Contact service.
Yellow	DEV_CTRL_ WARNING_ TEMPERATURE_ TOO_HIGH	The internal temperature is above the defined warning limit.	Decrease ambient temperature and improve cooling.
Red	DEV_CTRL_ ERROR_ TEMPERATURE_ TOO_HIGH	The internal temperature has reached the defined error limit.	The camera automatically switches to safety mode and indicates an image with a pin-stripe test pattern on a black background. 1. Switch off the power supply and let the camera cool down. 2. Check the ambient conditions (0 °C – 60 °C; 32 °F – 140 °F) and improve cooling. 3. Switch on the power supply.

Maintenance and disposal

Safety instructions

- Only technicians of Chromasens GmbH are permitted to open or slacken screws or housing sections of the device.
- Before carrying out any work on the device disconnect the power supply.
- To avoid the risk of fire let other devices such as radiators, heaters or lightning equipment cool down first.
- Necessary repairs may only be carried out by Chromasens GmbH.

	CAUTION
	The device can heat up to 60 °C.
	Do not touch the hot surface. Let the device cool down before carrying out any work on it.

Cleaning

During operation of the device, particles such as dust etc. may be settled on the lens. These deposits affect the quality of the optical image and the function of the device negatively.

Cleaning intervals

Specify regular cleaning intervals depending on your ambient conditions and the degree of soiling.

Cleaning procedure

1. Disconnect the power supply.
2. Let the device cool down.
3. Wipe all surfaces with a soft and lint-free cloth, starting with the lens. The use of isopropanol ist optional, refer to the manufacturer's manual.
4. Inspect the device to ensure that cleaning was effective and repeat if necessary.

Repair

In case of damages to the device refer to Chromasens GmbH.

Disposal

	This product is an electronic device. Please dispose this product in accordance with your local regulations. Contact your local government office for details about environmentally safe recycling.